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## **Camden Power Station Ash Disposal Facilities Expansion Project**

### **DRAFT REPORT FOR STAKEHOLDER REVIEW**

#### **Proponent:**

Eskom Holdings SOC Limited  
Megawatt Park  
Maxwell Drive, Sunninghill

**DEA Reference Number: 12/12/20/2300**

**March 2013**

**Zitholele Project No: 12670**

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## **DRAFT ENVIRONMENTAL IMPACT REPORT**

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## PURPOSE OF THIS DOCUMENT

Eskom is currently operating Camden Power Station as part of its electricity generation fleet. Throughout the operational life of the station, ash is generated at the station. This ash is being disposed of in an existing ash disposal facility within the Camden Power Station premises. The current ash disposal facilities have been providing disposal services since the establishment of the station (~44 years), and are reaching the end of their capacity. It has been calculated that as of the middle of 2014 a new ash disposal facility will be required to accommodate the remaining 19 years of operational life remaining.

To continue the practice of environmentally responsible ash disposal, this Environmental Impact Assessment (EIA) process is being undertaken, with the purpose of identifying, assessing, planning, and licensing a new ash disposal facility and its ancillary infrastructure. In order to comply with the necessary legal requirements of the National Environmental Management Waste Act (No 59 of 2008[NEM:WA]), the new ash disposal facility and associated structures must be appropriately designed and licensed, as ash disposal is a listed waste disposal activity. An integrated Environmental Impact Assessment (EIA) and Waste Management License Application process is being undertaken in line with the requirements of the EIA regulations promulgated under the National Environmental Management Act (No 107 of 1998 [NEMA]).

Eskom Holdings SOC Limited has appointed Zitholele Consulting (Pty) Ltd, an independent company, to conduct the EIA process required, to evaluate the potential environmental and social impacts of the proposed project, and undertake the necessary waste licensing processes. The Environmental Assessment Practitioner (EAP) is Mr Warren Kok of Zitholele Consulting.

According to the EIA Regulations, Interested and Affected Parties (I&APs) must have the opportunity to comment on the proposed project, and verify that all the issues raised to date have been recorded and addressed. To date this has been achieved through the public participation process (PPP) undertaken throughout the Scoping phase. The PPP included initial public notification, and a Draft Scoping Report (DSR) including comments from all stakeholders received during the announcement phase of the project was developed, and was available for comment for the period 18 July 2011 to 22 August 2011. Comments received were used to produce the Final Scoping Report, which was submitted to the Competent Authority (CA), the Department of Environmental Affairs (DEA) for review and acceptance. The CA issued an acceptance letter for the FSR on the 13 June 2011, and specialist studies were then commenced.

This Report, the Draft Environmental Impact Report (Draft EIR), documents the detailed studies, impacts, mitigation measures, and recommendations of the EAP, for consideration by all stakeholders. The comments received will be utilised to produce the Final EIR which will be submitted to the CA for decision-making.

### Summary of what the Draft EIR Contains (adapted from the EIA Regulations [2010])

- All of the information necessary for the authority to make a decision;
- Details of the Environmental Assessment Practitioner, and his expertise to carry out the EIA;
- A detailed description of the proposed activities;
- A description of the location and property on which the development is proposed;
- A description of the receiving environment that may be affected by the activity, including the manner in which it will be affected (physical, biological, social, economic, cultural aspects);
- Details of the Public Participation Process;
- A Description of the need and desirability of the proposed activity;
- A description of the identified potential alternatives to the proposed activity;
- An indication of the impact assessment methodology;
- A description and comparative assessment of all alternatives;
- A summary of specialist findings and recommendations;
- A description of all environmental issues that were identified and an assessment of the significance of each issue;
- An assessment of each identified potentially significant impact;
- A description of any assumptions, uncertainties, and gaps in knowledge;
- A reasoned opinion as to whether the activity should or should not be authorised;
- An environmental impact statement; and
- A draft Environmental Management Programme;
- Copies of any specialist studies must be attached; and
- Specific information required by authorities.

## TABLE OF CONTENTS

SECTION	PAGE
1	INTRODUCTION ..... 1
1.1	Who is the proponent? ..... 1
1.2	Camden Ash Disposal Facilities Expansion Project ..... 1
1.3	Project Location ..... 1
1.4	Authorisation Process Progress ..... 3
1.5	Context of this Report ..... 4
1.6	Environmental Impact Assessment Practitioner (EAP) Details ..... 5
2	LEGAL REQUIREMENTS ..... 6
2.1	The Constitution of the Republic of South Africa (Act 108 of 1996) ..... 8
2.2	National Environmental Management Act (Act 107 of 1998) ..... 9
2.2.1	What are the NEMA principles? ..... 10
2.2.2	Environmental Impact Assessment Regulations: 543-546 of 18 June 2010 ..... 10
2.3	National Environmental Management: Waste Act (NEM:WA) (Act 59 of 2008) ..... 13
2.4	Environment Conservation Act (Act 73 of 1989) ..... 14
2.5	The National Water Act (No. 36 of 1998) ..... 15
2.6	Additional Acts and Frameworks ..... 16
3	ENVIRONMENTAL IMPACT ASSESMENT PROCESS ..... 17
3.1	Study Approach and Progress to-Date ..... 17
3.2	Pre-Application Consultation ..... 17
3.3	Submission of an Application for Authorisation ..... 17
3.4	Site Visit ..... 17
3.5	Draft Scoping Report and Plan of Study for EIA ..... 17
3.6	Final Scoping Report and PoS EIA ..... 19
3.7	Specialist Studies ..... 19
3.8	Impact Assessment Phase ..... 19
3.8.1	Approach to Impact Assessment ..... 19
3.8.2	Impact Assessment Methodology ..... 20
3.8.3	Mitigation and Management Measures ..... 21
3.9	Draft EIR and EMP Compilation ..... 21
3.9.1	Draft Environmental Impact Report ..... 21
3.9.2	Environmental Management Programme (EMP) ..... 22
3.10	Final EIR and EMP Compilation ..... 22
3.11	Submission and Decision-making ..... 22
3.12	Public Participation Process (PPP) ..... 23
3.12.1	Objectives of public participation in an EIA ..... 23
3.12.2	Identification of Interested and Affected Parties (I&APs) ..... 23
3.12.3	Announcement of opportunity to become involved ..... 24
3.12.4	Obtaining comment and contributions ..... 25
3.12.5	Issues and Response Report ..... 26
3.12.6	Draft Scoping Report ..... 26
3.12.7	Final Scoping Report ..... 27
3.12.8	Public participation during the Impact Assessment ..... 27
3.12.9	Notification to I&APs of the Submission of the final EIR ..... 27
3.12.10	Announcement of Environmental Authorisation ..... 28
4	ISSUES AND CONCERNS RAISED ..... 29
5	ALTERNATIVES IDENTIFIED ..... 32
5.1	Waste Disposal Alternatives ..... 32

5.2	Site Alternatives.....	33
5.2.1	Initial Site Identification .....	34
5.2.2	Fatal Flaw Identification.....	36
5.2.3	Site Screening.....	37
5.3	Design Alternatives.....	39
5.4	The No-Go alternative .....	40
6	PROJECT DESCRIPTION .....	41
6.1	Project Components and Layout.....	41
6.2	Affected Properties and Land Owners .....	44
6.3	Footprint and lifespan of the facility .....	44
6.4	Height of the facility .....	44
6.5	Sources of Waste .....	45
6.6	Volumes of Waste.....	46
6.6.1	Ash Volumes.....	46
6.6.2	RO Plant Brine Volumes .....	46
6.7	Waste Characterisation.....	46
6.7.1	Minimum Requirements (DWAF, 1998a).....	47
6.7.2	Draft Revised Waste Classification and Management Regulations .....	50
6.7.3	Barrier System Design .....	52
6.8	Clean and Dirty Water Separation and Containment Infrastructure.....	54
6.8.1	Clean Water Separation Infrastructure .....	54
6.8.2	Dirty Water Containment Infrastructure .....	55
6.8.3	Leachate Collection and Management .....	56
6.8.4	Surface- and Ground- water monitoring .....	57
6.9	Pipelines.....	57
6.9.1	Slurry pipelines .....	57
6.9.2	Return water pipelines .....	57
6.10	Access Roads, Fencing, and Access Control.....	58
6.11	Relocation of Transmission Lines and other infrastructure .....	58
6.12	Contractors Camp.....	59
6.13	Capping of the Ash Disposal Site.....	60
7	DESCRIPTION OF DEVELOPMENT ACTIVITIES.....	61
7.1	The Pre-Construction Phase.....	61
7.1.1	Land Purchases and Negotiation .....	61
7.1.2	Appointment of Contractor .....	61
7.1.3	Construction Schedule .....	61
7.1.4	Installation of surface water / groundwater monitoring points .....	61
7.2	The Construction and Remediation Phase.....	63
7.2.1	Obtaining the Environmental Authorisation.....	63
7.2.2	Installation of fences and access control .....	63
7.2.3	Site preparation and clearance for contractor's camp.....	63
7.2.4	Erection of camp sites for the contractors' workforce .....	63
7.2.5	Vegetation clearing to facilitate access and construction activities .....	63
7.2.6	Establishing of access roads.....	63
7.2.7	Site services.....	64
7.2.8	Relocation of existing services – 400kV power lines .....	64
7.2.9	Pipeline construction .....	65
7.2.10	Barrier System Installation .....	67
7.2.11	Construction of the starter wall for the first compartment.....	71
7.2.12	Remediation of construction activities .....	71
7.3	The Operational Phase.....	72

	7.3.1	Taking over the facility from the Contractor .....	72
	7.3.2	Access roads, fences, and access control.....	72
	7.3.3	Site services.....	73
	7.3.4	Relocated 400kV power lines .....	73
	7.3.5	Pipelines .....	73
	7.3.6	Clean and dirty water separation and containment infrastructure .....	74
	7.3.7	Barrier System Maintenance .....	75
	7.3.8	Ash disposal.....	75
	7.3.9	Dewatering of the ash slurry.....	75
7.4		Rehabilitation and Decommissioning Phase .....	76
	7.4.1	Consecutive capping and rehabilitation of ash disposal facility .....	76
	7.4.2	Rehabilitation of disturbed areas .....	77
8		DESCRIPTION OF RECEIVING ENVIRONMENT .....	79
	8.1	Climate .....	79
	8.2	Geology .....	81
	8.2.1	Methodology and Data Sources .....	81
	8.2.2	Regional Description .....	81
	8.2.3	Study area Description .....	81
	8.3	Topography .....	82
	8.3.1	Data Collection.....	82
	8.3.2	Regional Description .....	82
	8.3.3	Study area Description .....	82
	8.3.4	Sensitivities .....	82
	8.4	Soils.....	84
	8.4.1	Data Collection.....	84
	8.4.2	Regional Description .....	84
	8.4.3	Study area Description .....	84
	8.4.4	Shallow (Rocky) Soils .....	85
	8.4.5	Agricultural Soils .....	87
	8.4.6	Transitional Soils.....	89
	8.4.7	Clay Soils .....	90
	8.4.8	Disturbed Soils.....	92
	8.5	Agricultural Potential (Land Capability) .....	92
	8.5.1	Data Collection.....	92
	8.5.2	Regional Description .....	92
	8.5.3	Study area Description .....	93
	8.6	Surface Water.....	96
	8.6.1	Data Collection.....	96
	8.6.2	Regional Description .....	96
	8.6.3	Study area Description .....	96
	8.6.4	Sensitivities .....	96
	8.7	Terrestrial Ecology .....	102
	8.7.1	Data Collection.....	102
	8.7.2	Vegetation.....	103
	8.7.3	Terrestrial Animal Species .....	109
	8.8	Avifauna .....	109
	8.8.1	Data Collection.....	109
	8.8.2	Regional Description .....	110
	8.8.3	Study area Description .....	111
	8.9	Visual Study.....	113
	8.9.1	Methodology .....	113
	8.9.2	The Viewshed .....	113
	8.9.3	Visibility Assessment.....	114

9	COMPARATIVE ASSESSMENT OF ALTERNATIVES .....	117
9.1	Construction Phase .....	117
9.2	Operational Phase .....	121
9.3	Closure Phase – Proposed Ash Disposal Facility .....	123
9.4	Post Closure Phase – Ash Disposal Facility .....	125
9.5	Conclusions from the Comparative Assessment .....	126
10	ENVIRONMENTAL IMPACT STATEMENT .....	127
10.1	Impact Assessment Methodology .....	127
10.2	Construction Phase .....	131
10.2.1	Geology .....	131
10.2.2	Topography .....	133
10.2.3	Soils and Land Capability .....	135
10.2.4	Surface Water and Wetlands .....	139
10.2.5	Groundwater .....	143
10.2.6	Terrestrial Ecology (Flora and Fauna) .....	146
10.2.7	Avifauna .....	148
10.2.8	Air Quality .....	151
10.2.9	Noise Impact .....	153
10.2.10	Social Environment .....	155
10.2.11	Economic Environment .....	162
10.2.12	Infrastructure .....	164
10.2.13	Traffic Impact .....	165
10.2.14	Visual .....	167
10.2.15	Cultural Heritage Environment .....	169
10.3	Operational Phase .....	171
10.3.1	Geology .....	171
10.3.2	Topography .....	171
10.3.3	Soils and Land Capability .....	171
10.3.4	Surface Water and Wetlands .....	173
10.3.5	Groundwater .....	176
10.3.6	Terrestrial Ecology (Flora and Fauna) .....	179
10.3.7	Avifauna .....	181
10.3.8	Air Quality .....	181
10.3.9	Noise Impact .....	183
10.3.10	Social Environment .....	183
10.3.11	Economic Environment .....	185
10.3.12	Infrastructure .....	185
10.3.13	Traffic Impact .....	186
10.3.14	Visual .....	186
10.3.15	Cultural Heritage Environment .....	187
10.4	Closure Phase .....	187
10.4.1	Geology .....	187
10.4.2	Topography .....	188
10.4.3	Soils and Land Capability .....	189
10.4.4	Surface Water and Wetlands .....	192
10.4.5	Groundwater .....	195
10.4.6	Terrestrial Ecology (Flora and Fauna) .....	197
10.4.7	Avifauna .....	200
10.4.8	Air Quality .....	200
10.4.9	Noise Impact .....	202
10.4.10	Social Impact .....	203
10.4.11	Economic Environment .....	203
10.4.12	Infrastructure .....	203
10.4.13	Traffic Impact .....	203

	10.4.14 Visual .....	203
	10.4.15 Cultural Heritage Environment .....	205
10.5	Post Closure Phase .....	205
	10.5.1 Geology .....	206
	10.5.2 Topography.....	206
	10.5.3 Soils and Land Capability.....	206
	10.5.4 Surface Water and Wetlands .....	206
	10.5.5 Groundwater .....	207
	10.5.6 Terrestrial Ecology (Flora and Fauna) .....	207
	10.5.7 Avifauna.....	207
	10.5.8 Air Quality .....	207
	10.5.9 Noise Impact.....	208
	10.5.10 Social Impact .....	208
	10.5.11 Economic Environment .....	208
	10.5.12 Infrastructure.....	208
	10.5.13 Traffic Impact .....	209
	10.5.14 Visual .....	209
	10.5.15 Cultural Heritage Environment .....	209
	10.5.16 Summary Matrix – Residual Impacts.....	209
11	EAP OPINION .....	211
12	CONCLUSION AND WAY FORWARD.....	215

---

## LIST OF FIGURES

---

Figure 1-1: Location of the Camden Ash Disposal Facility Project.....	2
Figure 3-1: Technical and public participation process and activities for this project .....	18
Figure 3-2: BID documents placed on neighbouring landowners.....	24
Figure 3-3: Site notice boards were put up in the study area.....	25
Figure 5-1: Waste Hierarchy .....	33
Figure 5-2: Site alternative locality map.....	35
Figure 6-1: Camden Ash Disposal Facility Expansion Project Layout Map for Site 1 .....	42
Figure 6-2: Camden Ash Disposal Facility Expansion Project Layout Map for Site 3.....	43
Figure 6-3: View of the sides of the existing ash disposal site .....	45
Figure 6-4: Transportation (red) and disposal (yellow) at current ash disposal facilities.....	46
Figure 6-5: H:H Lagoon Barrier System .....	53
Figure 6-6: Proposed Class C landfill barrier system (DEA, 2011) .....	54
Figure 6-7: Capping on the existing ash disposal site in the foreground.....	60
Figure 7-1: Proposed location of monitoring boreholes .....	62
Figure 7-2: Phased Installation of Liner System for Site 1 .....	68
Figure 7-3: Phased Installation of Liner System for Site 3A.....	70
Figure 7-4: Phased Installation of Liner System for Site 3B.....	70
Figure 8-1: Mean annual Precipitation of Ermelo District.....	80
Figure 8-2: Mean annual Temperature of Ermelo District .....	80
Figure 8-3: Regional topography.....	83
Figure 8-4: Mispah soil form (Soil Classification, 1991). .....	85

Figure 8-5: Soil Type Map .....	86
Figure 8-6: Dresden Soil Form (Soil Classification, 1991) .....	87
Figure 8-7: Clovelly soil form (Soil Classification, 1991) .....	87
Figure 8-8: Avalon Soil Form (Soil Classification, 1991) .....	88
Figure 8-9: Hutton Soil Form (Soil Classification, 1991) .....	88
Figure 8-11: Soft plinthic B-horizon .....	89
Figure 8-10: Longlands Soil Form (Soil Classification, 1991) .....	89
Figure 8-12: Wasbank Soil Form (Soil Classification, 1991) .....	90
Figure 8-13: Westleigh Soil Form (Soil Classification 1991) .....	90
Figure 8-14: Katspruit Soil form (Soil Classification, 1991) .....	91
Figure 8-15: Willowbrook Soil Form (Soil Classification 1991) .....	91
Figure 8-16: Witbank Soil Form (Soil Classification 1991) .....	92
Figure 8-17: Agricultural Potential .....	95
Figure 8-18: Wetland and surface water .....	97
Figure 8-19: Wetlands and Riparian Zones including buffer .....	101
Figure 8-20: Vegetation map of the study area .....	104
Figure 8-21: De Jager's Pan with the existing ash facility in the foreground .....	105
Figure 8-22: Moist Grassland found at the bottom of the southern slopes prior to joining De Jager's Pan .....	106
Figure 8-23 Drainage around the existing ash facility .....	107
Figure 8-24: Eastern Highveld Grassland found to the north (left) and south (right) of Camden Power Station .....	108
Figure 8-25: Disturbances to natural vegetation found along the route .....	108

Figure 8-26: Cultivated field and Grassland .....111

Figure 8-27: Existing Ash dam and ash disposal facility .....112

Figure 8-28: Difference in view from below (left) and above (right).....115

---

## LIST OF TABLES

---

Table 2-1: Summary of relevant legislation .....	6
Table 2-2: Potential applicable Section 21 Water Use Licenses .....	15
Table 3-1: Quantities rating and equivalent descriptors for the impact assessment criteria.....	20
Table 3-2: Advertisements placed during the announcement phase .....	25
Table 3-3: A Stakeholder meeting was advertised and was held as part of the public review period of the Draft Scoping Report.....	25
Table 3-4: A public meeting was advertised and was held as part of the public review period of the Draft Scoping Report.....	26
Table 3-5: List of public places where the Draft Scoping Report was available .....	27
Table 4-1: List of issues raised through the various phases of the project, and where they are addressed in this report. ....	29
Table 5-1: Fatal Flaws used in the site selection .....	36
Table 5-2: Presence of Fatal Flaws on each of the identified site alternatives (indicated by a Red Cross).....	37
Table 5-3: Sensitivity risk matrix for Alternative 1 and 3 .....	39
Table 6-1: Properties and Land Owners Affected if Site 1 is developed for the Camden Ash Disposal Facility Expansion Project .....	44
Table 6-2: Footprint (in hectares) of each site alternative for the Camden Ash Disposal Facility Expansion Project.....	44
Table 6-3: Waste Type and Class of Landfill Required based on Minimum Requirements .....	50
Table 6-4: Waste Type and Class of Landfill Required based on the DEA draft Revised Waste Classification and Management Regulations (2011).....	52
Table 6-5: Sizing of Clean Water Diversion Trench.....	54
Table 6-6: Sizing of Solution Trenches.....	55

Table 6-7: Sizing of Return Water Dam.....	56
Table 6-8: Leachate Flow Rates .....	57
Table 6-9: Details of the areas earmarked for Transmission Line Relocation .....	59
Table 7-1: Liner Required for Site 1 .....	67
Table 7-2: Phased Installation of Liner System at Site 1 .....	68
Table 7-3: Liner required for Site 3A .....	69
Table 7-4: Liner required for Site 3B .....	69
Table 7-5: Phased Installation of Liner System at Site 3A and Site 3B.....	69
Table 8-1: Agricultural Potential criteria.....	93
Table 8-2: Land Capability of the soils within the study area .....	94
Table 8-3: Potential Waterbird species at the existing and proposed new ash dam .....	112
Table 8-4: Visual Impact Assessment Criteria.....	114
Table 9-1: Summary Results: Comparative Assessment – Construction Phase .....	118
Table 9-2: Summary Results: Comparative Assessment – Operational Phase.....	122
Table 9-3: Summary Results: Comparative Assessment – Closure Phase.....	124
Table 9-4: Summary Results: Comparative Assessment – Post Closure Phase.....	125
Table 10-1: Description of the significance rating scale.....	128
Table 10-2: Description of the spatial rating scale. ....	128
Table 10-3: Description of the temporal rating scale.....	129
Table 10-4: Description of the degree of probability of an impact accruing .....	129
Table 10-5: Description of the degree of certainty rating scale .....	130
Table 10-6: Example of rating scale .....	130

Table 10-7: Impact Risk Classes.....	130
Table 10-8: Construction Phase Impact Assessment Matrix: Geology .....	133
Table 10-9: Construction Phase Impact Assessment Matrix: Topography .....	135
Table 10-10: Area of Impact per land Capability class.....	136
Table 10-11: Construction Phase Impact Assessment Matrix: Soil and Land Capability .....	139
Table 10-12: Construction Phase Impact Assessment Matrix: Surface Water and Wetlands.....	142
Table 10-13: Construction Phase Impact Assessment Matrix: Groundwater .....	145
Table 10-14: Vegetation composition and impact areas .....	146
Table 10-15: Construction Phase Impact Assessment Matrix: Terrestrial Ecology .....	148
Table 10-16: Construction Phase Impact Assessment Matrix: Avifauna .....	151
Table 10-17: Construction Phase Impact Assessment Matrix: Air Quality .....	153
Table 10-18: Construction Phase Impact Assessment Matrix: Noise.....	154
Table 10-19: Summary of Socio-economic impacts .....	155
Table 10-20: Construction Phase Impact Assessment Matrix: Socio-Economic Environment.....	162
Table 10-21: Construction Phase Impact Assessment Matrix: Economic Environment.....	164
Table 10-22: Construction Phase Impact Assessment Matrix: Traffic and Infrastructure.....	165
Table 10-23: Construction Phase Impact Assessment Matrix: Traffic and Infrastructure.....	167
Table 10-24: Construction Phase Impact Assessment Matrix: Visual Environment .....	169
Table 10-25: Construction Phase Impact Assessment Matrix: Archaeology, Palaeontology, and Cultural Heritage.....	171

Table 10-26: Operational Phase Impact Assessment Matrix: Soil and Land Capability .....	173
Table 10-27: Operational Phase Impact Assessment Matrix: Surface Water and Wetlands.....	176
Table 10-28: Breakdown of the existing and combined ash disposal footprint for Camden Power Station .....	177
Table 10-29: Operational Phase Impact Assessment Matrix: Groundwater .....	178
Table 10-30: Operational Phase Impact Assessment Matrix: Terrestrial Ecology .....	181
Table 10-31: Operational Phase Impact Assessment Matrix: Air Quality .....	183
Table 10-32: Summary of Socio-economic impacts .....	184
Table 10-33: Operational Phase Impact Assessment Matrix: Social Environment.....	185
Table 10-34: Operational Phase Impact Assessment Matrix: Visual Impact .....	187
Table 10-35: Closure Phase Impact Assessment Matrix: Topography .....	189
Table 10-36: Closure Phase Impact Assessment Matrix: Soil and Land Capability .....	192
Table 10-37: Closure Phase Impact Assessment Matrix: Surface Water and Wetlands.....	195
Table 10-38: Closure Phase Impact Assessment Matrix: Groundwater .....	197
Table 10-39: Closure Phase Impact Assessment Matrix: Terrestrial Ecology .....	200
Table 10-40: Closure Phase Impact Assessment Matrix: Air Quality .....	202
Table 10-41: Closure Phase Impact Assessment Matrix: Visual Environment .....	205
Table 10-42: Summary Matrix: Residual Impacts Post Closure .....	210

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## **LIST OF APPENDICES**

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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

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## ABBREVIATIONS

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ARL.....	Acceptable Risk Levels
CA.....	Competent Authority
CAR .....	Co-ordinated Avifaunal Road count project
CO <sub>2</sub> .....	Carbon Dioxide
DMR .....	Department of Mineral Resources
DEA .....	Department of Environmental Affairs
DWA .....	Department of Water Affairs
DWEA.....	Department of Water and Environmental Affairs (Ministry)
IEA.....	Integrated Environmental Authorisation
EAP .....	Environmental Assessment Practitioner
ECA .....	Environment Conservation Act
EIA.....	Environmental Impact Assessment
EIR.....	Environmental Impact Report
GCL .....	Geo-Synthetic Clay Liner
GIS .....	Geographic Information System
GNR.....	Government Notice Regulation
HDPE.....	High Density Polyethylene
HDI .....	Historically Disadvantaged Individuals
I&APs.....	Interested and Affected Parties
IEM .....	Integrated Environmental Management
IEP .....	Integrated Energy Plan
ISEP .....	Integrated Strategic Electricity Planning
kV .....	Kilo Volts
LCT.....	Leach Concentration Thresholds
MVA.....	Mega Volt Ampere
NEMA .....	National Environmental Management Act
NEM:WA.....	National Environmental Management: Waste Act
NERSA .....	National Energy Regulator of South Africa
NIRP .....	National Integrated Resource Plan
QDGC.....	Quarter-Degree Grid Cell
RO .....	Reverse Osmosis
SABAP1.....	Southern African Bird Atlas Project 1
SABAP2.....	Southern African Bird Atlas Project 2
SAR .....	South African Railways
SIA.....	Social Impact Assessment

SO <sub>2</sub> .....	Sulphur Dioxide
SR.....	Scoping Report
TC.....	Total Concentration
ToR.....	Terms of Reference
WMCO.....	Waste Management Control Officer
WMLA.....	Waste Management License Application

---

## 1 INTRODUCTION

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### 1.1 WHO IS THE PROPONENT?

Eskom Holdings SOC (Ltd) is the main South African utility that generates, transmits and distributes electricity. Eskom supplies ~95% of the country's electricity, and ~60% of the total electricity consumed on the African continent. Eskom plays a major role in accelerating growth in the South African economy by providing a high-quality and reliable supply of electricity.

### 1.2 CAMDEN ASH DISPOSAL FACILITIES EXPANSION PROJECT

Eskom is currently operating Camden Power Station as part of its electricity generation fleet. Throughout the operational life of the station, ash is generated. This ash is being disposed of in an existing ash disposal facility within the Camden Power Station premises.

The current ash disposal facilities have been providing disposal services for the last 44 years. This ash disposal site is now reaching the end of its life and as of the middle of 2014; a new ash disposal facility will be required to service the rest of the station life.

In order to establish a new ash disposal site within close proximity to the power station property and the current ashing site, a site selection exercise was undertaken in line with the Minimum Requirements for the Disposal of Waste by Landfill (both the 2<sup>nd</sup> Edition (1998) <sup>1</sup> and the Draft 3<sup>rd</sup> edition (2005)<sup>2</sup> were taken into account during the identification of the most feasible site alternatives, and design of the facility).

The new ash disposal facility (and its associated infrastructure) will need to cater for an estimated 12,86 million m<sup>3</sup> of ash up to 2023, plus 5 years contingency (2028). It is anticipated that additional structures/ancillary infrastructure will include *inter alia* Ash Water Return Dams (AWRD) and channels, pipelines, roads and fences.

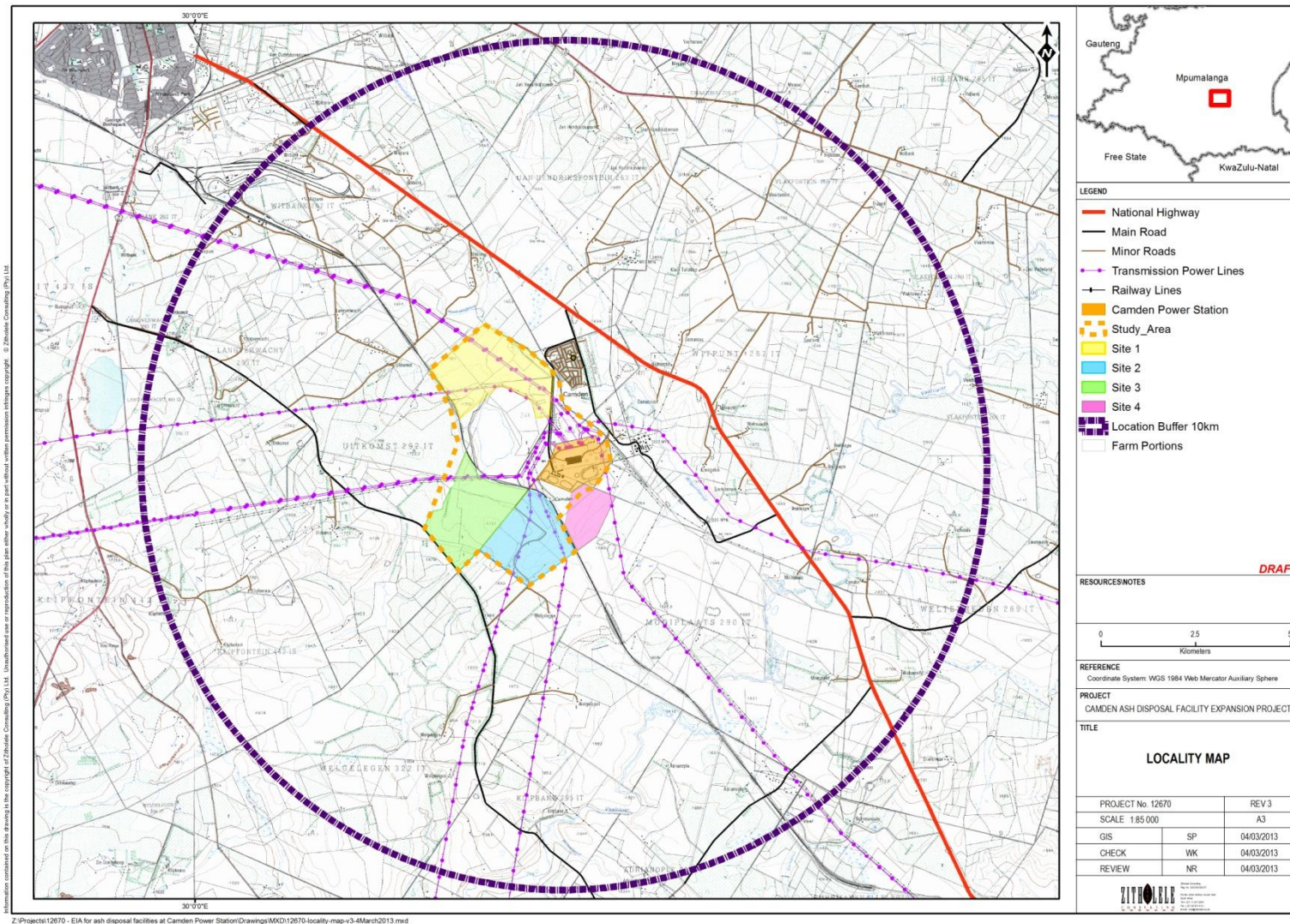
### 1.3 PROJECT LOCATION

The proposed project area is located adjacent to the Camden Power Station which is approximately 12 km outside the town of Ermelo in the Mpumalanga Province. The area is within the boundaries of the Msukaligwa Local Municipality in the Gert Sibande District Municipality, refer to the project locality map shown in Figure 1-1.

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<sup>1</sup> Department of Water Affairs & Forestry (DWAF), (1998) *Waste Management Series. Minimum Requirements for Waste Disposal by Landfill*, 2<sup>nd</sup> Ed, Government Printer, Pretoria.

<sup>2</sup> DWAF, (2005) *Waste Management Series. Minimum Requirements for Waste Disposal by Landfill*, Draft 3<sup>rd</sup> Ed, Government Printer, Pretoria



**Figure 1-1: Location of the Camden Ash Disposal Facility Project**

## 1.4 AUTHORISATION PROCESS PROGRESS

The proposed Camden Ash Facility Expansion project triggers listed activities in terms of the National Environmental Management Act ([NEMA] No 107 of 1998) and the National Environmental Management Waste Act ([NEM:WA] Act No 59 of 2009). In terms of these Acts a Waste Management License (WML) and Environmental Authorisation (EA) are required prior to the commencement of construction and operation. In order to obtain these authorisations an Environmental Impact Assessment (EIA) process must be undertaken. In terms of the aforementioned legislation and associated regulations Eskom needs to apply to the Department of Environmental Affairs (DEA) for an integrated WML and EA.

The EIA process for this project is divided into four main phases: (1) Scoping; (2) Impact Assessment; (3) Environmental Impact Reporting; and (4) Decision-making.

- (1) The Scoping Phase of this project has been completed, which included the following:
  - Pre-application consultation with relevant stakeholders and authorities;
  - Completion and submission of the relevant EIA Application documentation;
  - Placement of advertisements;
  - Compilation and distribution of a Background Information Document;
  - Site selection process?
  - Hosting public meetings, and allowing public participation;
  - Compilation of a Draft Scoping Report; and
  - Compilation, submission and acceptance of the Final Scoping Report and Plan of Study for EIA.
- (2) The Impact Assessment Phase of the project has also been completed, and consisted of the following:
  - Specialist Studies;
  - Comparative Impact Assessment of Feasible Alternatives; and
  - Conceptual Engineering / Conceptual Project Design.
- (3) We are currently in the Environmental Impact Reporting Phase, which consists of the following:
  - Compilation of a Draft Environmental Impact Report (EIR) and Draft Environmental Management Programme (Draft EMP);
  - Compilation of the waste application supporting documentation;

- Public participation process; and
  - Finalisation, submission, and decision-making of the Final EIR and EMP.
- (4) The next step in the process will be the Decision-making Phase, and will consist of the following:
- Authority and stakeholder review of the Final EIR and EMP;
  - Issuing of a decision on the finally submitted documentation; and
  - An appeal process will be undertaken to all Interested and Affected Parties (I&APs) to appeal the decision.

## **1.5 CONTEXT OF THIS REPORT**

This report is the Draft Environmental Impact Report (Draft EIR), a key component of the Integrated WML and EA process for the proposed establishment of new ash disposal facilities, at the Camden Power Station.

This report addresses the requirements for the Impact Assessment Phase for the EIA as outlined in the NEMA regulations. The aim of this Draft EIR is to:

- Provide information to the authorities as well as Interested and Affected Parties (I&APs) on the proposed project; including details on the:
  - Alternatives that are being considered;
  - Receiving environment; and
  - Assessing and ranking methodology;
- Indicate how I&APs have been, and are still being, afforded the opportunity to contribute to the project, verify that the issues they raised to date have been considered, and comment on the findings of the impact assessments;
- Provide proposed mitigation measures in order to minimise negative impacts and enhance positive impacts; and
- Present the findings of the Impact Assessment Phase in a manner that facilitates decision-making by the relevant authorities.

## 1.6 ENVIRONMENTAL IMPACT ASSESSMENT PRACTITIONER (EAP) DETAILS

In terms of the NEMA and associated Environmental Impact Assessment (EIA) Regulations (2010), the proponent must appoint an Environmental Assessment Practitioner (EAP) to undertake the environmental assessment of an activity regulated in terms of the aforementioned Act.

In this regard, Eskom appointed Zitholele Consulting to undertake the EIA for the proposed expansion of the Camden Power Station ash disposal facilities, in accordance with the EIA Regulations promulgated and amended in June 2010 in terms of the NEMA. This process also complies with the NEM:WA requirements for licensing of waste disposal facilities as the proposed activity is listed in the waste regulations (R718 Category B).

Zitholele Consulting is an empowerment company formed to provide specialist consulting services primarily to the public sector in the fields of Water Engineering, Integrated Water Resource Management, Environmental and Waste Services, Communication (public participation and awareness creation) and Livelihoods and Economic Development.

Zitholele Consulting has no vested interest in the proposed project and hereby declares its independence as required by the EIA Regulations. The details of the EAP representatives are listed below, refer to Appendix A for a copy of his *curricula vitae*.

### Warren Kok, BA Hon. (Geography and Environmental Management, RAU, 2000)

Name:	Warren Kok
Company Represented:	Zitholele Consulting (Pty) Ltd.
Address:	P O Box 6002, Halfway House, 1685
Telephone:	071 250 5371
Fax:	086 674 6121
E-mail:	WarrenK@zitholele.co.za

**Warren Kok** will be the designated Project Director on behalf of Zitholele. Warren will ensure regulatory compliance, quality assurance and overseeing the Technical Environmental Team. Warren holds a B.Hons degree in Geography and Environmental Management from Rand Afrikaans University (2000) and a Higher Certificate in Project Management from Damelin. He is a certified Environmental Assessment Practitioner (EAP) who is registered with EAPASA. Warren has in excess of 11 years' experience in environmental consulting in South Africa. His experience spans both the public and private sector. Warren has successfully undertaken countless integrated EIA processes that require integration of the MPRDA, NEM:WA, WULA and NEMA regulatory processes. Many of these projects are considered landmark projects in South Africa's environmental mining sector and included several hazardous waste facilities. He is ideally skilled and experienced to manage this project to its conclusion.

## 2 LEGAL REQUIREMENTS

Environmental legislation in South Africa was promulgated with the aim of, at the very least, minimising and, at the most, preventing environmental degradation. The Acts and Regulations applicable to the Camden Ash Disposal Facilities Expansion Project are summarised in Table 2-1. A discussion of the most relevant legislation is given in the sections that follow.

**Table 2-1: Summary of relevant legislation**

Legislation	Sections	Relates to
The Constitution Act (No 108 of 1996)	Chapter 2	Bill of Rights
	Section 24	Environmental rights
	Section 25	Rights in property
	Section 27	Health care, food, water and social security
	Section 32	Administrative justice
	Section 33	Access to information
National Environmental Management Act (No 107 of 1998) as amended	Section 2	Defines the strategic environmental management goals, principles and objectives of the government. Applies throughout the Republic to the actions of all organs of state that may significantly affect the environment
	Section 24	Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment.
	Section 28	The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care
NEM: Protected Areas Act (No 57 of 2003)	The Act came into operation on 01 November 2004. The aim of the Act is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity, natural landscapes and seascapes. In 2004, the National Environmental Management: Protected Areas Amendment Act 31 of 2004 was promulgated to amend Act 57 of 2003 with regard to the application of that Act to national parks and marine protected areas. The NEM: Protected Areas Amendment Act was published for public information on 11 February 2005 and came into operation on 01 November 2005. The NEM: Protected Areas Act, as amended by the NEM: Protected Areas Act 31 of 2004 repeals sections 16, 17 & 18 of the ECA as well as the National Parks Act with the exception of section 2(1) and Schedule 1.	
The Conservation of Agricultural Resources Act (No 43 of 1983) and regulations	Section 6	Implementation of control measures for alien and invasive plant species
National Heritage Resources Act (No 25 of 1999)	Section 34	No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.
	Section 35	No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site.

Legislation	Sections	Relates to
	Section 36	No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. "Grave" is widely defined in the Act to include the contents, headstone or other marker of such a place, and any other structure on or associated with such place.
	Section 38	This section provides for Heritage Impact Assessments (HIAs), which are not already covered under the ECA. Where they are covered under the ECA the provincial heritage resources authorities must be notified of a proposed project and must be consulted during the HIA process. The Heritage Impact Assessment (HIA) will be approved by the authorising body of the provincial directorate of environmental affairs, which is required to take the provincial heritage resources authorities' comments into account prior to making a decision on the HIA.
Atmospheric Pollution Prevention Act (No 45 of 1964) and regulations	Sections 27 – 35	Dust control
	Section 36 -40	Air pollution by fumes emitted by vehicles
National Environmental Management: Air Quality Act (No 39 of 2004)	Section 32	Control of dust
	Section 34	Control of Noise
	Section 35	Control of offensive odours
Occupational Health and Safety Act (No 85 of 1993) and regulations	Section 8	General duties of employers to their employees
	Section 9	General duties of employers and self-employed persons to persons other than their employees
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA),	Strategy for achieving the objectives of the United Nation's Convention on Biological Diversity, to which South Africa is a signatory	
	Sections 65-69	These sections deal with restricted activities involving alien species; restricted activities involving certain alien species totally prohibited; and duty of care relating to alien species
	Sections 71 and 73	These sections deal with restricted activities involving listed invasive species and duty of care relating to listed invasive species.
National Forests Act (No 84 of 1998) and regulations	Section 7	No person may cut, disturb, damage or destroy any indigenous, living tree in a natural forest, except in terms of a licence issued under section 7(4) or section 23; or an exemption from the provisions of this subsection published by the Minister in the Gazette.

Legislation	Sections	Relates to
	Sections 12-16	These sections deal with protected trees, with the Minister having the power to declare a particular tree, a particular group of trees, a particular woodland, or trees belonging to a particular species, to be a protected tree, group of trees, woodland or species. In terms of section 15, no person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister.
Fencing Act (No 31 of 1963)	Section 17	Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to protection of flora.
National Water Act (No 36 of 1998) and regulations	Section 19	Prevention and remedying the effects of pollution.
	Section 20	Control of emergency incidents
	Chapter 4	Use of Water and licensing
Hazardous Substances Act (No 15 of 1973) and regulations	Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances	
Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (No 36 of 1947) and regulations	Sections 3 to 10	Control of the use of registered pesticides, herbicides (weed killers) and fertilisers. Special precautions must be taken to prevent workers from being exposed to chemical substances in this regard.
All relevant Provincial Legislation and Municipal bylaws		

## 2.1 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA (ACT 108 OF 1996)

Section 24 of the Constitution states that: Everyone has the right

- a) to an environment that is not harmful to their health or well-being; and
- b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-
  - prevent pollution and ecological degradation;
  - promote conservation; and
  - secure ecologically sustainable development and use of natural resources, while promoting justifiable economic and social development

The current environmental laws in South Africa concentrate on protecting, promoting, and fulfilling the Nation's social, economic and environmental rights; while encouraging public participation, implementing cultural and traditional knowledge and benefiting previously disadvantaged communities.

Section 27 of the Constitution states that:

1. Everyone has the right to have access to
  - a) health care services, including reproductive health care;
  - b) sufficient food and water; and
  - c) social security, including, if they are unable to support themselves and their dependants, appropriate social assistance.
2. The state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of each of these rights.

## **2.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)**

The EIA for this proposed project is being conducted in terms of the EIA Regulations that were promulgated in terms of Section 24 (5) of the NEMA, as amended. The NEMA can be regarded as the most important piece of general environmental legislation. It provides a framework for environmental law reform and covers three areas, namely:

- Land, planning and development;
- Natural and cultural resources, use and conservation; and
- Pollution control and waste management.

This law is based on the concept of sustainable development. The objective of the NEMA is to provide for co-operative environmental governance through a series of principles relating to:

- The procedures for state decision-making on the environment; and
- The institutions of state which make those decisions.
- The NEMA principles serve as:
  - A general framework for environmental planning;
  - Guidelines according to which the state must exercise its environmental functions; and
  - A guide to the interpretation of NEMA itself and of any other law relating to the environment.

### 2.2.1 What are the NEMA principles?

Some of the most important principles contained in NEMA are that:

- Environmental management must put people and their needs first;
- Development must be socially, environmentally and economically sustainable;
- There should be equal access to environmental resources, benefits and services to meet basic human needs;
- Government should promote public participation when making decisions about the environment;
- Communities must be given environmental education;
- Workers have the right to refuse to do work that is harmful to their health or to the environment;
- Decisions must be taken in an open and transparent manner and there must be access to information;
- The role of youth and women in environmental management must be recognised;
- The person or company who pollutes the environment must pay to clean it up;
- The environment is held in trust by the state for the benefit of all South Africans; and
- The utmost caution should be used when permission for new developments is granted.

The National Department Environmental Affairs (DEA) is the Competent Authority (CA) responsible for issuing environmental authorisation for the proposed project. The Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) is a key commenting authority along with the Department of Water Affairs (DWA).

### 2.2.2 Environmental Impact Assessment Regulations: 543-546 of 18 June 2010

Even though the main activity of the proposed ash disposal facilities triggers the NEM: WA, certain proposed activities (see below) are also listed activities in terms of NEMA regulations. These are described below.

In terms of Government Notice (GN) R. 545 of 2010, the following listed activities require that a full EIA be undertaken and are applicable to this proposed project:

Activity 8: The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275kiloVolt (kV) or more, outside an urban area or industrial complex.

Activity 15: Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, industrial or institutional use where the total area to be transformed is 20 hectares or more;

Activity 19: The construction of a dam where the highest part of the dam wall, as measured from the toe of the wall to the highest part of the wall, is 5 metres or higher, or where the high water mark of the dam covers an area of 10 hectares or more.

In terms of Government Notice (GN) R. 544 of 2010, the following listed activities require that a Basic Assessment be undertaken for the proposed project (these activities having a lesser impact than those of the activities requiring an EIA will result in one EIA being undertaken for the proposed project):

Activity 9: The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water –

- I. With an internal diameter of 0.36 metres or more; or
- II. With a peak throughput of 120 litres per second or more.

Activity 11: The construction of -

- i) canals;
- ii) channels;
- iii) bridges;
- iv) dams;
- v) weirs;
- vi) bulk storm water outlet structures;
- vii) marinas;
- viii) jetties exceeding 50 m<sup>2</sup> in size;
- ix) slipways exceeding 50m<sup>2</sup> in size;
- x) buildings exceeding 50m<sup>2</sup> in size;
- xi) infrastructure or structures covering 50m<sup>2</sup> or more;

where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.

Activity 22: The construction of a road outside urban areas

- i. With a reserve wider than 13,5 metres;

- ii. Where no reserve exists where the road is wider than 8 metres, or
- iii. For which an EA was obtained for the route determination in terms of Activity 5 of GN 387 of 2006 or Activity 18 of GN 545 of 2010.

Activity 24: The transformation of land bigger than square 1000 metres in size, to residential, retail commercial, industrial or institutional use, where at the time of coming into effect of this Schedule or thereafter such land was zoned as open space, conservation or has an equivalent zoning.

Activity 27: The decommissioning of existing facilities or infrastructure, for:

- i) electricity generation with a threshold of more than 10MW;
- ii) Electricity transmission and distribution with a threshold of more than 132kV;

Activity 29: The expansion of facilities for the generation of electricity where:

- ii) Regardless the increased output of the facility, the development footprint will be increased by 1 hectare or more.

Activity 37: The expansion of facilities or infrastructure for the bulk transportation of water, sewage or storm water where –

- i) The facility or infrastructure is expanded by more than 1 000 metres in length; or
- ii) Where the throughput capacity of the facility or infrastructure will be increased by 10% or more.

Activity 39: The expansion of -

- i) canals;
- ii) channels;
- iii) bridges;
- iv) weirs;
- v) bulk storm water outlet structures;
- vi) marinas;

within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, where such expansion will result in an increased development footprint but excluding where such expansion will occur behind the development setback line.

- Activity 38: The expansion of facilities for the transformation and distribution of electricity where the expanded capacity will exceed 275kV and the development footprint will increase.
- Activity 47: The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre
- i) With a reserve wider than 13,5 metres;
  - ii) Where no reserve exists where the road is wider than 8 metres,
  - iii) Excluding widening or lengthening inside urban areas.

**Therefore, for the proposed project, a Scoping and EIA had to be undertaken. NEMA provides for a single integrated process for all the listed activities on site. Since the project comprises activities that require both a Basic Assessment and EIA levels of investigation, all activities will be assessed to the detail required for a Scoping and EIA process.**

### **2.3 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT (NEM:WA) (ACT 59 OF 2008)**

With the recent proclamation (July 2009) of the National Environmental Management: Waste Act (NEM: WA) some waste related activities previously listed under the NEMA EIA listings have been repealed and are now listed in the ambit of the NEM:WA. The Minister of Environmental Affairs published Regulation 718 in terms of Section 19 (1) of the NEM: WA. These regulations highlight the waste management activities that require waste licensing. The regulations comprise two Categories, namely Category A, which identifies activities that require a Basic Assessment process; and Category B, which identifies activities that require a full scoping and EIA process to be followed. In terms of these regulations the following activities which require a Waste Management Licence authorisation, are applicable to this project:

#### **Regulation 718 - Category B**

- Activity 1 The storage of hazardous waste in lagoons.
- Activity 9: The disposal of any quantity of hazardous waste to land.
- Activity 11: The construction of facilities for activities listed in Category B of Schedule 19(1) ~ GNR718.

**Regulation 718 - Category A**

Activity 19: The expansion of facilities of or changes to existing facilities for any process or activity, which requires an amendment of an existing permit or license or a new permit or license in terms of legislation governing the release of pollution, effluent or waste.

As described in Regulation 718 “a person who wishes to commence, undertake or conduct an activity listed under this Category, must conduct an environmental impact assessment process, as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as part of a waste management license application”.

**Therefore the proposed infrastructure requires the submission of a WML Application as well as a full Scoping and EIA to the National Department of Environmental Affairs.**

**2.4 ENVIRONMENT CONSERVATION ACT (ACT 73 OF 1989)**

The Environment Conservation Act (ECA) is a law that relates specifically to the environment. Although most of this Act has been replaced by the NEMA there are still some important sections that remain in operation. These sections relate to:

- Protected natural environments;
- Special nature reserves;
- Limited development areas; and
- Regulations on noise, vibration and shock.

## 2.5 THE NATIONAL WATER ACT (NO. 36 OF 1998)

***It should be noted upfront that any water uses that may require licensing in terms of the National Water Act ([NWA] No 36 of 1998) are being addressed by Eskom. The consultant has however included, for the sake of completeness, the potential water uses that may be triggered by this project.***

The list of potential water uses that will require licensing is given in Table 2-2.

**Table 2-2: Potential applicable Section 21 Water Use Licenses**

Water Use	Description	Potential Section 21 Water Uses
Section 21 (a)	Taking of water from a water resource.	Using water for dust suppression on roads or waste disposal facility; and Borehole water abstraction. Dewatering shallow perched aquifers.
Section 21 (b)	Storing of water.	Storing of water in return water dams, pollution control dams, and or storm-water control dams.
Section 21 (c)	Impeding or diverting the flow of water in a water course.	Activities within or near wetlands, or activities affecting wetlands.
Section 21 (e)	Engaging in a controlled activity: S37(1)(a) irrigation off any land with waste, or water containing waste generated through any industrial activity or by a water work.	Water used for dust suppression.
Section 21 (g)	Disposing of waste in a manner which may impact on a water resource.	Construction of the waste disposal facility. Storage of contaminated water in a pollution control dam / balancing dam / evaporation dam.
Section 21 (h)	Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process.	Construction of the waste disposal facility in which ash and blow down water from the Camden Cooling tower will be disposed of.
Section 21 (i)	Altering the bed, banks, course, or characteristics of a watercourse. This includes altering the course of a watercourse (previously referred to as a river diversion).	Activities within or near wetlands, or activities affecting wetlands.

## 2.6 ADDITIONAL ACTS AND FRAMEWORKS

In addition to the ECA, NEMA and NEM: WA, the following Acts have some bearing on the proposed activities:

### The National Heritage Resources Act (No. 25 of 1999)

The proposed construction of the waste disposal site comprises certain activities (e.g. changing the nature of a site exceeding 5 000m<sup>2</sup> and linear developments in excess of 300m) that require authorisation in terms of Section 38 (1) of the Act. Section 38 (8) of the Act states that, if heritage considerations are taken into account as part of an application process undertaken in terms of the ECA, there is no need to undertake a separate application in terms of the National Heritage Resources Act. The requirements of the National Heritage Resources Act have thus been addressed as an element of the EIA process, specifically by the inclusion of a Heritage Assessment.

### Department of Environmental Affairs and Tourism<sup>3</sup> Integrated Environmental Management Information Series

The Department of Environmental Affairs (DEA) Information Series of 2002 and 2006 comprise 23 information documents. The documents were drafted as sources of information about concepts and approaches to Integrated Environmental Management (IEM). The IEM is a key instrument of the NEMA and provides the overarching framework for the integration of environmental assessment and management principles into environmental decision-making. The aim of the information series is to provide general guidance on techniques, tools and processes for environmental assessment and management.

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<sup>3</sup> The Department of Environmental Affairs and Tourism is now referred to as the Department of Environmental Affairs (DEA).

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### **3 ENVIRONMENTAL IMPACT ASSESMENT PROCESS**

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#### **3.1 STUDY APPROACH AND PROGRESS TO-DATE**

The EIA Process being followed for this project complies with the EIA Regulations as amended and administered by the DEA and promulgated in July 2010 in terms of the Section 24 (5) of the NEMA. The technical and public participation process undertaken for this EIA is summarised below and schematically represented in Figure 3-1.

#### **3.2 PRE-APPLICATION CONSULTATION**

On notification and receipt of the appointment letter from Eskom, a project inception meeting was held on 13<sup>th</sup> April 2011 between Eskom and the Zitholele Consulting Project Team. During this project kick-off meeting the following was discussed:

- Project Scope and Requirements;
- Project Schedule;
- Identification of key stakeholders and role players; and
- Analysis of the preliminary ash disposal sites.

#### **3.3 SUBMISSION OF AN APPLICATION FOR AUTHORISATION**

The DEA Integrated EIA and WML application form (Appendix B) for the proposed project was submitted to the DEA on 19th May 2011. Copies of the application form and notification of this application form were forwarded to the MDEDET as a key commenting authority. As a point of departure, the I&AP database available from Camden Power Station was used for initial project notification and ground-truthed by the Zitholele team to identify additional I&APs on the 16th May 2011.

#### **3.4 SITE VISIT**

A site visit was conducted on the 16<sup>th</sup> of May 2011 with the objective of familiarising the project team with the area, undertaking the site selection and to distribute BID's to landowners.

#### **3.5 DRAFT SCOPING REPORT AND PLAN OF STUDY FOR EIA**

The Draft Scoping Report (Draft SR) was prepared with information and issues identified during the Scoping Phase activities. The Plan of Study (PoS) for EIA and the Terms of Reference (ToR) for the envisaged specialist studies were included in Chapter 8 of that report. The Draft SR and PoS for EIA was then updated with the comments received from key commenting authorities, public review and comments obtained from I&APs.

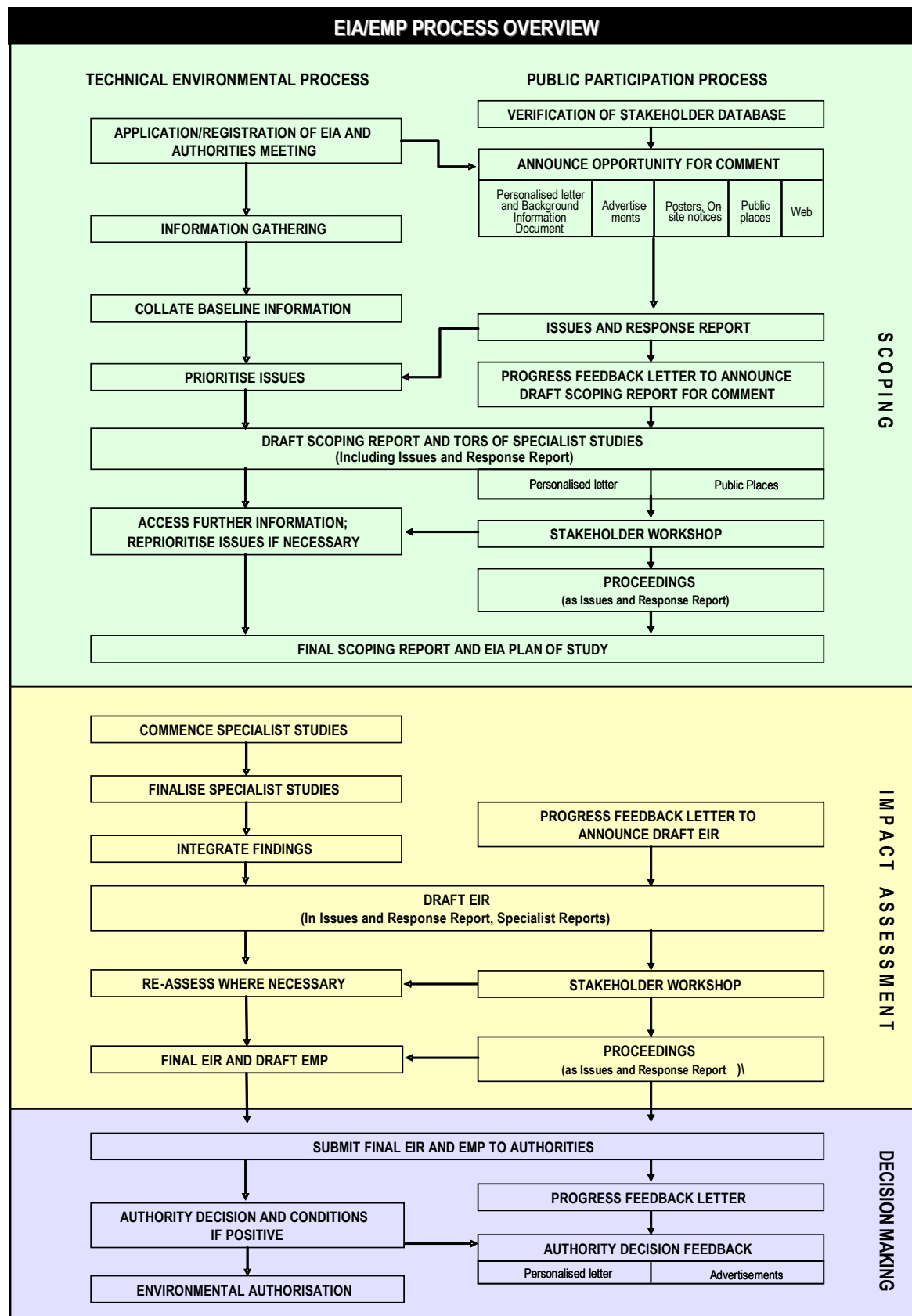


Figure 3-1: Technical and public participation process and activities for this project

### **3.6 FINAL SCOPING REPORT AND POS EIA**

The comments from the review of the Draft SR and PoS for EIA were used to compile a Final Scoping Report (Final SR). The Final SR was submitted to the CA for decision-making. An acceptance letter from the CA was received and is attached in Appendix C

### **3.7 SPECIALIST STUDIES**

In the PoS for EIA several specialist studies were suggested and accepted by the DEA. These studies have been used to inform the compilation of this report, and include:

- Ash Classification;
- Ash Site Conceptual Design and compilation of an Operational Manual;
- Geotechnical Investigations (Phase 1);
- Topographical Survey;
- Soils and Land Capability Assessment;
- Terrestrial Ecology (Fauna and Flora);
- Avifauna Assessment;
- Surface Water and Wetland Delineation and Assessment;
- Groundwater Assessment;
- Traffic Impact Opinion (*pending completion*);
- Air Quality Impact Opinion (*pending completion*);
- Noise Impact Opinion (*pending completion*);
- Heritage and Paleontological Assessment; and
- Visual Assessment.

These studies are attached as Appendix G to Appendix M.

### **3.8 IMPACT ASSESSMENT PHASE**

#### **3.8.1 Approach to Impact Assessment**

The impact assessment was not a discrete process happening in isolation, but was rather conducted throughout the entire EIA process. Once a final preferred layout and design for the facility has been proposed, the final impact assessment statement for the various environmental elements was written up in this EIR report.

### 3.8.2 Impact Assessment Methodology

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

- Direction of Impact (Positive / Negative);
- Magnitude / Significance;
- Spatial scale;
- Duration / Temporal scale;
- Probability of Impact Occurring; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the afore-mentioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in Table 3-1.

**Table 3-1: Quantities rating and equivalent descriptors for the impact assessment criteria.**

Rating	Magnitude	Extent scale	Temporal scale
1	VERY LOW	<i>Isolated Site / Development site</i>	<u>Incidental</u>
2	LOW	<i>Study area</i>	<u>Short-term</u>
3	MODERATE	<i>Local</i>	<u>Medium-term</u>
4	HIGH	<i>Regional / Provincial</i>	<u>Long-term</u>
5	VERY HIGH	<i>National</i>	<u>Permanent</u>

The impact assessment methodology is explained in detail in Section 3.8.2 of this report.

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*

### **3.8.3 Mitigation and Management Measures**

The development of mitigation and management measures was undertaken throughout the course of the process, from the assessment of the first alternative to the selection of a preferred design. Mitigation measures through the design review iterations and development of the preferred options have been recorded. In addition best practices were considered when identifying mitigation and management measures for potential impacts.

## **3.9 DRAFT EIR AND EMP COMPILATION**

### **3.9.1 Draft Environmental Impact Report**

Upon completion of the specialist studies and impact assessment the results of the studies were documented in this draft EIR (this Report) and made available for stakeholder review prior to finalisation and submission to authorities. The contents of the EIR are determined by the NEMA EIA Regulations and at a minimum include the following:

- Introduction (details of the EAP who prepared the report and his/her expertise);
- Motivation for the proposed project based on economic and environmental considerations;
- A detailed description of the proposed development;
- A detailed description of the proposed development site;
- A description of the environment that may be affected by the activity and the manner in which physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed development;
- A description of the need and desirability of the proposed development and the identified potential alternatives to the proposed activity;
- A summary of the methodology used in determining the significance of potential impacts;
- A description and comparative assessment of all alternatives identified during the environmental impact assessment process;
- A summary of the findings of the specialist studies;
- A detailed assessment of all identified potential impacts;
- A list of the assumptions, uncertainties and gaps in knowledge;
- An opinion by the EAP as to whether the development is suitable for approval within the proposed site;
- An environmental management plan that complies with Regulation 34 of Act 107 of 1998;
- Copies of all specialist reports appended to the EIA report;
- An environmental awareness plan; and

- Any further information that will assist in decision making by the authorities.

In addition, as required by the new EIA Regulations, the PPP report will be attached to the final EIR as an appendix and will include:

- details of the public participation process conducted, *inter alia* –
  - a list of all the potential interested and affected parties that were notified;
  - the steps that were taken to notify potentially interested and affected parties;
  - proof that notice boards, advertisements and notices notifying potentially interested and affected parties, and (if applicable) the owner or person in control of the land, of the application have been displayed, placed or given;
  - a list of all persons, organisations and organs of state that were registered as interested and affected parties in relation to the application;
  - Comments and Response Reports containing summaries of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues (or the reason for not addressing an issue); and
  - copies of all the comments received from interested and affected parties.

### **3.9.2 Environmental Management Programme (EMP)**

EMP, in the context of the new EIA Regulations, is a tool that takes a project from a high level consideration of issues, down to detailed workable mitigation measures that can be implemented in a cohesive and controlled manner.

The objectives of an EMP are to minimise disturbance to the environment, present mitigation measures for identified impacts, maximise potential environmental benefits, assign responsibility for actions to ensure that the pre-determined aims are met, and to act as a “cradle to grave” document.

The EMP has been drafted according to the findings of this draft EIR and is published as a separate report.

### **3.10 FINAL EIR AND EMP COMPILATION**

The Draft EIR and EMP will be made available for review by stakeholders. The comments received from the review phase will be used to finalise the reports.

### **3.11 SUBMISSION AND DECISION-MAKING**

Upon finalisation, the EIR and EMP will be submitted to the CA for decision-making and approval.

### **3.12 PUBLIC PARTICIPATION PROCESS (PPP)**

Public participation is an essential and legislative requirement for environmental authorisation. The principles that demand communication with society at large are best embodied in the principles of the NEMA. In addition, Section 24 (5), Regulation 54-57 of Government Notice Regulation (GNR) 543 under the NEMA, guides the public participation process that is required for an Environmental Impact Assessment (EIA) process.

The public participation process for the proposed Camden ash disposal facilities has been designed to satisfy the requirements laid down in the above legislation and guidelines. Figure 3-1 provides an overview of the EIA technical and public participation processes, and shows how issues and concerns raised by the public are used to inform the technical investigations of the EIA at various milestones during the process.

#### **3.12.1 Objectives of public participation in an EIA**

The objectives of public participation in an EIA are to provide access to sufficient information to I&APs in an objective manner so as to:

- During Scoping:
  - Assist I&APs to identify issues of concern, and providing suggestions for enhanced benefits and alternatives;
  - Contribute their local knowledge and experience;
  - Verify that their issues have been considered and to help define the scope of the technical studies to be undertaken during the Impact Assessment;
- During Impact Assessment:
  - Verify that their issues have been considered either by the EIA Specialist Studies, or elsewhere; and
  - Comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones.

The key objective of public participation is to ensure transparency throughout the process and to promote informed decision making.

#### **3.12.2 Identification of Interested and Affected Parties (I&APs)**

The identification of stakeholders is on-going and is refined throughout the process. As the “on-the-ground” understanding of affected stakeholders improves through interaction with various stakeholders in the area the database is updated. The identification of key stakeholders and community representatives (land owners and occupiers) for this project is important as their contributions are valued. The identification of key stakeholders was done in

collaboration with Eskom (through the I&AP database for the EIAs in the area), the local municipalities and other organisations in the study area.

The stakeholders' details are captured in an electronic database management software programme that automatically categorises every mailing to stakeholders, thus providing an on-going record of communications - an important requirement by the authorities for public participation. In addition, comments and contributions received from stakeholders are recorded, linking each comment to the name of the person who made it.

According to the NEMA EIA Regulations, a register of I&APs (Regulation 55 of GNR 543) must be kept by the public participation practitioner. Such a register has been compiled and is being kept updated with the details of involved I&APs throughout the process (See appendix D)

### 3.12.3 Announcement of opportunity to become involved

The opportunity to participate in the EIA was announced on the 16<sup>th</sup> May 2011 as follows:

- Distribution of a letter of notification to the neighbours of Camden Power Station, a letter of invitation to stakeholders to become involved was distributed, which was addressed to individuals and organisations, accompanied by a Background Information Document (BID) containing details of the proposed project, including a map of the project area, and a registration sheet (Appendix E and Figure 3-2).



**Figure 3-2: BID documents placed on neighbouring landowners**

**Advertisements were placed in the following newspapers as seen in Table 3-2 (Appendix D)**

**Table 3-2: Advertisements placed during the announcement phase**

NEWSPAPER	DATE
Ekasi News	20 May 2011
Highvelder	19 May 2011
Highveld Tribune	24 May 2011
Beeld	23 May 2011
Citizen	20 May 2011

- Site notice boards were positioned at prominent localities during May 2011 on all roads around the Camden Power Station. These notice boards were placed at conspicuous places and at various public places (Figure 3-3).



**Figure 3-3: Site notice boards were put up in the study area**

#### **3.12.4 Obtaining comment and contributions**

The following opportunities to contribute were available to I&APs during the Scoping Phase:

- Completing and returning the registration / comment sheets on which space was provided for comment;
- Providing comments telephonically or by email to the public participation office; and
- Attending the Open House session and Public Meeting that was widely advertised (see Table 3-3 below) and raise comments there.

**Table 3-3: A Stakeholder meeting was advertised and was held as part of the public review period of the Draft Scoping Report**

DATE	TIME	AREA	VENUE AND ADDRESS
27 July 2011	11:00 – Open House	ERMELO	Indawo Lodge
27 July 2011	16:00 – Public Meeting	ERMELO	Indawo Lodge

### 3.12.5 Issues and Response Report

The issues raised in the announcement phase of the project were captured in an Issues and Responses Report (IRR) Version 1 and appended to the Draft SR. The report was updated to include additional I&AP contributions received throughout the the Scoping Phase. The issues and comments raised during the public review period of the Draft SR was added to the report as Version 2 of the IRR. Version 3 of the IRR is attached to the Draft EIR and Version 4 will be attached to the Final EIR.

### 3.12.6 Draft Scoping Report

The purpose of the Draft SR was to enable I&APs an opportunity to verify that their contributions had been captured, understood and correctly interpreted, and to raise further issues. At the end of the Scoping Phase, the issues identified by the I&APs and by the environmental technical specialists, were used to define the Terms of Reference for the Specialist Studies that have been conducted during the Impact Assessment Phase of the EIA.

In addition to media advertisements and site notices that announced the opportunity to participate in the EIA, the opportunity for public review was announced as follows:

- In the Background Information Document (May 2011).

In advertisements published (see Table 3-4 below and Appendix D)

- to announce the review of the Draft SR and inviting stakeholders to attend a public meeting; and
- In a letter sent out in May 2011, and addressed personally to all individuals and organisations on the stakeholder database.

**Table 3-4: A public meeting was advertised and was held as part of the public review period of the Draft Scoping Report**

NEWSPAPER	DATE
Ekasi News	15 July 2011
Highvelder	21 July 2011
Highveld Tribune	19 July 2011
Beeld	14 July 2011
Citizen	14 July 2011

The Draft SR, including the Issues and Response Report Version 1, were distributed for comment as follows:

- Left in public venues within the vicinity of the project area (these are listed in Table 3-5 below);
- Published on the Eskom and Zitholele websites;
- Mailed to stakeholders;

- Mailed to I&APs who requested the report; and
- Copies have been made available at the stakeholder meeting.

I&APs could comment on the report in various ways, such as completing the comment sheet accompanying the report, and submitting individual comments in writing or by email.

**Table 3-5: List of public places where the Draft Scoping Report was available**

PLACE	CONTACT PERSON	TELEPHONE	ADDRESS
Ermelo Public Library	Mr Stanley Dondolo	(017) 801-3621	Cnr Church and Taute Street, Civic Centre, ERMELO
Visitor Centre, Camden Power Station	Ms Thandiwe Mzoyi	017 827 8000	Camden Power Station

### 3.12.7 Final Scoping Report

The Final Scoping Report was updated with additional issues raised by I&APs. The Final SR was submitted to the Competent Authority (CA) (DEA) and I&APs, and to those individuals who specifically requested a copy.

### 3.12.8 Public participation during the Impact Assessment

The purpose of the public participation process during the Impact Assessment Phase is to ensure that the Draft EIR is made available to the public for comments. I&APs will be requested to comment on the findings of the EIA, including the measures that have been proposed to enhance positive impacts and reduce or avoid negative ones.

The Draft EIR includes the IRR (Version 3), which lists every issue raised with an indication of where the issue is dealt with in the technical evaluations, and the relevant findings. It also includes a full description of the EIA process, including the necessary appendices.

The draft EIR will be reviewed by the public as described for the SR above. In summary stakeholders will be notified of the availability of the report and afforded an opportunity will be provided for stakeholders to engage with the report and the team. An Open House session and public meeting will be held and the draft report will be freely available in electronic format. The report will also be made available in Eskom and Zitholele websites.

### 3.12.9 Notification to I&APs of the Submission of the final EIR

Once the Final EIR and EMP reports are submitted to the CA, a letter will be sent to I&APs that the reports have been submitted and are available should they request copies of the reports. The letter will additionally outline the next steps in the process.

### **3.12.10 Announcement of Environmental Authorisation**

Once the decision is issued Eskom must, in writing, within 12 days of the date of the decisions (i.e. within 12 days after the date the decision was made by the DEA and not within 12 days of having been notified of the decisions) notify the registered I&APs of the outcome of the decisions, refer to the DEA's reasons for the decisions as contained in the copies of the DEA's decisions to be attached to the notice, and draw their attention to the fact that appeals may be lodged against the decisions.

In addition to the notice to the registered I&APs, Eskom must also within 12 days of the date of the decisions place notice in the same newspaper(s) used for the placing of notices during the PPP that was undertaken, informing I&APs of the DEA's decisions, where the I&APs can access copies of the DEA's decisions (note that the proponent must give access to copies of the decisions to I&APs), and draw their attention to the fact that appeals may be lodged against the decisions, and the manner in which to lodge appeals against the decisions.

## 4 ISSUES AND CONCERNS RAISED

A detailed list of the issues and concerns raised is attached in the Issues and Response Report (Appendix F). A list of the issues raised during the project is given in Table 4-1 below along with a reference to where the issue is addressed in this report.

**Table 4-1: List of issues raised through the various phases of the project, and where they are addressed in this report.**

Issue / comment Raised	Response / Report Reference
<b>Project Phasing</b>	
Eskom notified stakeholders at the public meeting that an Environmental Control Officer will be appointed in the construction phase of the project. This must be documented in the EMP.	<i>An Environmental Control Officer (ECO) or Waste Management Control Officer (WMCO) will be appointed as per the EMP. Refer to Appendix N of this report.</i>
<b>Alternatives</b>	
Alternative ash disposal options must be investigated which will also allow for business opportunities.	<i>Eskom are always open to new uses of their ash, and on-going investigations are undertaken by Eskom. The volume of ash is too large to dispose of through alternative uses. Approximately 5% of Eskom's Ash is disposed of through other uses.</i>
The option of constructing the facility on an incline must put forward as an alternative.	<i>Noted. Refer to the attached Conceptual Engineering report that investigated site alternatives.</i>
Placement of the facility to take existing infrastructure into account must be an alternative.	<i>Noted. Refer to the attached Conceptual Engineering report that investigated site alternatives.</i>
<b>Description of the receiving environment</b>	
Which municipalities are involved?	<i>Msukaligwa Local Municipality in the Gert Sibande District Municipality. Refer to Section 1.3 of this report.</i>
What comments have been received?	<i>Refer to the attached Issues and Response Report, Appendix F</i>
Why have the officials from the municipalities not attended the public meetings?	<i>Authorities are invited and attend as and when they please. Authorities are however part of the process but are able to contribute in a variety of other means. Authorities often preferring written submissions to attendance at public meetings.</i>
Concerns with erosion - mitigation measures have to be included in EMP.	<i>Noted. Refer to Appendix N of this report..</i>
Concerns with seepage – the lining must be adequate to minimize any seepage and possible groundwater pollution.	<i>Noted. Refer to Section 6.7.3 of this report.</i>
Specific fish species no longer occur in the De Jagers Pan.	<i>Noted. The de Jagers pan will not be used as the AWRD for the proposed new facility. A separate AWRD will be constructed. Preventing polluted water</i>

	<i>from leaving the site, seeping through the site and entering the de Jagers Pan. See Section 6.8.2 of this report.</i>
The Ash from the current facility pollutes the air and has a negative impact on buildings, farming activities and human health.	<i>Noted. Air quality impacts associated with ash disposal facilities is widely reported. The air quality study is pending finalisation. Current literature indicates that if managed the extent of the impact can be severely limited, and thus health related impacts can be reduced significantly.</i>
Dust suppression needs to be more effective and alternative methods of dust suppression must be investigated.	<i>Noted. Camden continuously tries to use dust suppression processes to mitigate dust.</i>
What is the impact to land use and agricultural potential, including such factors as loss of land, loss of income, loss of land value, reduction in crop production,	<i>A total 138.2 ha of arable land will be lost, and 76.1 ha of grazing land will be lost. This impact is assessed in Section 8.5 of this report. Also see the Biophysical Specialist Study that addresses this impact in more detail, Appendix I.</i>
Visual Impact of the facility.	<i>The visual impact was assessed and is addressed in Section 0 of this report.</i>
Windblown dust / ash is a concern.	<i>This impact was assessed and is addressed in Section 10.2.8 of this report.</i>
Water pollution due to the overflow of the De Jagers Pan.	<i>Noted. The de Jagers pan will not be used as the AWRD for the proposed new facility. A separate AWRD will be constructed. Preventing polluted water from leaving the site and entering the de Jagers Pan. See the attached Conceptual Engineering Report, Appendix J.</i>
Potential increase in crime and security concerns.	<i>This impact was assessed and is addressed in Section 10.2.10 of this report. Also see social impact study, Appendix M.</i>
<b>Infrastructure</b>	
Alternative 3 is not suitable because of the water pipeline, transmission line, and railway line running through the proposed site.	<i>Noted. All three (3) sites were evaluated equally by all specialists, and the preferred/recommended alternative finally selected is Alternative 1.</i>
<b>Socio-Economic Environment</b>	
Sense of place.	<i>This impact was assessed and is addressed in Section 10.2.10 of this report. Also see social impact study, Appendix M</i>
San rock paintings and figures near the alternative sites.	<i>A heritage assessment was undertaken, and the preferred alternative selected will not result in impacts</i>

	<i>to any such features. Refer to the attached Heritage Report, Appendix L.</i>
<b>Public Participation</b>	
Illiteracy.	<i>People unable to read and write were able to raise their comments / concerns or ask questions verbally at public meetings that were held or telephonically to the PP officer. Translators were available.</i>
Inclusion throughout the whole EIA process must happen	<i>A thoroughly inclusive stakeholder engagement process was undertaken in line with the requirements of the NEMA.</i>
<b>Impact Assessment</b>	
Request for an economic assessment, agriculture vs. waste facility.	<p>All potential alternatives will result in similar impacts to agricultural activities. Thus agricultural economics do not play a differential role in site selection.</p> <p>The issue then becomes whether the economics of constructing a waste disposal facility outweigh the economics of alternative land uses. In all circumstances the impact is again the same, the waste facility does not generate any income.</p> <p>However, without the waste facility the Camden Power station will need to close down. This latter scenario is covered in the NO-GO Assessment, and therefore the EAP does not see the value of a separate Economic Assessment Specialist study.</p>
Request for a palaeontological assessment.	Noted. Refer to attached Heritage Impact Assessment specialist report , Appendix L
Request for a wetland delineation assessment.	Noted. Refer to attached Biophysical Assessment specialist report, Appendix I.

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## **5 ALTERNATIVES IDENTIFIED**

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Alternatives considered for the proposed Camden Ash Disposal Facility project can be divided into the following categories:

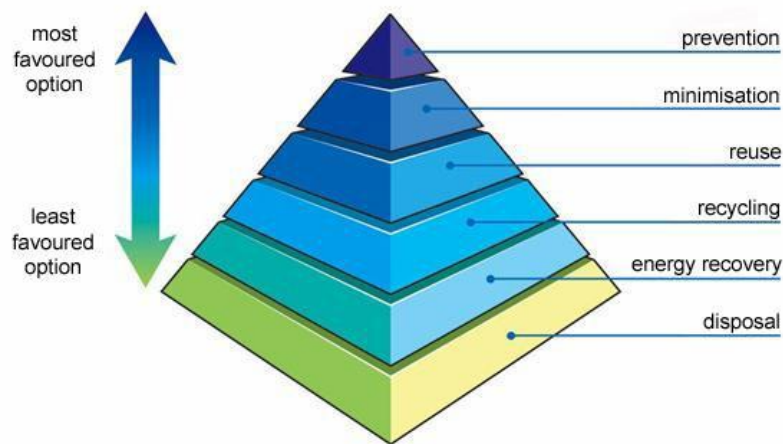
- Waste disposal alternatives;
- Site alternatives;
- Operation alternatives, and
- The No-Go (no development) alternative.

These are discussed in the sections below.

### **5.1 WASTE DISPOSAL ALTERNATIVES**

The waste management hierarchy is an internationally accepted guide to prioritise waste management options and aims to achieve optimal environmental results, and is also a General Duty of a Holder of Waste in NEMWA. The first priority should be to prevent the generation of waste. If not possible, waste should be minimised or re-used as far as possible. Refer to Figure 5-1 for an illustration of the waste hierarchy.

Ash from coal-fired power stations provides a unique challenge to waste minimisation. Ash in its various forms can be utilised in the building industry as a cement extender or aggregate. Although the ash is generated in large volumes, the classification of the ash according to legislation has posed several challenges as the ash was not considered when the classifications were developed. Using the leaching analysis, ash is mostly classified as hazardous according to the Minimum Requirements, which prevents the use/recycling of the ash prior to the delisting of the ash by the Department for a specific use. In addition the sheer volume of ash produced by power stations far exceeds the potential market for recycled ash products. At present there is no feasible recycling or reuse alternative for the ash being produced at Camden Power Station.



**Figure 5-1: Waste Hierarchy**

The Camden Ash Disposal Facility will form an integral part of the handling, re-use and disposal of water and waste at the Camden Power Station operations. The ash disposal facility is the last resort in the ash waste stream as it is a final disposal facility. Water from the wet ashing process is recycled via ash water return dams, from where the water is pumped to the power station and re-used in the process of ash transportation rather than using clean water. In the case of the ash, the waste disposal is currently the most feasible alternative for the Camden power station due to the fact that the combined sales the aforementioned uses would not reduce the waste stream by noticeable volume (less than 0.05%), or even reduce the footprint of a facility required to store the waste stream.

## **5.2 SITE ALTERNATIVES**

A site identification and evaluation exercise was undertaken in line with the Minimum Requirements for the Disposal of Waste by Landfill, both the 2<sup>nd</sup> Edition (1998)<sup>1</sup> and the Draft 3<sup>rd</sup> Edition (2005)<sup>2</sup> were taken into account, technical engineering requirements were also used in the initial identification of the site alternatives and refined later in the conceptual engineering of the feasible alternatives. The identification and evaluation of site alternatives is a phased approach consisting primarily of the following:

- Identification of potential sites against a set of technical criteria;
- Fatal flaw analysis of potential site alternatives; and
- Screening and ranking of sites against economic, environmental and public criteria.

The site identification and evaluation exercise was undertaken by the environmental consultants (environmental, geotechnical and engineering) and Eskom personnel (site engineer, environmental manager station and environmental advisor head office).

### 5.2.1 Initial Site Identification

Potential sites alternatives were identified in a one day workshop at Camden Power Station using the government published 1:50 000 topo-cadastral maps of the area, site knowledge and available aerial photographs of the area surrounding the power station. Once the workshop was completed the sites were visited to confirm their feasibility.

The initial technical conditions utilised to identify potential sites were:

- It should be able to link easily into existing ash disposal infrastructure i.e. use existing pipelines and roads wherever possible;
- It must be within a 10 km radius of the station to minimise the distance that ash slurry needs to be transported; and
- Had to have a minimum footprint size of 120 ha<sup>4</sup> (including associated infrastructure) to accommodate a worse case growth rate in waste volumes over the next 20 years.

Four site alternatives were identified meeting the aforementioned criteria during a screening exercise hosted at the power station. The four site alternatives identified are shown in Figure 5-2 and are described briefly below.

#### Site 1

This site is located immediately north of the existing ash disposal facility and approximately 2.8 km north-west of the Camden Power Station. The Camden Village is located ~300 m to the east of the proposed site. The total area identified is ~272 hectares in size. The terrain is mostly sloping in the northerly direction (away from De Jagers Pan) at 2.6%.

#### Site 2

The second site is located ~1.2 km south of the Camden power Station and immediately south of the South African Railways (SAR) servitude for the Richards Bay Coal Line. There is an active coal mine located adjacent and to the east of this site. The total area of this site is ~291 hectares. Natural drainage over the site is split in the north easterly and south easterly directions at approximately 4%. The site is situated within the headwaters of a non-perennial north flowing stream that flows into the Witpuntspruit approximately 3 km to the north-east.

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<sup>4</sup> This initial footprint of 120 ha had to be revised upward (Site 1= ~216.7 ha and Site 3= ~259.4 ha) in size once the topography of the area was taken into account.

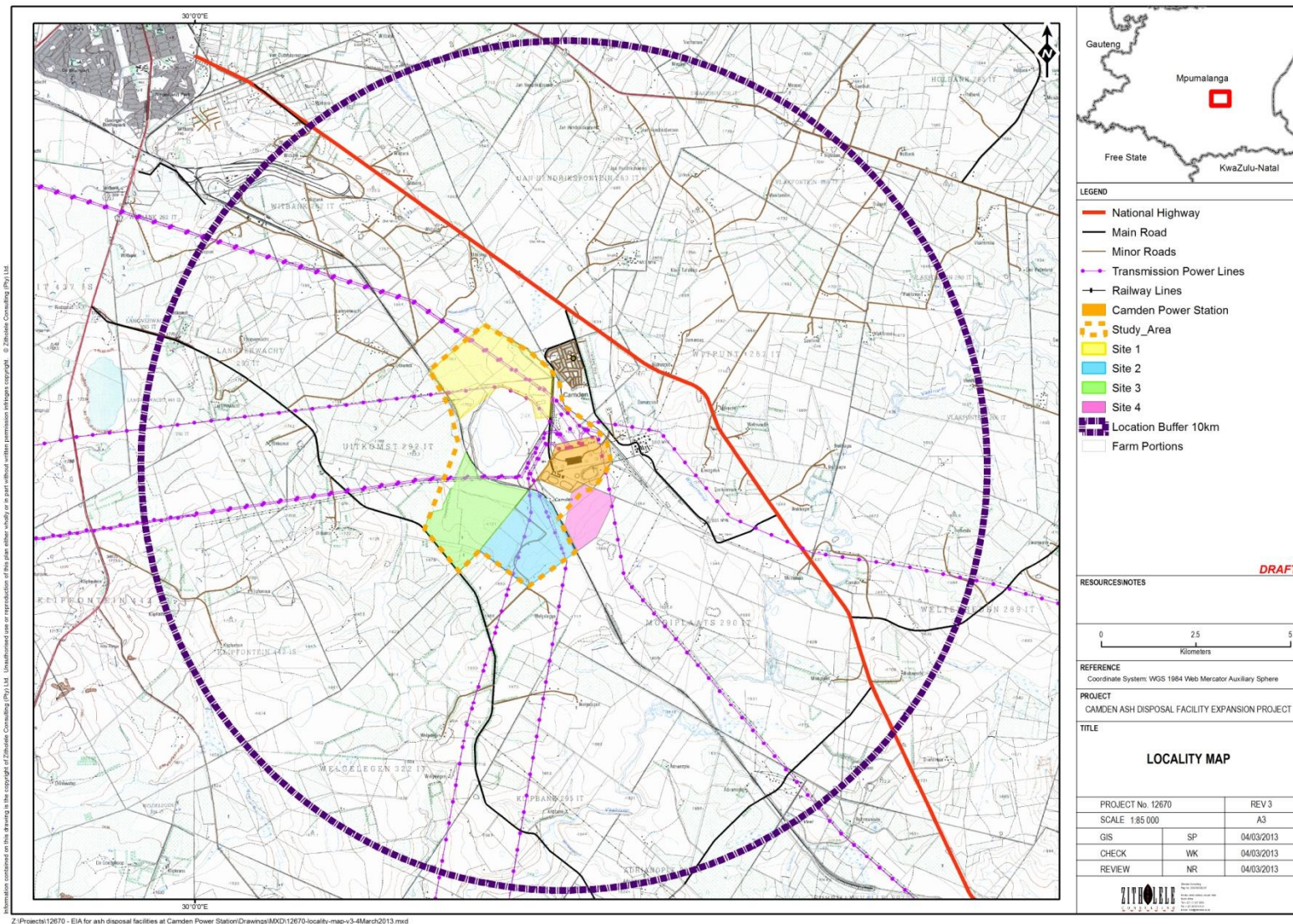


Figure 5-2: Site alternative locality map

### Site 3

This site is located immediately south of De Jagers Pan and the SAR servitude, and ~1 km south west of the Camden Power Station. Site 3 is adjacent and west of Site 2. The total area available for development is 322 hectares. A natural watershed divides the site, sloping in a north easterly direction towards De Jagers Pan and in a south westerly direction away from the Pan at a constant grade of 4%.

### Site 4

Site 4 is located immediately south-south east of the Camden Power Station. The site is north of the SAR servitude. The non-perennial stream originating on Site 2 flows directly through this site and joins the Witpuntspruit just to the northeast of the boundary of this site. The Witpuntspruit is a perennial water resource flowing in a northerly direction and is located within 1,2 km of the site. Coal is currently being mined immediately to the south of the site. The total area of Site 4 is ~135 ha.

## **5.2.2 Fatal Flaw Identification**

Fatal flaws are features that would prevent the site alternative being utilised for an ash disposal site. These were extracted and adapted from the Minimum Requirements 2<sup>nd</sup> Ed (1998) and 3<sup>rd</sup> Ed (2005) and are shown in Table 5-1 below.

**Table 5-1: Fatal Flaws used in the site selection**

Ranking Component	
Fatal Flaws	500m from an airfield
	Within the 1:100 year flood line
	Areas in close proximity to significant surface water bodies
	Unstable / undermined areas
	Sensitive ecological and/or historical areas
	Areas of flat gradients, shallow or emergent ground water
	Areas within the secure power station area (National Keystone Infrastructure)
	Areas characterized by shallow bedrock with little soil cover
	Areas in close proximity to land-uses that are incompatible with disposal sites
	Areas immediately upwind of a residential area in the prevailing wind direction(s).
	Areas over which servitudes are held that would prevent the establishment of a ash disposal facility e.g. Eskom, Transnet, Water Board

The results of the fatal flaw assessment are show in Table 5-2. As indicated two sites identified (Site 2 and Site 4) have fatal flaws preventing them from being used for development of the Ash Disposal Facility:

- Site 2 was fatally flawed because of the presence of unstable geology, as reported in the attached Engineering Report, as well as the geotechnical report; and

- Site 4 was fatally flawed because it was located within the 1:100 year floodline of the Witpuntspruit surface water resource. Engineers from Camden Power Station also reported that based on their local knowledge Site 4 was likely undermined by historic coal mining activities in the area. This could not be verified, however the EAP felt it prudent to be cautious and has avoided the site.

**Table 5-2: Presence of Fatal Flaws on each of the identified site alternatives (indicated by a Red Cross)**

Fatal Flaw Criteria	Site 1	Site 2	Site 3	Site 4
Airfield	✓	✓	✓	✓
1:100 year flood line	✓	✗	✓	✗
Significant surface water bodies	✓	✓	✓	✓
Unstable / undermined areas	✓	✗	✓	✗
Sensitive ecological / historical areas	✓	✓	✓	✓
Flat gradients, Shallow groundwater	✓	✓	✓	✓
National Keystone Infrastructure	✓	✓	✓	✓
Shallow bedrock	✓	✓	✓	✓
Incompatible land use	✓	✓	✓	✓
Upwind of residential area	✓	✓	✓	✓
Servitudes preventing establishment	✓	✓	✓	✓
Notes:		Geology is geo-technically unstable – Refer to attached 1. Conceptual Engineering Report ( 2. Appendix J) 3. Geo-technical Specialist Report ( 4. Appendix J)		Refer to Figure 5-2 showing the location of the site and water body.  Undermining although reported was not confirmed on this site.

### 5.2.3 Site Screening

Upon completion of the fatal flaw assessment a screening assessment of each of the sites was undertaken. Site screening involved the compilation of a site screening rating matrix, a one-day site investigation, and a workshop between the environmental team and key Camden Power Station personnel to rate each of the potential sites. Economic, Environmental and Public Criteria were all taken into account. The site screening matrix is shown in Table 5-3

#### Economic Criteria

The economic criteria focussed on the establishment and operating cost associated with each specific site. This includes the distance to the site from the waste sources, the accessibility of the site, the ease of operations, the available footprint, the cost to establish the site, and security concerns.

According to the economic criteria Alternatives 1 is the most preferred. This result was expected as Alternative 1 is located very close to the existing ash disposal site, which will allow very easy integration with current operations.

*It should be noted that a key finding from this analysis was that all the alternatives have existing transmission power lines running through the sites. The deviation of these transmission lines has been included in this EIA and the specialist studies that have been undertaken.*

*A further important factor to consider is the difficulty of crossing the Richards Bay Coal Line, a requirement of both Site 2 and 3. This will substantially increase the cost of both these options.*

### Environmental Criteria

The environmental criteria that were identified as important ranking components include the distance to ground or surface water features, presence of wetlands, geological instability, terrestrial ecological sensitivity, soil depth and agricultural potential, and potential presence of features of cultural / historical sensitivity.

The scoring from the matrix indicated that Alternative 1 had the lowest score. Scoring most preferred for all components except for terrestrial ecology.

### Public Criteria

The public criteria that were considered during the site evaluation was the possible displacements of local habitants, the visibility of the site, the sensitivity of the access road and the distance to the nearest residential area.

According to the evaluation of the public criteria, Alternative 3 was the most suitable site, as this site will present the least visibility of the disposal facility from the main roads and settlements in the area. In addition the Camden township is close to Alternative 1. In recent years this township has been vacated by residents to a large degree, but a few residents remain.

### Overall Site Scoring

The combined scores indicate which of the two sites is the most suitable in terms of the DWAF Minimum Requirements approach (2<sup>nd</sup> Ed [1998] and draft 3<sup>rd</sup> Ed [2005])<sup>1</sup>. The combined site ranking is shown in Table 5-3.

The results of the analysis show that Alternative 1 is the most preferred site. However, the NEMA EIA Regulations require assessment of all feasible alternatives, and thus both Site 1 and 3 have been investigated further in this EIA.

**Table 5-3: Sensitivity risk matrix for Alternative 1 and 3**

Ranking Component		Alt 1	Alt 3
Economic	The distance of the site from the ash/brine generation areas	3	1
	Access to the ash disposal site	3	1
	Size of available footprint	3	3
	Ease of operation	3	1
	Relocation of existing services to avoid facility	-1	-1
	Cost to establish infrastructure	1	1
	Land Owned Fully or Partially by Eskom	1	-1
	Security Concerns	1	0
<b>Total Economic</b>		<b>14</b>	<b>7</b>
Environmental	Surface Water and Wetland	3	3
	Groundwater	3	3
	Soils and Land Capability	3	1
	Terrestrial Ecology (Fauna and Flora)	1	1
	Archaeology, Cultural Historical, and Paleontological	3	3
<b>Total Environmental</b>		<b>13</b>	<b>11</b>
Public	The displacement of local inhabitants.	1	1
	Exposed sites with high visibility	-1	1
	Sensitivity of access road(s) passes	1	1
	The distance to the nearest residential area	-1	1
<b>Total Public</b>		<b>0</b>	<b>4</b>
<b>Overall Site Scoring</b>		<b>27</b>	<b>22</b>
3	Very suitable		
1	suitable		
0	unknown		
-1	unsuitable		
-3	very unsuitable		
-10	Fatal flaw		

### 5.3 DESIGN ALTERNATIVES

It should be noted that ash disposal facilities are not a new solution for ash disposal and Eskom has developed this technology for a number of their power stations between 1960 and 1980 however, the requirements for lining of the ash disposal facilities is new. This lining requirement poses new challenges to the operating methods of ash disposal facilities. With the introduction of a liner system the management of compartments becomes critical, as it will not be practical to line the entire facility on initiation as the risk of liner damage will be high. The number and sequencing of compartments have a direct impact on the layout and number of decant penstocks. For each of the alternative sites the different construction and lining options were investigated. Either a H:H barrier system as per the DWAF Minimum Requirements or a Class C barrier system as per the DEA's draft regulations is proposed, depending on the applicable legislation at the time of authorisation, and project execution.

#### **5.4 THE NO-GO ALTERNATIVE**

This alternative presents that, in the case that the project does not take place, the power station will have to stop operating all together, since Eskom cannot dispose of the ash generated illegally.

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## **6 PROJECT DESCRIPTION**

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The proposed project is the extension of ash disposal facilities and associated infrastructure for the Camden Power Station. A detailed description of the project components is given in this section for both Alternative 1 and 3. For more detail about the alternative assessment refer to Section 5. For further details of each alternative refer to the Conceptual Engineering Report attached in appendix J.

### **6.1 PROJECT COMPONENTS AND LAYOUT**

It is envisaged that the Camden Ash Disposal Facility Expansion project will consist of the following components:

- A suitably designed and lined ash containment facility (wet facility) able to accommodate the ~19 years of ash still to be generated by Camden Power Station;
- Clean and dirty water separation and containment facilities, including:
  - Ash Water Return Dams (AWRD) and trenches / drains;
  - Storm water drainage canals and discharge; and
  - Monitoring boreholes;
- Pipelines for the transportation of ash slurry to the disposal facility (containment dam);
- Access roads around the facility, fencing around the facility and access control;
- Relocation of existing service infrastructure (including power lines and roads); and
- Rehabilitation of redundant infrastructure.

A simplified site layout plan for both Alternative 1 and 3 showing all of these project elements is included below as Figure 6-1 and Figure 6-2 respectively.

It should be noted that entire waste stream can be accommodated within a single facility on Site 1; whereas the topography requires that two facilities be constructed on Site 3 to accommodate the same volume of waste. Site 3 is therefore labelled Site 3A and Site 3B on diagrams and in the textual discussions below. The reader must note that both Site 3A and Site 3B will need to be built if Site 3 is selected as the preferred alternative.

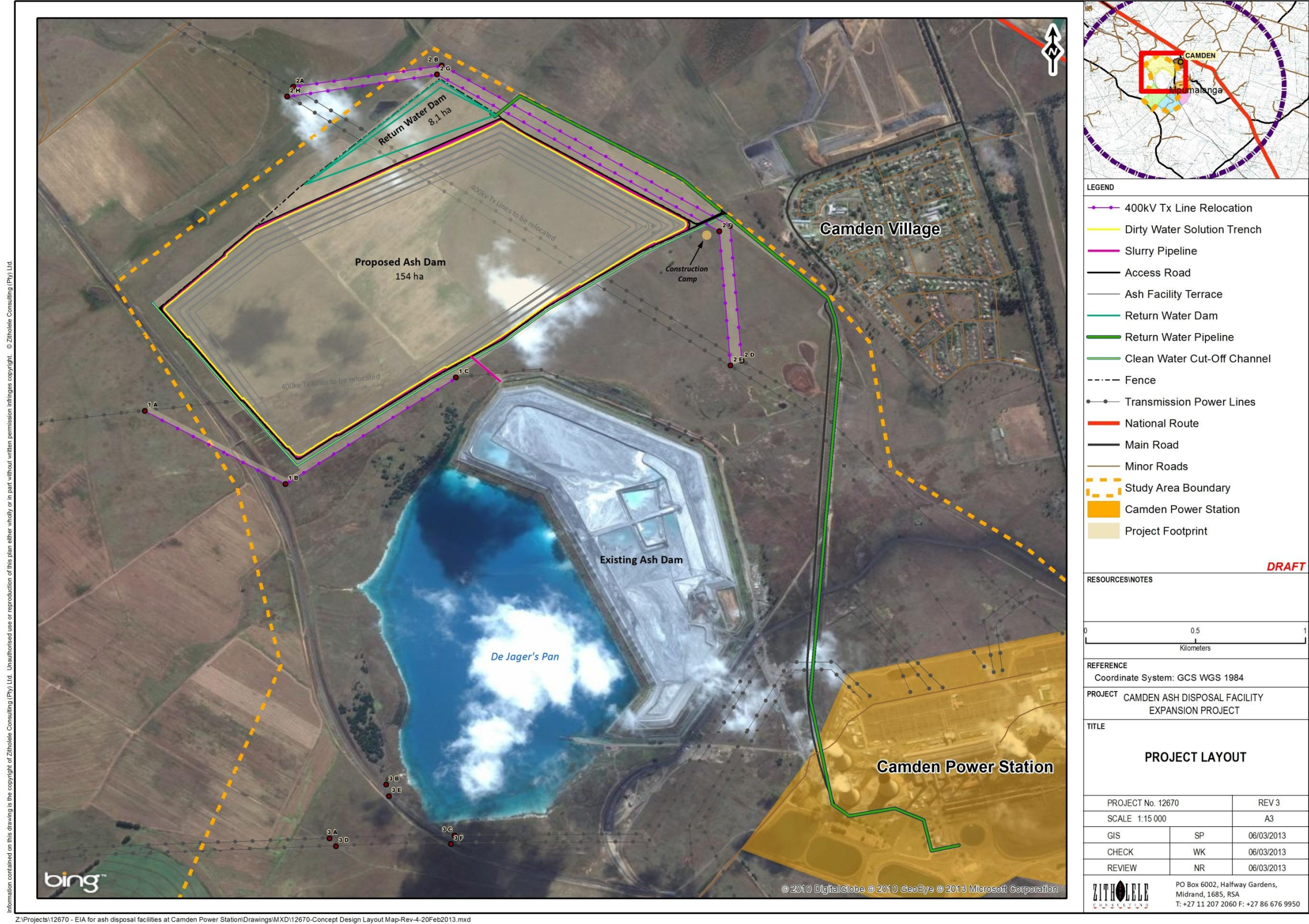


Figure 6-1: Camden Ash Disposal Facility Expansion Project Layout Map for Site 1

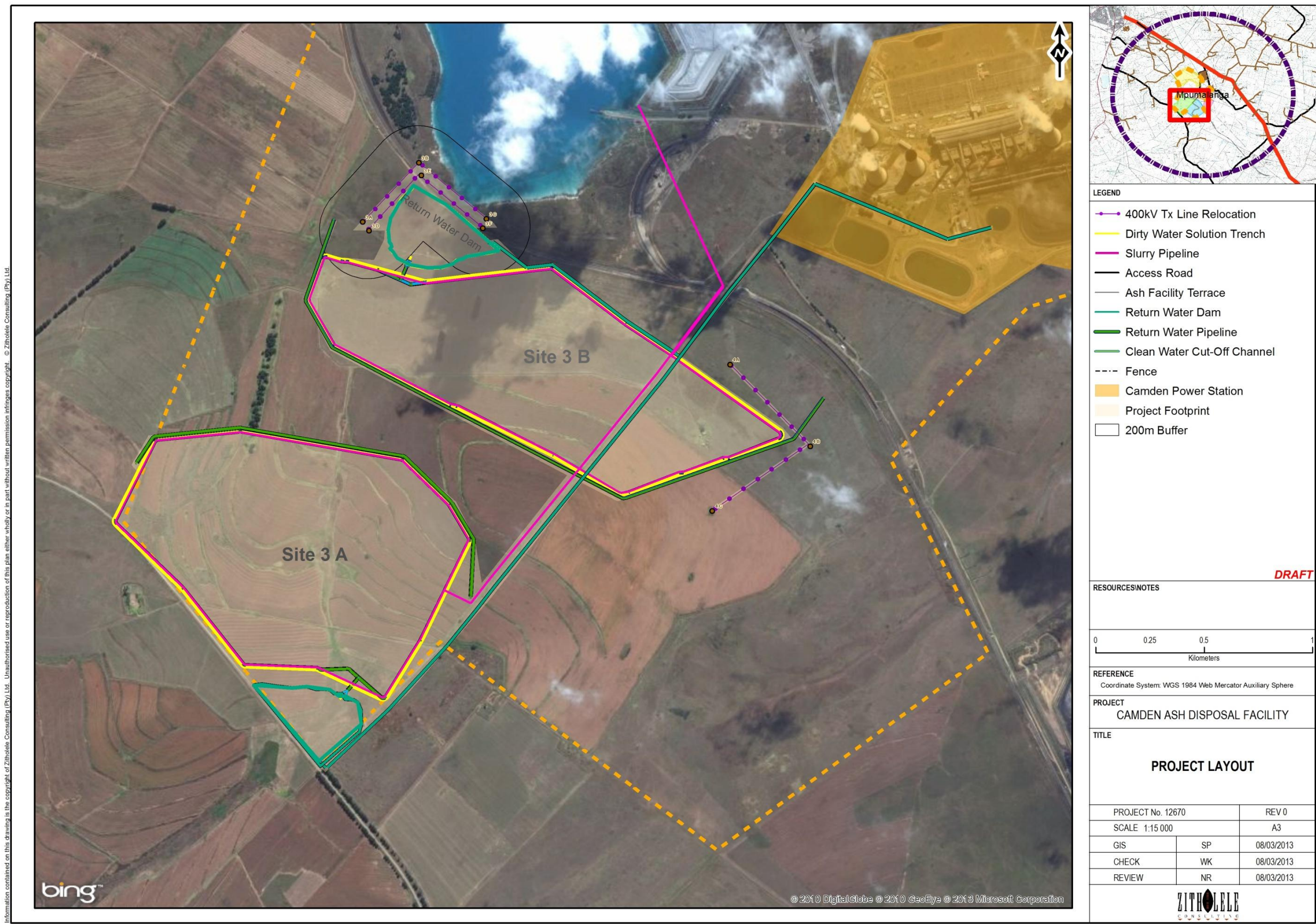


Figure 6-2: Camden Ash Disposal Facility Expansion Project Layout Map for Site 3

## 6.2 AFFECTED PROPERTIES AND LAND OWNERS

The properties and landowner details that will be affected at Site 1 and 3 are documented in Table 6-1.

**Table 6-1: Properties and Land Owners Affected if Site 1 is developed for the Camden Ash Disposal Facility Expansion Project**

Site	Farm Name	Portion No	Registered Land Owner
1	Uitkomst 292 IT	18	Catharina Elizabeth du Toit
3A	Uitkomst 292 IT	10	Lodewyk Johannes de Jager
	Uitkomst 292 IT	2	Lood de Jager Trust
3B	Mooiplaats 290 IT	14	Willem Nicolaas Van der Wath
	Uitkomst 292 IT	18	Catharina Elizabeth du Toit

## 6.3 FOOTPRINT AND LIFESPAN OF THE FACILITY

The new ash disposal site will need to cater for an estimated 12,86 million m<sup>3</sup> of ash up to 2023, plus 5 years contingency (2028). Additional structures *inter alia* AWRD and channels, roads, pipelines and fences will also increase the footprint of the project. A breakdown of the footprint of the project is shown in Table 6-2 and is represented graphically in Figure 6-1 and Figure 6-2 for each alternative respectively.

**Table 6-2: Footprint (in hectares) of each site alternative for the Camden Ash Disposal Facility Expansion Project**

Project Component	Site 1 (ha)	Site 3A +3B (ha)
Ash Disposal Facility	154,00 ha	193,40 ha
Ash Return Water Dam	8,10 ha	14,00 ha
Pipelines for slurry deposition	1,20 ha	2,76 ha
Pipelines for return water	3,00 ha	1,47 ha
Dirty water containment canals and trenches	1,80 ha	3,98 ha
Storm water cut-off trenches / channels	0,70 ha	2,11 ha
Access Roads and Access Control	1,60 ha	5,44 ha
Relocation of transmission lines	25,60 ha	9,25 ha
Areas between facilities and infrastructure	20,68 ha	34,00 ha
<b>Total</b>	<b>216,68 ha</b>	<b>266,44 ha</b>

## 6.4 HEIGHT OF THE FACILITY

According to Eskom policy the height of a facility and the rate of rise are critical to ensure that an ash disposal site is operated safely and efficiently. It is envisaged that the rate of rise will not exceed the current 3 m per annum. The new facility will be ~36 m high at its highest point once fully constructed. Figure 6-3 provides a photograph of the current disposal site from high point in the terrain.



**Figure 6-3: View of the sides of the existing ash disposal site**

## **6.5 SOURCES OF WASTE**

The waste that requires disposal on the ash disposal facilities originates from two main sources:

- Camden Power Station: fly ash and coarse ash from coal burning operations (this currently contains blow down water from the cooling towers, which is used to transport the ash; and
- Camden Power Station Reverse Osmosis (RO) / ash water treatment plant: brine salts.

The ash and brine received by the current ash disposal facilities is transported via pipelines to the ash disposal facility from the various source areas. The wet ash in slurry form is pumped to the ash containment facility, where some water is evaporated and some is retained through penstocks. Surplus water that does not evaporate drains to the De Jagers pan, through penstocks, from where the water is abstracted and treated through a RO plant. The clean water from the RO plant is taken to the power station where it is reused. The concentrated brine from the RO plant is discharged back into the Ash water return lines to the station Ash water high level reservoir on site, to be used for ash removal from boilers ash and dust hoppers and subsequently forms part of the ash water that assists with the transportation of ash slurry to the ash disposal facility. The pipelines (Figure 6-4) are placed strategically from the source areas in the power station and the RO plant.



**Figure 6-4: Transportation (red) and disposal (yellow) at current ash disposal facilities.**

## **6.6 VOLUMES OF WASTE**

### **6.6.1 Ash Volumes**

The volumes of ash vary from month-to-month, however a detailed register of all the ash disposed at the existing facility is kept at the power station. The current site is authorised to receive a maximum of 3 421 000 m<sup>3</sup> of slurry a year. It is anticipated that the new site will have to take the same consistency and composition of ash for the estimated life of the facility, which is estimated for another 19 years from 2014 to 2033.

### **6.6.2 RO Plant Brine Volumes**

Once the treatment plant is operational at 85% recovery rate, it will produce ~500 m<sup>3</sup> of brine per day. It is envisaged that the water treatment plant will only be operative for three years (I. Hodgskin, 2011). This volume of brine waste stream is considered negligible at 5% of the total waste stream per annum to be disposed of on the proposed ash disposal facility, and will only constitute a total of 4.25% of the total waste stream over the 19 year life of the facility.

## **6.7 WASTE CHARACTERISATION**

Waste in South Africa is currently classified in terms of the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste 2<sup>nd</sup> Ed. (1998). The methods for characterisation / classification of waste in South Africa is currently under review, and at the

time that this report was being written it was anticipated that the draft Revised Waste Classification and Management Regulations would be imminently promulgated.

As such the EAP has undertaken to have the waste classified by a specialist consultant in terms of both the Minimum Requirements (DWAF, 1998a) as well as the draft Revised Waste Classification and Management Regulations, these are discussed separately below. For more detailed information please refer to the Waste Classification Report undertaken by Jones and Wagener Consulting Engineers (J&W) in Appendix J

#### **6.7.1 Minimum Requirements (DWAF, 1998a)**

The ash from Camden Power Station was classified in terms of the Minimum Requirements (DWAF, 1998a) and the letters from the Department of Environment and Tourism (DEAT), titled "Waste Delisting Procedure", signed by their Director General, dated April 2008 and June 2009 respectively (DEAT, 2009). The hazard rating in this report is therefore in compliance with the Minimum Requirements as amended by the DEAT. The ash was hazard rated based on the leach results of the South African ARLP (Acid Rain Leach Procedure) only.

The ARLP is used in cases where non-organic waste is mono-disposed or disposed with other waste not containing bio-degradable organic waste or in cases where a waste is to be used in an application where the chances of organic acid generation are minimal, such as road building and brick making.

The concentrations of the hazardous substances in the leach solutions were compared to the Acceptable Risk Levels (ARL) for the aquatic environment as listed in the Minimum Requirements or as identified by J&W. The ARL is, expressed in parts per million (ppm) or  $\text{mg/l} = 0.1 \times \text{LC}_{50} (\text{mg/l})^5$ . Where the concentration in the leach solution is greater than the ARL, the waste is classified as hazardous for that particular substance. The most hazardous substance dictates the Hazard Rating of the waste. Four Hazard Rating classes are specified in the Minimum Requirements ranging from Hazard Group 1 (Extreme Hazard) to Hazard Group 4 (Low Hazard).

The waste has been classified and hazard rated based on the most hazardous constituent of concern in the ash. Furthermore, the monthly loading rate, i.e., the amount of waste that can be disposed of in tons / hectare / month, has also been calculated, namely:

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<sup>5</sup> The factor of 0.1 is calculated from a cross section of typical dose response data, with a typical slope of dose response curves. From an exposure 10 times lower than the LC50, approximately 0,00034% or one in 300 000 of a population exposed to the contaminant, is likely to die (DWAF, 1998a).

- *Monthly loading rate = Allowable dose per month (g/ha/month)/Concentration in leach solution, where allowable dose per month =  $ARL/0.66$ <sup>6</sup>*

The allowable maximum load per hectare for lined waste disposal facilities is again calculated from the dose as:

- *Total load (ton/hectare) =  $100 \times \text{dose (g/ha/month)/mg of most hazardous substance per kilogram of waste}$*

or, for unlined waste disposal facilities as:

- *Total load (ton/hectare) =  $10 \times \text{dose (g/ha/month)/mg of most hazardous substance per kilogram of waste}$*

A waste can be delisted to general waste in cases where the:

- Concentration in the leach solution < ARL for Hazard Group 2, 3 or 4 substances, or
- Concentration in the leach solution <  $0.1 \times$  Hazard Group 1, or
- An allowable load of  $[(ARL/0.66) / (\text{Measured concentration})]$  is not exceeded.

#### Primary Hazard Rating of the Camden Power Station Dry Ash

Based on the Minimum Requirements approach a waste is first categorised based on the industry type. In this case the waste is ash /brine originating from the wet-ash process at the Camden Power Station for the generation of electricity. The ash is therefore classified as potentially hazardous, as the Energy Industry was identified in the Minimum Requirements as an industry generating potentially hazardous waste (DWAF, 1998a).

The next step in the primary hazard rating involves a Total Concentration (TC) analysis to determine the chemicals of concern. The TC analysis indicates that the dry ash contains between 6.86 and 7.03 % iron and between 488 and 508 mg/kg manganese, which, in terms of the Minimum Requirements, results in the ash being classified as potentially hazardous. Both iron and manganese are listed as potentially hazardous wastes in terms of the Minimum Requirements, as they have the potential to leach out of the ash it may therefore cause negative impacts in the environment.

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<sup>6</sup> The factor 0.66 is derived from the ratio of the substance in a weight of underground body of water (DWAF, 1998). A correction factor of a 1000 was applied by the DWAF to obtain g/ha/month instead of mg/ha/month – this was never fully explained in the Minimum Requirements.

### Secondary Hazard Rating of the Camden Power Station Dry Ash

As discussed above the Primary Hazard Rating is potentially hazardous, based on the industry type and TC values of Iron and Manganese in the waste stream, and therefore a secondary hazard rating was undertaken. The results of the Secondary Hazard Rating indicated that the dry ash is a Hazard Group 1 or extreme hazardous waste due to the hexavalent chromium concentration (Cr VI) in the ARLP leach solution being greater than its ARL value.

These results indicate that disposal of the ash should be onto a facility that complies with the most stringent barrier (liner) performance requirements of a H:H waste disposal facility, as per the Minimum Requirements (DWAF, 1998a).

The monthly loading rate based on the ARLP concentrations of hexavalent chromium present in the ash is only 75 tons / ha / month. The size of the ash disposal facility will determine the total amount of ash that can be disposed of per month.

Ms I. Hodgskin of the power station reported that 1.6 million tons of dry ash is deposited per annum. The monthly disposal rate will therefore be 133 333 tonnes, which requires a disposal site of 1 778 hectares in size. Clearly this is not achievable as the anticipated ash disposal facility size is only 100 hectares. This demonstrates that the loading rate principle of the Minimum Requirements is not practical. However, the actual leachate (seepage water) from the existing ash disposal facility was also analysed, and as the seepage water represents the actual impact on the environment, the seepage water was therefore used as the basis for the classification.

### Waste Classification in terms of the DWAF Minimum Requirements Methodology (1998a)

Based on the DWAF's Minimum Requirements waste classification methodology and when subjected to an ARLP, the Camden Ash is classified as a Hazard Group 1 waste. This is caused by the concentration of leachable chrome VI (Hazard Group 1) being higher than its ARL, which means that the waste cannot be delisted to a general waste. Hazard Group 1 wastes need to be disposed of on H:H waste disposal facilities.

However, when considering the quality of the ash seepage water not one of the elements of concern was detected at a concentration higher than its respective ARL value. Therefore the ash and ash carrier water can be delisted to a general waste as per the Minimum Requirements for disposal purposes. Although delisted liquid waste should be disposed of on landfills with H:H Lagoon barrier systems, the ash and ash carrier can be disposed of on a G:L:B<sup>+</sup> waste disposal facility, provided the seepage water (leachate) head can be maintained at equal or less than 300mm on top of the barrier layer and the drainage piping system on the barrier is of adequate size, spacing and strength to ensure atmospheric pressure within the drainage system for the service life of the landfill.

The RO brine was classified as a Hazard Group 2 waste or High Hazard Waste due to the lead concentration in the brine being greater than its ARL value. The brine has to be disposed of on a hazardous lagoon (H:H lagoon).

Should consideration be given to the co-disposal of the ash and brine on a single facility, disposal should be acceptable on a H:H waste disposal facility with a H:H barrier system. This barrier system is required as the brine was classified as a Hazard Group 2 waste, which requires disposal on a H:H waste disposal facility.

The landfill class for disposal of the wastes based on the Minimum Requirements are summarised in Table 6-3 below. A recommended barrier system is also given. Descriptions of the various barrier systems considered are given separately in this report in Section 6.7.3.

**Table 6-3: Waste Type and Class of Landfill Required based on Minimum Requirements**

<b>Waste</b>	<b>Type of Waste</b>	<b>Disposal Scenario</b>	<b>Class of Landfill</b>	<b>Recommended Barrier System</b>
Ash + Ash Carrier Water	Delisted	Mono-disposal	G:L:B <sup>+</sup>	*G:L:B <sup>+</sup>
Brine from Water Treatment Plant	Hazard Group 2 Waste	Mono-disposal	H:H Lagoon	H:H Lagoon
Ash + Ash Carrier Water + Reverse Osmosis Brine	Hazard Group 2 Waste	Co-disposal	H:H	H:H
* <b>Provided there is no significant water head (&gt;300mm) on the barrier system and the drainage piping system on the barrier is of adequate size, spacing and strength to ensure atmospheric pressure within the drainage system for the service life of the landfill</b>				

### 6.7.2 Draft Revised Waste Classification and Management Regulations

In terms of the DEA's proposed Revised Waste Classification and Management Regulations for disposal, the Camden Ash was subjected to a Total Concentration (TC) extract and a Deionised (DI) water leach. Two samples were used in the assessment, namely dusting ash (fine ash) and ashing ash (coarse ash). In addition, the water leaching from the current ash disposal facility was also analysed and compared to the respective Leach Concentration Thresholds (LCT) values.

Based on the analysis both the fine and coarse ash samples are classified as Type 3 wastes requiring disposal on a Class C landfill. This is because the TC of arsenic, barium, copper, lead and zinc were higher than their respective TC Threshold (or TCTi) values. In addition, the leach concentrations (LC) of barium, chromium, hexavalent chromium and molybdenum were also higher than their respective LCTi values for the fine ash. The coarse ash sample also classified as a Type 3 waste because of the boron, mercury, molybdenum, Total Dissolved Salts (TDS) and sulphate LC values being higher than their respective LCTi values. In addition, the TDS concentration of the DI water leach solutions in both cases is greater than

the LCTi value of 250mg/l. The leachate from the existing site also classifies as a Type 3 waste because of the barium, sulphate, chloride and TDS concentrations being higher than their respective LCTi values. This is considered the true classification of the ash waste, as the leachate (seepage water) constitutes actual field conditions.

The Camden Power Station ash should therefore be disposed of on a facility that has been designed and constructed as a Class C landfill (DEA, 2011b). Class C landfills are very similar in design to the current G:L:B+ landfills, with the major difference being the HDPE layer added to the barrier system. This barrier system is considered appropriate for the wet ash disposal facility provided the seepage water (leachate) head can be maintained at equal or less than 300mm on top of the HDPE barrier layer and the drainage piping system on the barrier is of adequate size, spacing and strength to ensure atmospheric pressure within the drainage system for the service life of the landfill.

As the water treatment plant was not operational on the day that the samples were collected, the classification was undertaken on a modelled value provided by Eskom. When using the DEA draft Revised Waste Classification and Management Regulations, the brine classifies as a Type 3 waste due to the boron, mercury, chloride, TDS and sulfate concentrations of the modelled brine solution being greater than their respective LCTi values. Type 3 wastes should be disposed of on Class C landfills, but in the case of the brine, which is a liquid, the brine will have to be disposed of in a hazardous waste lagoon disposal facility complying with the design requirements as given in the Minimum Requirements (DWAF, 1998a).

In the case that the brine is co-disposed with the ash on the new ash disposal facility, a Class C landfill barrier is considered appropriate for the ash disposal facility. It is a requirement that liquid waste should be disposed of in hazardous lagoon facilities, but provided the seepage water (leachate) head can be maintained at equal or less than 300mm on top of the primary HDPE barrier layer and the drainage piping system on the barrier is of adequate size, spacing and strength to ensure atmospheric pressure within the drainage system, a Class C barrier system is considered suitable for the co-disposal of the ash and brine.

Table 6-4 below summarises the classification of the ash and brine water based and also indicates the barrier systems required for the various disposal scenarios.

**Table 6-4: Waste Type and Class of Landfill Required based on the DEA draft Revised Waste Classification and Management Regulations (2011)**

<b>Waste</b>	<b>Type of Waste</b>	<b>Disposal Scenario</b>	<b>Class of Landfill / Barrier System</b>
Ash + Ash Carrier Water	Type 3: Low Risk Waste	Mono-disposal	Class C*
Brine from Water Treatment Plant	Type 3: Low Risk Waste but a liquid	Mono-disposal	H:H Lagoon
Ash + Ash Carrier Water + Reverse Osmosis Brine	Type 3: High Risk Waste	Co-disposal	Class C*
* <b>Provided there is no significant water head (&gt;300mm) on the barrier system and the drainage piping system on the barrier is of adequate size, spacing and strength to ensure atmospheric pressure within the drainage system for the service life of the landfill</b>			

### 6.7.3 Barrier System Design

It should be noted that ash disposal facilities are not a new solution for ash management and Eskom has developed this technology for a number of their power stations between 1960 and 1980, however, the installation of a barrier system or “lining of the ash disposal facilities” is a new requirement (since 1998). This poses new challenges to the operating methods of ash disposal facilities. With the introduction of a barrier system the management of compartments becomes critical, as it will not be practical to install the barrier system for the entire facility on initiation as the risk of liner damage will be too high. This is discussed in more detail in Section 7.2.10 of this report, which details the installation of the barrier system.

In addition the design of the barrier system is determined by the classification of the waste, as discussed in summary in Section 6.7 above, and in more detail in the Waste Classification Report (attached as Appendix J).

The design specifications for the barrier system will this also differ, depending on the classification system used. The EAP has provided the specifications for both the Minimum Requirements (DWAF, 1998a) and the draft Revised Waste Classification and Management Regulations separately below. The barrier system utilised will be dependent on the WML and EA conditions issued, and the relevant legislation promulgated at the time of construction.

#### Minimum Requirements (DWAF, 1998a)

In terms of the Minimum Requirements (DWAF, 1998a) a H:H Lagoon Barrier System is required. The typical cross section of the H:H Lagoon Barrier System is given in Figure 6-5 below.

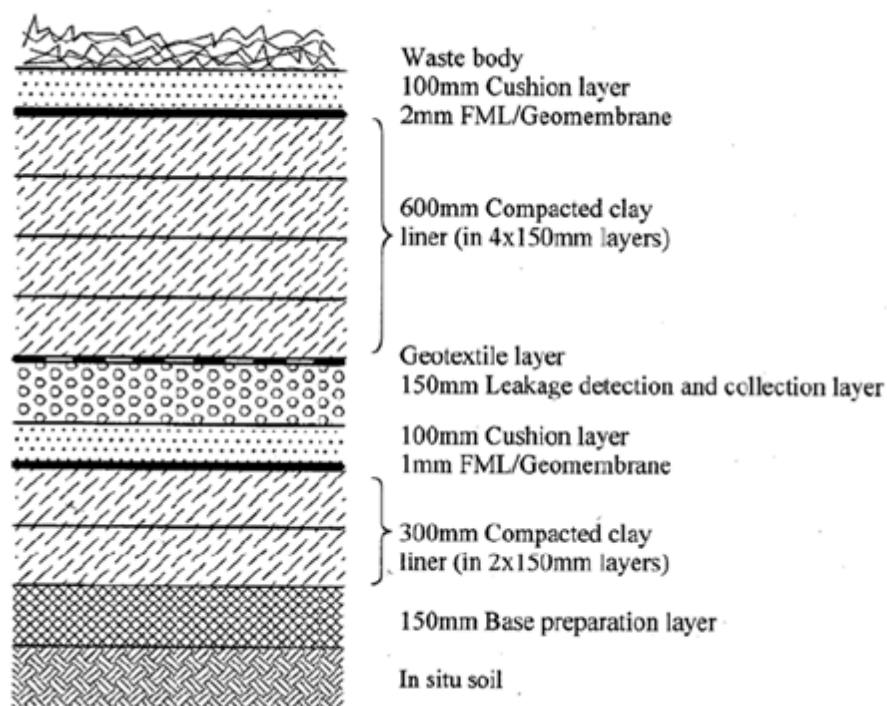
An HDPE sheet is used for the geo-membrane, and river sand is proposed for the cushion layer. Grade A4 bidim is proposed for the geotextile layer. The barrier system also calls for a

900 mm clay layer. Large quantities of clay are not available on site. Importation of clay is possible however may not be economically viable.

The following are alternatives to the clay liner:

- HDPE;
- Geosynthetic Clay liner (GCL); and
- Bauxite.

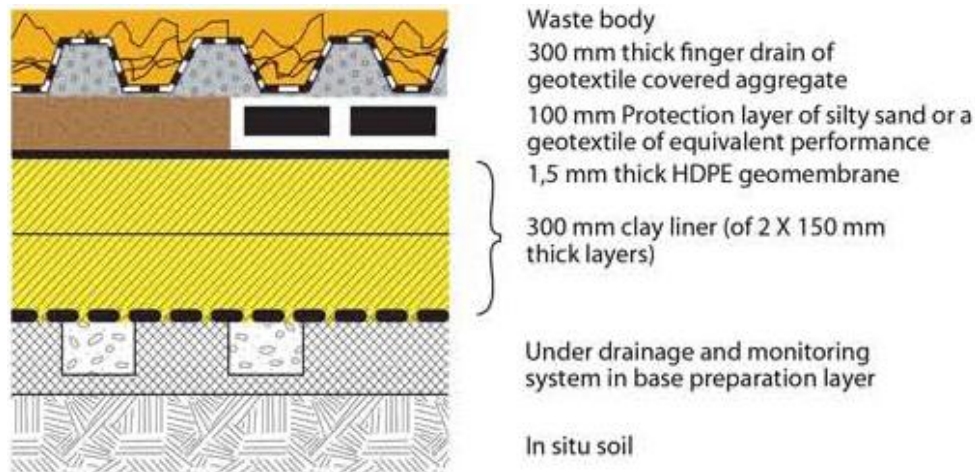
These options need to be investigated during detailed design of the facility.



**Figure 6-5: H:H Lagoon Barrier System**

#### Draft Revised Waste Classification and Management Regulations

The Waste Classification report proposes a Class C barrier, show in Figure 6-6 below, as per the DEA's regulations (not promulgated as yet) for both the co-disposal as well as mono-disposal of ash.



**Figure 6-6: Proposed Class C landfill barrier system (DEA, 2011)**

## **6.8 CLEAN AND DIRTY WATER SEPARATION AND CONTAINMENT INFRASTRUCTURE**

### **6.8.1 Clean Water Separation Infrastructure**

An upstream concrete lined channel shall be constructed to divert clean water around the proposed facility and discharge into the natural environment. The channel will be sized to accommodate the 1:100 year storm event. The sites have been positioned such that the “clean” area between the natural watershed and the proposed facility is as small as possible. The proposed sizes of the trapezoidal channel, with side slopes of 1.5:1 (h:v) and base width of 1 m, required for each alternative are listed in Table 6-5. The location of the proposed clean water diversion channel is shown on Figure 6-1 and Figure 6-2 for each alternative respectively.

**Table 6-5: Sizing of Clean Water Diversion Trench**

Site No	“Clean” Area (ha)	Flow Rate (m <sup>3</sup> /s)	Channel Length (m)	Channel Height (mm)	Channel Top Width (mm)
1	30.1	11.0	2100	800	3400
3A	13.1	10.1	1700	700	3100
3B	28.2	11.4	1800	700	3100
3B	27.5	10.4	1200	700	3100

## 6.8.2 Dirty Water Containment Infrastructure

### Solution trench

Dirty water run-off generated off the side slopes of the ash disposal facility will drain into a suitably sized “solution trench” running around the facility. This trench will be designed to receive and convey run-off generated after a 50 year storm event. The solution trench will also receive discharge from the leachate collection system and this flow has also been included in the sizing of the infrastructure. Conceptual sizes of the trapezoidal channels, with side slopes of 1.5:1 (h:v) and base width of 1 m, required are listed for each alternative in Table 6-6. The location of the proposed dirty water trenches is shown Figure 6-1 and Figure 6-2 for each alternative respectively.

**Table 6-6: Sizing of Solution Trenches**

Site No	Channel ID	Flow Rate (m <sup>3</sup> /s)	Channel Length (m)	Channel Height (mm)	Channel Top Width (mm)
1	A	3.7	850	500	2,500
	B	8.3	1,900	700	3,100
	C	14.4	900	900	3,700
	D	18.6	1,650	1,000	4,000
3A	A	6.3	1,700	500	2,500
	B	13.7	800	800	3,400
	C	5.9	580	500	2,500
	D	3.4	730	500	2,500
3B	A	7.5	1,300	600	2,800
	B	2.6	400	400	2,200
	C	6.6	700	600	2,800
	D	16.9	1,150	900	3,700
	E	22.9	570	1,000	4,000
	F	10.5	350	700	3,100

### Ash Water Return Dam

Water draining from the deposited wet ash will be recycled via a system consisting of an Ash Water Return Dam (AWRD) and drains that collect the runoff from the ash disposal facility (containment dam) prior to pumping the water to the power station or RO plant for treatment or reuse.

For the foreseeable future water from the AWRD will be sent to the RO Plant, where it will be treated, clean water will be sent to the power station for reuse; while brine will be combined with the ash slurry for transportation of ash to the proposed ash disposal facility. As a barrier system will be installed at the new facility it is anticipated that no water will be lost through seepage, but may be lost through evaporation, and as such a closed loop system is formed.

The placement and size of the AWRD and associated infrastructure is shown in Figure 6-1 and Figure 6-2 for each alternative respectively, and detailed sizing is provided in Table 6-7.

All dirty water run-off generated within the footprint area of the waste disposal facility will be captured in the new AWRD. Although Government Notice 704 (GN704) stipulates that the AWRD shall be sized to accommodate the 50 year 24 hour storm event, this is based on the assumption that the AWRD is empty prior to this storm event. However, this is rarely the case and a more realistic approach should be adopted. It is Best Practice to undertake continuous modelling (a daily time step model) of the system in order to ascertain a more realistic capacity of the dam. This method takes into account the operating philosophy of the facility as well any abstractions from the dam including evaporation.

At this stage of the project, as is typical, only conceptual engineering is undertaken and it is therefore necessary to make certain assumptions in order to determine the size of the AWRD and associated facilities. At a later stage detailed design engineering will be undertaken, and the final plans submitted to the Department of Water Affairs (DWA) for approval. The assumption was made that the AWRD will be 25% full prior to the 1 in 50 year storm event. The table below gives the proposed sizes of the AWRD for Site 1.

**Table 6-7: Sizing of Return Water Dam**

Site No	“Contaminated” Area (ha)	Crest Height (mamsl)	AWRD Size (m <sup>3</sup> )
1	198.0	1 663,65	174 800
3A	162.3	1 669,80	153 400
3B	214.5	1 682,55	180 600

Stormwater captured at the Ash Dam pool level will be conveyed to the AWRD via penstocks. The penstocks and the discharge pipes will be designed such that the flow is attenuated at the pool level and drained over a 24 hour period (with two penstock inlets in operation) to the AWRD.

A silt trap will be installed to remove silt from the decanted water before it enters the lined return water dam. The amount of silt in the water will need to be determined and will provide input into the detailed sizing and cleaning frequency of the silt trap. Refinement to fit within the property boundary and accommodate the silt trap at the inflow section will form part of the next design phase.

A well prepared and compacted base is essential for the liner. The liner requirement for the AWRD is the same for the ash facility.

### **6.8.3 Leachate Collection and Management**

The leachate collection system will comprise of a toe drain as well as a main drain system. A leachate collection system will be designed such that a maximum leachate head of 300 mm

will be maintained over the liner system. The leachate will be drained to the solution trench, discussed below, which ultimately discharges to the AWRD. The solution trench and AWRD is shown in Figure 6-1 and Figure 6-2 for each alternative respectively.

The leachate collection system will be designed using a cuspated drain with geomesh above to ensure structural integrity of the system. This will be located above the liner system. The permeability of the leachate collection system varies between 3 to 20 m per year. Based on this, a conservative drainage rate of 5mm/h was assumed in order to determine the size of cuspated drain required for the leachate collection system. Conceptual flows draining to the AWRD via the solution trenches indicated in the previous section (Section 6.8.2) is indicated in the Table 6-8 below.

**Table 6-8: Leachate Flow Rates**

Site No	Max Area for Leachate (ha)	Flow Rate (m <sup>3</sup> /s)
1	154	2.2
3A	101	1.4
3B	92	1.3

#### **6.8.4 Surface- and Ground- water monitoring**

On-going monitoring of the storm water drainage features, relevant surface water resources, and groundwater monitoring boreholes will be undertaken; if necessary additional groundwater monitoring boreholes will be installed for monitoring. The location of monitoring points are shown on Figure 6-1 and Figure 6-2 for each alternative respectively.

### **6.9 PIPELINES**

#### **6.9.1 Slurry pipelines**

Once the existing ashing facility has reached its design capacity, the slurry pipeline will be discontinued to the discharge point at the existing facility. The pipeline will be extended from the existing facility to the new facility by a 6 mm thick, 350 mm diameter steel pipeline. This will be installed above surface and fixed to concrete plinths. The sections of the existing pipeline no longer required will be dismantled and the areas impacted will be rehabilitated. The length of the pipeline to Site 1 will be 6,07 km by comparison to the 10,32 km of pipeline to be used for Site 3. The placement of these pipelines is shown on Figure 6-1 and Figure 6-2.

#### **6.9.2 Return water pipelines**

The existing ash return water pipeline from De Jagers Pan will need to remain in place after the existing facility has reached its design capacity. This will be required in order to manage

stormwater that either runs off the contaminated terrain and side slopes of the facility or any stormwater that recharges through the facility before it is capped.

A new return water pipeline will need to be installed from the new AWRD back to the power station. A 400 mm diameter High Density Polyethylene (HDPE) pipeline with a rating of PE80 PN 12.5 will be installed. This pipeline will be buried within a trench approximately 1.5 m deep.

The length of the pipeline to Site 1 will be 5,2 km by comparison to the 7,27 km of pipeline to be used for Site 3. The placement of these pipelines is shown on Figure 6-1 and Figure 6-2.

#### **6.10 ACCESS ROADS, FENCING, AND ACCESS CONTROL**

The site will be accessed from the existing access roads located on the north eastern boundary of the site. The current gravel access road is in a fair condition and does not require any upgrade.

A new access road to the facility will be constructed for vehicle access. This new road will be taken from the existing site access road, and will circumvent the entire facility, located at the toe of the ash disposal facility. The road will have no servitude. The proposed access road will consist of a gravel base with a stabilised wearing course.

The length of the road for Site 1 will be 5,5 km by comparison to the 51,59 km of road required for Site 3.

In order to ensure safety and to prevent illegal dumping the site will be secured by means of a 1,8 m high diamond mesh fence along the entire perimeter. Access will be gained through an access control point monitored by a security guard. This person can also be the existing security guards on site. Access can also be managed through station access processes.

The existing and proposed access roads, as well as fences and access control points is shown on Figure 6-1 and Figure 6-2.

#### **6.11 RELOCATION OF TRANSMISSION LINES AND OTHER INFRASTRUCTURE**

There are no pipelines visible on either of the footprints of the site and the roads were restricted to informal tracks. This will not need relocation. Three 400kV transmission lines will need realignment around the facility at Site 1. Three 400kV transmission lines will require relocation at Site 3.

There is sufficient area around each of the new facility to accommodate the relocation of these transmission lines. The details of the area for power line relocation for both Sites 1 and 3 are given in Table 6-9 below. The proposed route for realignment is shown on Figure 6-1 and Figure 6-2 for each alternative respectively.

**Table 6-9: Details of the areas earmarked for Transmission Line Relocation**

Site No	Centre Line Ref. Point	X Coordinate (DD)	Y Coordinate (DD)	No of Tx Lines	Servitude Required	Available Corridor
<b>Transmission Line 1 (located south west of Site 1)</b>						
	Tx-1-A	30.056797	-26.606486	1	55 m	100 m
	Tx-1-B	30.062546	-26.609482	1	55 m	100 m
	Tx-1-C	30.069527	-26.605117	1	55 m	100 m
<b>Transmission Line 2 (located north east of Site 1)</b>						
1	Tx-2-A	30.06287	-26.5932	2	110 m	200 m
	Tx-2-B	30.06894	-26.5924	2	110 m	200 m
	Tx-2-C	30.08074	-26.5989	2	110 m	200 m
	Tx-2-D	30.08122	-26.6044	2	110 m	200 m
	Tx-2-E	30.08076	-26.6046	2	110 m	200 m
	Tx-2-F	30.08032	-26.5991	2	100 m	200 m
	Tx-2-G	30.06875	-26.5927	2	100 m	200 m
	Tx-2-H	30.06261	-26.5936	2	100 m	200 m
<b>Transmission Line 3 (located North of Site #A)</b>						
3A	Tx-3-A	30.06436	-26.624	2	110 m	200 m
	Tx-3-B	30.06667	-26.6218	2	110 m	200 m
	Tx-3-C	30.06947	-26.6239	2	110 m	200 m
	Tx-3-D	30.06461	-26.6243	2	110 m	200 m
	Tx-3-E	30.06678	-26.6223	2	110 m	200 m
	Tx-3-F	30.06932	-26.6242	2	110 m	200 m
<b>Transmission Line 4 (located east Site 3A)</b>						
3A	Tx-4-A	30.07957	-26.6293	1	110 m	200 m
	Tx-4-B	30.08289	-26.6323	1	110 m	200 m
	Tx-4-C	30.07883	-26.6347	1	110 m	200 m
	Tx-4-D	30.07957	-26.6293	1	110 m	200 m

## 6.12 CONTRACTORS CAMP

A contractor's camp of 50m x 50m (2500 m<sup>2</sup>) will be established. The contractor's camp will be for:

- The location of the contractors site office and first aid station (containers, park-homes or similar type structure that can be removed will be used);
- Parking of vehicles (including heavy vehicles for construction purposes);
- Storage of equipment and construction materials;
- Safe storage of dangerous goods (including hydrocarbons and chemicals that may be required during construction, that will be stored in properly designed, ventilated, secured, and bunded storage facilities);
- Storage of potable water (a jojo tank or similar type temporary structure of about ~2000 litres will be installed for the duration of the construction phase); and
- Temporary ablution facilities will be established that consist of portable toilets or a conservancy tank will be used.

The location of the proposed contractor's camp is shown on Figure 6-1 and Figure 6-2 for each alternative respectively.

### 6.13 CAPPING OF THE ASH DISPOSAL SITE

The permit / license for the existing ash dam require rehabilitation of the facility through capping with soil material in order to cover the waste, and successful re-vegetation of rehabilitated areas of the site. This process has to date been very successful as illustrated in Figure 6-7 below, and the current practice will be continued at regardless of which site is selected for development..

The method's for capping and revegetation of the facility are addressed in more detail in Section 7.4.1 of this report, and is operationalized through the EMP<sup>7</sup> and the Operations Manual<sup>8</sup> for the Camden Ash Facility Expansion project. These reports are published separately, but have been made available for stakeholder review prior to finalisation.



**Figure 6-7: Capping on the existing ash disposal site in the foreground**

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<sup>7</sup> Zitholele Consulting (Pty) Ltd. (2012) *Draft Environmental Management Programme for the Camden Ash Disposal Facility Expansion Project*. Project No: 12670. (Referred to in this report as the Draft EMP for this project).

<sup>8</sup> Zitholele Consulting (Pty) Ltd. (2012) *Draft Conceptual Design Report for the Extension of the Ash Dam at Camden Power Station*. Project No: 12670. (Referred to in this report as the Draft Operations Manual or Conceptual Engineering Report).

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## **7 DESCRIPTION OF DEVELOPMENT ACTIVITIES**

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The construction, operation and closure activities of this project are discussed below according to the following phases: Pre-construction; Construction and Remediation; Operation and Consecutive Rehabilitation; Decommissioning and Closure of the Facility.

### **7.1 THE PRE-CONSTRUCTION PHASE**

#### **7.1.1 Land Purchases and Negotiation**

Once EA has been obtained Eskom's detailed negotiators will commence negotiation to purchase the land earmarked for the development.

#### **7.1.2 Appointment of Contractor**

After all land has been acquired and all the internal tendering processes have been satisfied, Eskom will appoint the construction contractor. The anticipated appointment date is early 2014.

#### **7.1.3 Construction Schedule**

The construction schedule will be determined prior to construction in consultation with the appointed contractor. The current timeframe for construction is estimated to be 12 – 24 months. It is envisaged that the proposed ash disposal facility must be ready to receive ash from the power station by the middle of the year 2015.

#### **7.1.4 Installation of surface water / groundwater monitoring points**

Monitoring will be commenced ahead of construction at all monitoring points designated by the DWA. The recommended monitoring points are shown in Figure 7-1. As the proposed boreholes are new monitoring points these will be drilled and suitably sleeved with PVC. Adequate borehole head protection will be installed.

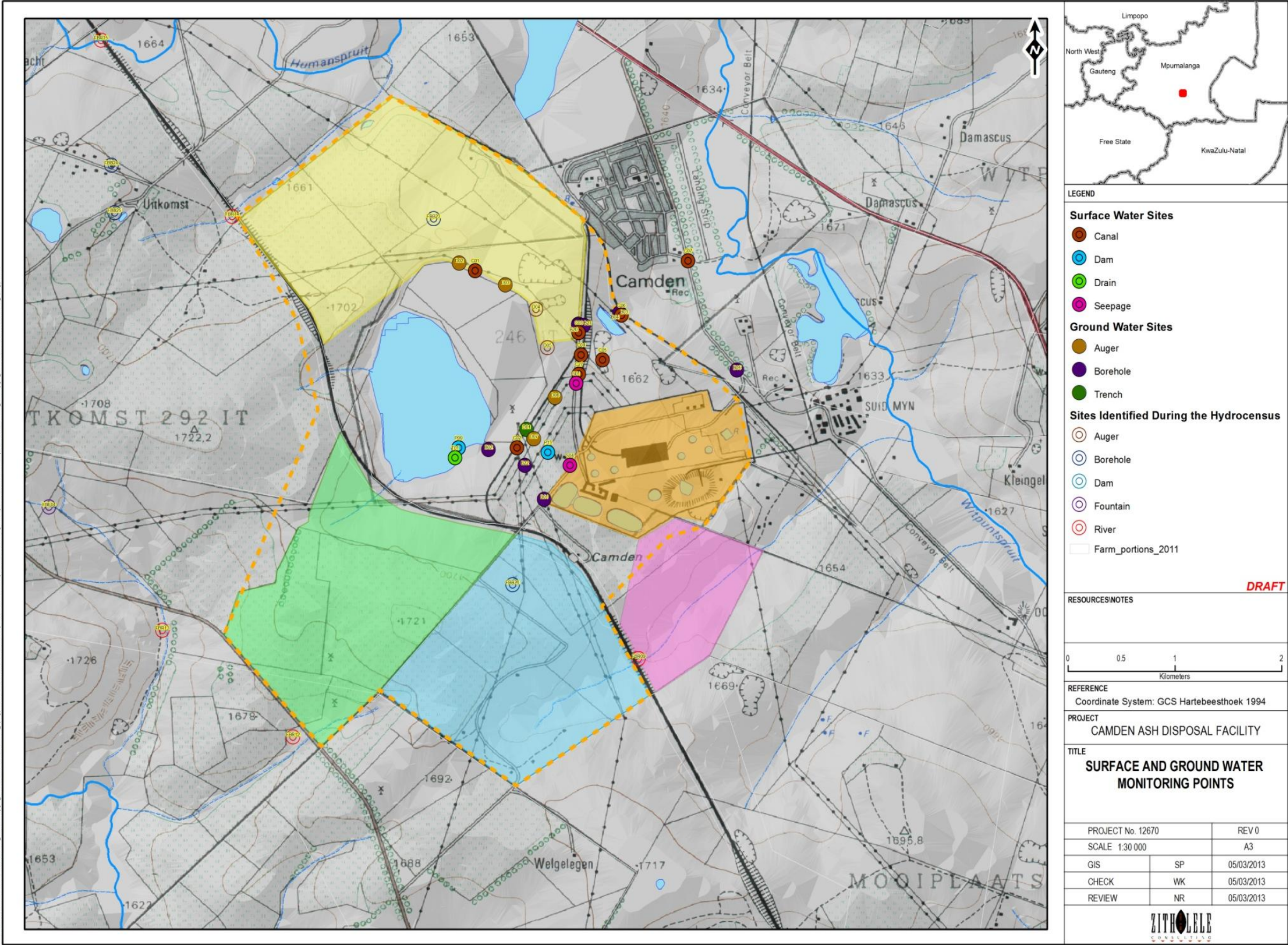


Figure 7-1: Proposed location of monitoring boreholes

## **7.2 THE CONSTRUCTION AND REMEDIATION PHASE**

### **7.2.1 Obtaining the Environmental Authorisation**

Obtaining the EA / WML and WUL will signal the commencement of the project construction phase. If a positive EA is obtained, the construction of the ash disposal facility and rerouting of transmission lines will be undertaken over a period of 12 - 24 months. The activities undertaken during the construction phase are discussed below.

### **7.2.2 Installation of fences and access control**

The construction area will be secured with a fence installed at the outset of construction phase.

### **7.2.3 Site preparation and clearance for contractor's camp**

An area will be cleared for the siting of a contractor's camp. The position of these potential contractors camps are show on Figure 6-1 and Figure 6-2 for each alternative respectively. The location has been selected because of its ease of access, central proximity, and currently disturbed status. Preparation of this area will include vegetation clearing, compaction, installation of bunded areas for hydrocarbon storage, establishment of temporary offices / storage facilities (such as containers or park homes), chemical toilets (portable / conservancy tanks), potable water storage, and fences and access control. This area will be rehabilitated as per the EMP requirements post construction.

The location of the facility is shown in Figure 6-1 and Figure 6-2 for the respective sites.

### **7.2.4 Erection of camp sites for the contractors' workforce**

Contractors will not house their workforce on site.

### **7.2.5 Vegetation clearing to facilitate access and construction activities**

Vegetation must be cleared to facilitate access, construction and safe operation. Where protected indigenous vegetation needs to be removed it must be replanted so as to minimise impacts to the environment. Search and rescue activities may be required for any protected species if found on site during clearing. Where protected species are identified a permit will be obtained for their relocation prior to any vegetation clearing activities commencing.

### **7.2.6 Establishing of access roads**

Once the contractor is established on site the access roads to the construction site will be established. Each road alignment will first be walked to ensure that site sensitivities are accounted for and avoided / planned for wherever encountered. Each road will then be

cleared of vegetation, graded, and where necessary a nominal wearing course of gravel may be imported and/or the road may be compacted for added stability. This will be determined during the detailed engineering phase of the project. All materials used in the development of access roads will be inert and non-carbonaceous material. The road will be developed taking into account proper storm water management measures, including upslope cut-off drains, and/or mitre drains where required.

### **7.2.7 Site services**

Apart from the access roads, no other services are envisaged for the proposed development. Portable chemical toilets will be used during the construction phase, and a reserve water tank of 2500 litres will supply potable water requirements at the construction camp as required.

### **7.2.8 Relocation of existing services – 400kV power lines**

In order for the ash disposal facility to be constructed the existing power lines that traverse the site will need to be relocated (as mentioned in Section 6.11). First the new power lines will be constructed, and then a switch will be made between the existing line and the new power line, and thereafter the existing line will be dismantled. The power line construction will consist of the following activities:

- *Corridor walk-down:* To ensure that all site specific sensitivities are avoided for location of the pylon. During this process the exact co-ordinates of the proposed pylons will be established.
- *Vegetation clearance:* A 55 metre (22.5 metres on either side of the power line) servitude is required for the proposed 400kV power line, tall trees will be cleared along the entire length of the servitude (the vegetation will also be maintained by Eskom in the operational phase of the project).
- *Pylon footings:* During construction the route will be surveyed, pegged and the soil nominations undertaken for each of the potential pylon foundations. The first step is the excavation of the pylon foundations, the reinforcing thereof and finally the concreting of the foundations. The equipment required to excavate the foundations can be manual labour, a TLB or in the case of hard rock – a drill rig will be required. The concrete will have to be transported via concrete trucks to the required locations.
- *Steelwork structures:* After the foundations and footings have been installed the construction team will transport the various steel parts of the towers to the site and start erection of the pylons. The pylons will be erected in piece-meal, i.e., in segments. This process again requires a lot of manual labour and often mobile cranes are used to assist with the erection of the towers.
- *Stringing:* Once the towers are erected the stringing of the conductor cable/s commences, from tower to tower and the line is tensioned as per the requirements.

- *Switching the feed:* Once the power line has been erected the feed will be switched from the current line to the new facility.

Once stringing and tensioning is complete the line is considered constructed, where after it will be tested prior to being commissioned.

### **7.2.9 Pipeline construction**

#### Slurry pipeline

The slurry pipeline to the new facility will be constructed in advance, to ensure that it is online and ready for operation once the existing facility reaches capacity. The construction activities for the pipeline will be similar to those documented above for the construction of the power lines, and will consist of the following: route walk down, identification of plinth positions, soil nominations at plinth positions, excavation for foundations, reinforcing and concreting of foundations (installation of concrete plinths), assembling and installation of pipelines on plinths, connection to pumping source, and inspection of the pipeline prior to commissioning.

It should be noted that the new pipeline for this facility will be taken off the existing pipeline, which will be retained until neither pipeline is required any longer (at this stage it is estimated that this will occur at the end of the life of this new ash disposal facility).

#### Return water pipeline

The new return water pipeline will need to be installed from the new AWRD back to the power station. The construction activities for the pipeline will include a route walk down, detailed geotechnical along route alignment, 1,5m excavation of the trench, temporary stockpiling of soils, placement of a nominal gravel bedding inside of the trench, installation of the HDPE pipeline, testing of the pipeline for leaks, replacement and profiling of stockpiled soils, and seeding and re-vegetation.

The existing return water pipelines will be retained as they are essential to the management of water levels in the De Jagers pan, which has been used as the return water dam for the existing ash disposal facility. This infrastructure is independent from this proposed Camden Ash Disposal Facility Expansion Project, and is therefore not addressed in this study. Installation of clean and dirty water separation and containment infrastructure

#### Clean Water Separation Channel

The detailed construction of the clean water channel will be undertaken during the detailed design phase of the project, and will be informed by the geotechnical conditions along the channel alignment. For the purpose of this assessment it has been assumed that construction will include the following activities:

- The channel position will be surveyed and pegged;
- Walk down of the proposed alignment to identify site specific sensitivities and concerns;
- Geotechnical study will be undertaken along the route to determine founding conditions;
- Vegetation will be cleared;
- The channel will be excavated;
- Where necessary material will be imported and/or the area compacted to improve stability;
- The concrete lining will be installed;
- The area will be profiled to tie into the adjacent terrain, ensuring that suitable measures are taken to avoid damming up of water on surface, and erosion at discharge points.

#### Dirty Water Solution Trench

The solution trench will be constructed in the same manner as described above for the clean water separation channel, with the exception that the solution trench will not be discharged to the environment. The dirty water contained in the solution trench will be discharged to the AWRD, from where it will be taken to the power station for re-use.

#### Ash Water Return Dam

The AWRD will be constructed using conventional construction equipment “plant” and methods. The sequence of construction will likely be as follows: the area earmarked for development will be surveyed and pegged; a detailed geotechnical study will then be undertaken; vegetation clearing will take place followed by topsoil stripping and stockpiling; the dam area will then be excavated and profiled as required; inert material will then be used to construct the dam wall (where insufficient material occurs on site the material required will be imported); once the dam wall and profile has been created the barrier system (including leak detection system) will be installed; the AWRD pipelines will be installed to the facility; and the final profiles will then be established and the remaining area of the dam will be re-vegetated.

#### Leachate Collection and Management

As previously mentioned the leachate collection system will comprise of a toe drain as well as a main drain system. The system will be designed using a cusped drain with geomesh above to ensure structural integrity of the system. This will be located above the liner system.

#### Surface and Groundwater Monitoring Points

During the construction phase on-going monitoring and reporting will be undertaken at designated monitoring points.

### 7.2.10 Barrier System Installation

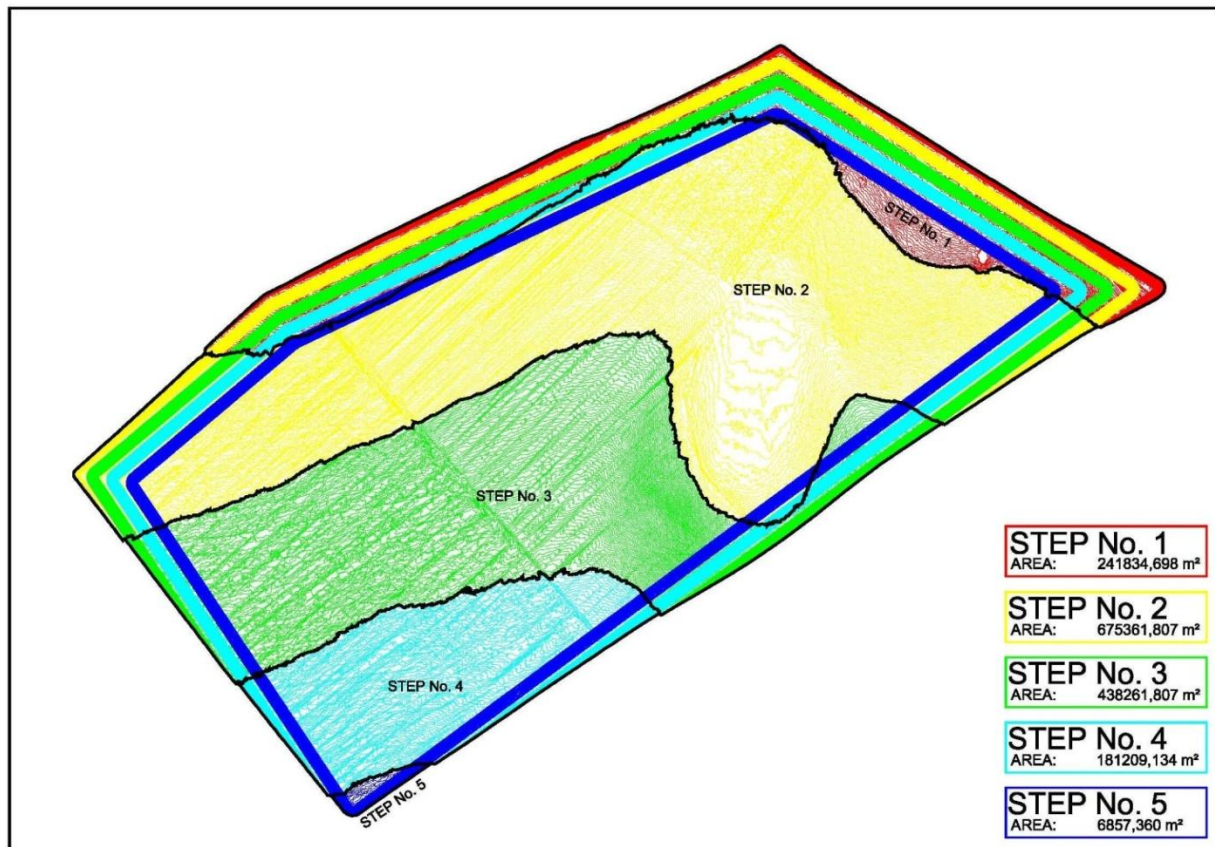
The footprint area of the ash disposal facility was determined for both Site 1 and 3 using 8 m height intervals. This was done in order to propose an optimal way of constructing the liner system for the facility without creating delays in the deposition of the ash. It was assumed that the installed liner system must create adequate storage capacity for at least three years of operation. This proposed exercise is carried forward to the staged costing of the facility and the applicable operating costs. The liner installation for Site 1 and Site 3 are each discussed separately below.

#### Site 1: Liner installation details

A graphical model of the 8 m height intervals as discussed above for Site 1 is shown in Figure 7-2 ; whilst Table 7-1 below summarises what is indicated graphically and provides a time line context.

**Table 7-1: Liner Required for Site 1**

Step No	Elevation	Footprint	Acc. Foot	Volume	Year	
	mamsl	m <sup>2</sup>	m <sup>2</sup>	m <sup>3</sup>	From	To
1	1669.3	241,800	241,800	468,700	2015	2015
2	1677.3	675,400	917,200	4,425,200	2015	2016
3	1685.3	438,300	1,355,500	12,570,500	2016	2021
4	1693.3	181,200	1,536,700	22,192,100	2021	2028
5	1701.3	6,800	1,543,500	31,134,600	2028	2033



**Figure 7-2: Phased Installation of Liner System for Site 1**

In order to achieve liner preparation for a minimum of three years, and due to the small quantities of the remaining footprint area, it is proposed that liner construction be undertaken in two phases as shown in Table 7-2.

**Table 7-2: Phased Installation of Liner System at Site 1**

Site No	Phase	Liner Area (m <sup>2</sup> )	Year (From)	Year (To)
1	I	1,355,459	2015	2021
	II	188,066	2021	2033

#### Site 3: Liner installation details

A graphical model of the 8 m height intervals as discussed above for Site 3 is shown in Figure 7-3 and Figure 7-4, whilst Table 7-3 and Table 7-4 below summarises what is indicated graphically and provides a time line context.

**Table 7-3: Liner required for Site 3A**

Step No	Elevation	Footprint	Acc. Foot	Volume	Year	
	mamsl	m <sup>2</sup>	m <sup>2</sup>	m <sup>3</sup>	From	To
1	1673.5	36,840	36,840	98,292	2015	2015
2	1681.5	579,830	616,670	906,215	2015	2015
3	1689.5	406,408	1,023,078	3,161,205	2015	2015
4	1697.5	239,347	1,262,425	6,876,435	2015	2018
5	1705.5	231,275	1,493,700	12,080,773	2018	2021
6	1713.5	68,722	1,562,422	17,379,228	2021	2024

**Table 7-4: Liner required for Site 3B**

Step No	Elevation	Footprint	Acc. Foot	Volume	Year	
	mamsl	m <sup>2</sup>	m <sup>2</sup>	m <sup>3</sup>	From	To
1	1693	58,233	58,233	934,204	2015	2015
2	1701	258,371	316,604	3,950,256	2015	2016
3	1709	301,265	617,869	8,731,753	2016	2019
4	1717	303,477	921,346	13,995,091	2019	2022

In order to achieve liner preparation for a minimum of three years, and due to the small quantities of the remaining footprint area, it is proposed that liner construction be undertaken in two phases for Site 3A and Site 3B respectively as shown in Table 7-5.

**Table 7-5: Phased Installation of Liner System at Site 3A and Site 3B**

Site No	Phase	Liner Area (m <sup>2</sup> )	Year (From)	Year (To)
3A	I	1,262,425	2015	2018
	II	299,997	2018	2024
3B	I	617,869	2015	2019
	II	303,477	2019	2022

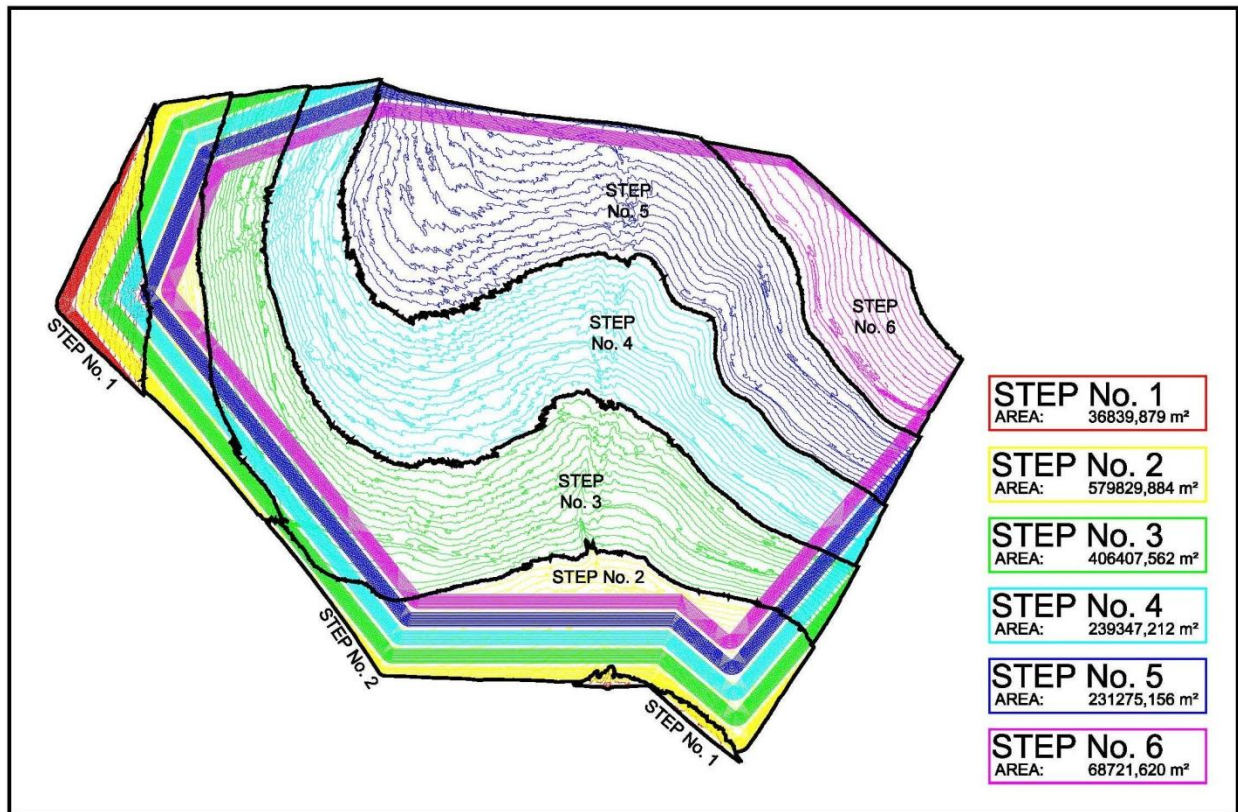


Figure 7-3: Phased Installation of Liner System for Site 3A

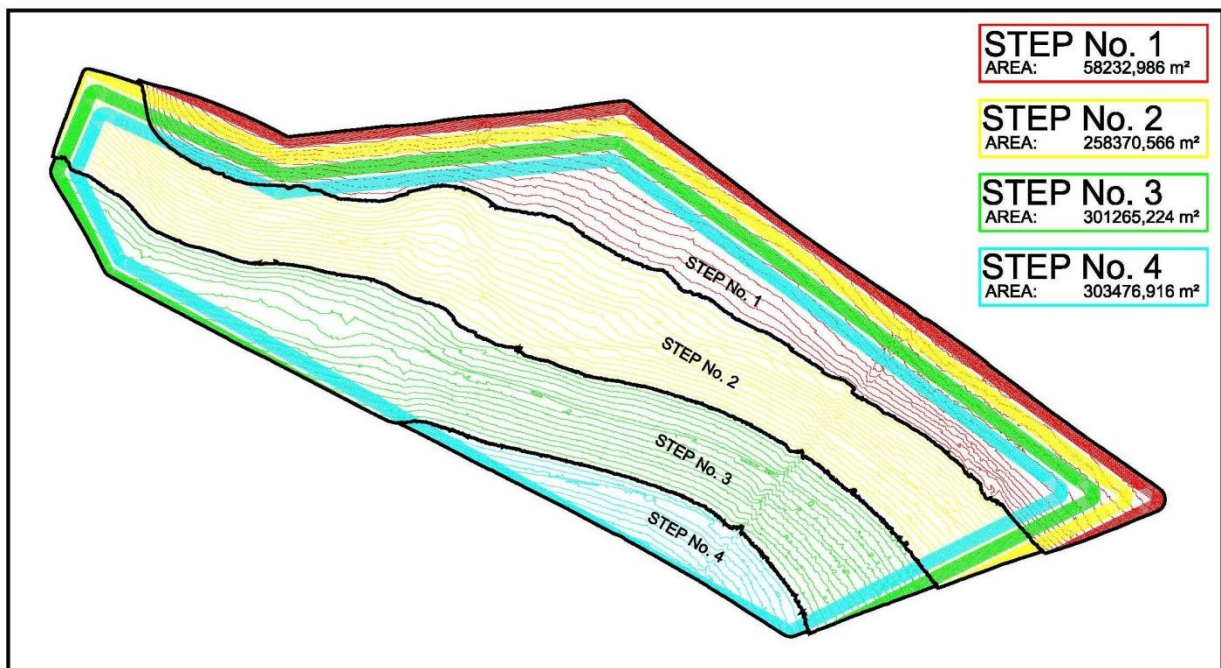


Figure 7-4: Phased Installation of Liner System for Site 3B

### **7.2.11 Construction of the starter wall for the first compartment**

Once all the protective measures are installed such as the: clean and dirty water separation and containment infrastructure and the barrier system, then the starter wall for the first compartment can be constructed.

Initial deposition needs to be contained using a starter earth wall for each compartment, built to a height that allows for a 3,0 m/year rise in the ash disposal facility. The construction of the starter wall for the first compartment is seen as part of the construction phase of the project; thereafter any additional starter walls will be considered part of the operational procedures of the facility.

### **7.2.12 Remediation of construction activities**

#### Rehabilitation of disturbed areas

Once construction is completed, rehabilitation / remediation of affected areas will be undertaken to obtain the following objectives:

- A sustainable topographic profile, tied into the adjacent vegetation in such a manner that erosion is controlled;
- A sustainable vegetation layer, free of alien invasive species; and
- A litter free environment where all construction waste has been suitably removed to a licensed facility.

The ECO / WMCO appointed to monitor the construction phase will delineate all areas requiring rehabilitation / remediation activities and will be responsible for signing off that these areas have been suitably rehabilitated as per the methods identified in the EMP and the Method Statement from the Contractor. The following areas have been identified at this juncture as areas that will require rehabilitation / remediation post construction:

- The contractors hard park / construction camp / lay down area;
- Any access roads not remaining for the operational phase maintenance and servicing of infrastructure;
- The return water pipeline surface area and servitude;
- The decommissioned slurry pipeline and adjacent servitude; and
- The dismantled power line servitude including old tower positions and service roads.

The methods for rehabilitation / remediation will be confirmed on site, based on the extent and type of impact, and will be in compliance with the approved EMP for the project. It is envisaged that rehabilitation / remediation activities will include at a minimum:

- Profiling of the terrain to ensure that it is free draining, and ties into the existing terrain without causing erosion;
- Soil amelioration and improvement will be undertaken to promote establishment of a sustainable vegetation layer;
- Seeding of the area will be undertaken with an appropriate seedmix to ensure that a sustainable vegetation cover is established;
- Water off? the area, usually in the first two years, during dry spells to ensure vegetation cover is properly established is common; and
- Alien invasive control is practiced to ensure that the area is maintained in a weed free condition.

#### Signing off by affected Landowners upon completion of the construction and rehabilitation

Once rehabilitation / remediation activities have been completed the area will be audited by the ECO / WMCO and a close out audit produced. The audit report will be submitted to the DEA and the affected landowners (if other than Eskom) for review and approval.

Once the construction is finished, it will be signed off as complete, and will be handed over to Eskom for Operation.

### **7.3 THE OPERATIONAL PHASE**

The operations of the project facilities and all of its components are described in detail in the Operations Manual. A summary description is given below.

#### **7.3.1 Taking over the facility from the Contractor**

Eskom will take ownership of the ash disposal facility from the Contractor (if separate from Eskom) upon completion of construction phase as described in the preceding section (section 7.2.12).

#### **7.3.2 Access roads, fences, and access control**

Access roads and fences (including those for the relocated 400kV power line and all associated pipeline servitudes) retained for the operational phase will be inspected regularly. Roads must be maintained according to the original design and construction specification. This includes cross slopes, road bed and wearing surface material, layer thickness and compaction of the layers. Periodic maintenance will be undertaken (as required) and will include: grading and profiling; importation of additional wearing course were required; debriding of storm water infrastructure such as cut-off / mitre drains; vegetation clearing (including firebreaks) and alien invasive control, repairing of fences; and litter collection and clean up.

### **7.3.3 Site services**

Apart from the access roads and fences, no other services are envisaged for the new development.

### **7.3.4 Relocated 400kV power lines**

The power line and its servitude will be inspected quarterly. Periodic maintenance on the line and servitude will be governed by the existing Operational EMP. Maintenance of the power line and servitude will be the same as what is envisaged for access roads and fences above.

During operations, Eskom requires access to the servitude for maintenance activities. Maintenance activities are specialised and are, therefore, carried out by Eskom employees. During the operational life of the power line, there will be no people housed along the servitude.

### **7.3.5 Pipelines**

#### Slurry pipelines

Regular inspections of the pipelines will be undertaken to ensure the integrity of the pipelines is retained and identify any leaks / damage that may have occurred. In addition to the general maintenance described for the access roads and fences above, maintenance on the pipeline will likely include the periodic flushing of the pipeline, replacement of pipe segments, and cleaning of spills / leaks that occur.

Depending on the size of the spill / leak that may occur, this will immediately be contained and then cleaned up manually by hand and shovel or a TLB (or similar type tracked equipment). The collected spill material will be loaded on to a suitably designed vehicle and disposed of at the waste disposal facility.

#### Return water pipeline

General maintenance of the pipeline servitude (such as vegetation clearing, alien invasive control, and repairs to fencing etc) will therefore also include maintenance of the flow meters to be placed at the pumping and discharge points of the pipeline, and monthly balancing of the flow meter results to ensure that the pipeline is not leaking. Maintenance inspections will also include observations to determine if surface evidence such as undue greening of the veld can be observed.

In the event that any pipeline leaks occur, pumping through this pipeline will be ceased, the position of the leak will be established, the area will be excavated and the extent of the leak investigated, appropriate measures to repair the damage to the pipeline will be undertaken,

and the excavated soils will be returned. The area will again be profiled and re-vegetated. Monitoring of the area will continue as before.

### **7.3.6 Clean and dirty water separation and containment infrastructure**

#### Clean Water Separation Channel

The clean water separation channel will be inspected prior to the rainy season each year, and fortnightly during the rainy season and after severe storms. Maintenance of the clean water separation channel will include debriding of the channel (cleaning of litter and vegetation that may have become overgrown), repairing of the channel as may be required, correction of any erosion identified, and control of alien invasive species.

#### Dirty Water Solution Trench

A regular monthly inspection of the solution trench shall be carried out to determine whether the trench has become choked by sediment or vegetation, or has been seriously eroded. Any damage shall be repaired as soon as possible. Grass and weeds growing through the concrete joints of the concrete lining shall be removed as soon as possible. Any trench crossings shall not encroach into the trench where the flow can be obstructed. Any seepage of water through the soil into the trench shall be noted, recording both the approximate flow rate and the location and repaired. The Ash Plant Manager must be notified of any such events. Any increase in the wetted area and/or flow from the toe of the ash dam is to be treated as an early indication that the filter drains are malfunctioning.

#### Return Water Dam

The most typical failure of AWRD's include seepage / pipelines; overtopping and erosion; and structural failures. These can all be managed or avoided entirely through a regular inspection and maintenance programme. This will form the basis of on-going operations and management of the AWRD.

#### Leachate Collection and Management

Once installed the leachate collection system will be between the waste body and the liner. Maintenance of the solution trench will be critical to ensure on-going operation of the leachate system occurs unhindered.

#### Surface and Groundwater Monitoring Points

During the construction phase on-going monitoring and reporting will be undertaken at designated monitoring points.

### **7.3.7 Barrier System Maintenance**

Once installed the barrier system will be inspected monthly in advance of deposition of waste. Any damage to the barrier system will be repaired immediately and prior to any waste being placed on the area. Once the area has been covered with waste it is assumed that the integrity of the barrier system is intact, and will operate for the life of the facility.

### **7.3.8 Ash disposal**

The ash slurry will be pumped from the power station to a central distribution point situated at a high point on the southern perimeter of the ash disposal facility (as shown in Figure 6-1 and Figure 6-2). From the distribution point the fly ash and the coarse ash are channelled through various open trenches and allowed to gravitate into the appropriate paddocks.

As indicated the initial deposition needs to be contained using a starter earth wall for each compartment. This initial deposition area is thus very small and grows as the compartment basin fills. Due to the small area the rate of rise is initially high. The ash does not have enough time to consolidate and gain sufficient strength to support itself. Therefore a starter wall is built to a height where the rate of rise is 3,0 m / year.

A transition from open end deposition to a spiggotting or daywall method is required once the starter wall height is reached. This is required for two reasons:

- Firstly the ash cannot be gravitated to the upper compartment from the level of the distribution box; and
- Secondly, at this point the ash may be used to build walls in an upstream direction.

Spiggotting in a cycle around the entire perimeter of each compartment allows the walls to be built in a stable way and enables proper pool and freeboard control.

Spiggotting allows for the slurry to be deposited in thin layers, which are then allowed to dry out and consolidate. A specified cycle time is allowed between the layers which is dependent on the geometry of the deposit and consolidation parameters. The deposit thus gains sufficient strength and rises continuously. An increase of 2,0 m in height over a year period was accepted for this study.

### **7.3.9 Dewatering of the ash slurry**

Water on top of the ash dam will be decanted from the pool using penstocks. Up to two temporary penstock inlets per compartment in the initial phases will be required. A permanent penstock, central to each compartment will then be installed and operated for the life of the facility.

In developing this solution various operational aspects were assumed which help reduce risks associated with the operation of the ash disposal facility and reduce potential environmental impacts. These include, inter alia:

- The pool will be operated at a minimum level; i.e. water will not be stored on the ash disposal facility (containment dam except during major storm events, in which case the water will be decanted as quickly as the penstock will safely allow. If water is stored on the facility the facility dam will need to be licensed as a water dam with the dam safety office according to regulation 1560 of the National Water Act (1998).
- More than one compartment allows flexibility in terms of deposition if a compartment requires maintenance.

A penstock consists of a vertical decant tower and an inclined horizontal conduit. The penstock's function is to remove the free water from the top surface of the ash disposal facility, thereby recovering the water for re-use in the next cycle of ashing. The penstock has been designed to decant all the water from the ashing operations and is also capable of removing the storm water from a 1 in 50 year 24 hour storm in 96 hours ( $3389 \text{ m}^3/\text{s}$ ) off the facility with one penstock functioning, or 48 hours with two penstocks functioning.

Penstocks are a very important part of an ash disposal facility but are notoriously unreliable. For this reason most slimes dams have two penstocks. Should a penstock fail and need replacement, ashing could continue without disruption using the other penstock. There are currently two penstocks on either side of the dividing wall of the ash disposal facility. Theoretical calculations show that the concrete penstock rings can safely carry the forces resulting from an ash height of 24m. The rings will experience crushing failure from 35m of ash onwards.

In order to reduce the risk of cavity formation in the future, it is important to double wrap the vertical sections of the penstock decant tower with a U24 geotextile once the rings have been placed.

## **7.4 REHABILITATION AND DECOMMISSIONING PHASE**

### **7.4.1 Consecutive capping and rehabilitation of ash disposal facility**

Rehabilitation of the ash disposal facility will commence during the operational phase and continue consecutively with operation, ensuring that the footprint for rehabilitation post operation is reduced. The methods for rehabilitation will be confirmed on site, and will be in compliance with the approved EMP for the project. It is envisaged that rehabilitation activities will include at a minimum:

- Profiling of the terrain to ensure that it is free draining, and ties into the existing terrain without causing erosion;

- Soil amelioration and improvement prior to placement will be undertaken to promote establishment of a sustainable vegetation layer;
- The improved soil will be placed in a 200 – 300 mm thick layer capping over the ash body;
- Seeding of the area will be undertaken with an appropriate seed mix to ensure that a sustainable vegetation cover is established;
- Water of the area, usually in the first two years, during dry spells to ensure vegetation cover is properly established is common; and
- Alien invasive control is practiced to ensure that the area is maintained in a weed free condition.

#### **7.4.2 Rehabilitation of disturbed areas**

##### Areas earmarked for rehabilitation

Once the ash disposal facility has reached capacity it will be finally capped as per the procedure documented above. It is envisaged that some of the associated infrastructure will then no longer be required, and will need to be dismantled and the area disturbed will need to be rehabilitated. It is envisaged that the following infrastructure will require dismantling and rehabilitation at closure of the facility:

- Any access roads not remaining for long term maintenance of the facility;
- The return water pipeline surface area and servitude; and
- The slurry pipeline and servitude.

This will be done in line with relevant legislation at the time of decommissioning of said infrastructure. Present legislation would require that an EIA be undertaken for the decommissioning of the aforementioned infrastructure.

##### Rehabilitation of disturbed areas

The following is assumed regarding the decommissioning and rehabilitation of infrastructure:

- The physical removal of the infrastructure would entail the reversal of the construction process;
- A rehabilitation programme would need to be agreed upon with the landowners (if applicable) before being implemented; and
- Materials generated by the decommissioning process will be disposed of according to the Waste Hierarchy i.e. wherever feasible materials will be reused, then recycled and lastly disposed of. Materials will be disposed of in a suitable manner, in a suitably licensed facility.

The primary objectives of the rehabilitation process will be to obtain the following objectives:

- A sustainable topographic profile, tied into the adjacent vegetation in such a manner that erosion is controlled;
- A sustainable vegetation layer, free of alien invasive species;
- Where feasible / possible pre-construction land use will be re-established; and
- A litter free environment where all construction waste has been suitably removed to a licensed facility.

The methods for rehabilitation / remediation will be confirmed on site, based on the extent and type of impact, and will be in compliance with the approved EMP for the project. It is envisaged that rehabilitation / remediation activities will include at a minimum:

- Profiling of the terrain to ensure that it is free draining, and ties into the existing terrain without causing erosion;
- Soil amelioration and improvement will be undertaken to promote establishment of a sustainable vegetation layer;
- Seeding of the area will be undertaken with an appropriate seedmix to ensure that a sustainable vegetation cover is established;
- Water of the area, usually in the first two years, during dry spells to ensure vegetation cover is properly established is common; and
- Alien invasive control is practiced to ensure that the area is maintained in a weed free condition.

#### Signing off of all rehabilitated areas upon completion

Once rehabilitation / remediation activities have been completed the area will be audited by an independent competent person and a close out audit produced. This will be submitted to the DEA and the affected landowners for review and approval. Once approval has been obtained the decommissioning will be signed off as complete.

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## **8 DESCRIPTION OF RECEIVING ENVIRONMENT**

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### **8.1 CLIMATE**

The project area falls within the highveld climate classification of Viterito (1987), and can thus expect warm, wet summers, and mild, dry winters, with equivalent evaporation depths exceeding precipitation. Regular dust storms can also be expected during periods of prolonged dry weather. Average annual rainfall for the highveld decreases from 900 mm in the east to 650 mm in the west, with approximately 85% falling between October and April. In the vicinity of Camden Power Stations the estimated rainfall from showers and thunderstorms is about 726 mm/year and the evaporation 1400 mm/year, based on available records for Nooitgedacht – Agriculture College (442811) a South African Weather Bureau meteorological station about 17 km to the northwest of the area (See Figure 8-1 below). The water balance in the area plays a major role in the possible impacts on especially surface water but also groundwater. It is evident that the evaporation exceeds the precipitation by a large margin. The area thus has a water deficit and a negative water balance in general.

Average daily maximum temperatures vary from 25°C in January to 16°C in June, but in extreme cases these may rise to 34 and 23°C, respectively. In comparison, average daily minima of 13 and 0°C can be expected, with temperatures falling to 5 and –10°C, respectively, on unusually cold days (See Figure 8-2 below).

For the entire study area there is a daily swing between berg and in-shore air movement. The main direction of air movement is from the south-west alternating with winds from the north-east. The south-westerly winds are often associated with cold fronts that are preceded by warm fronts. The hot air ahead of cold fronts is often the cause of veld fires in winter when the veld is dry.

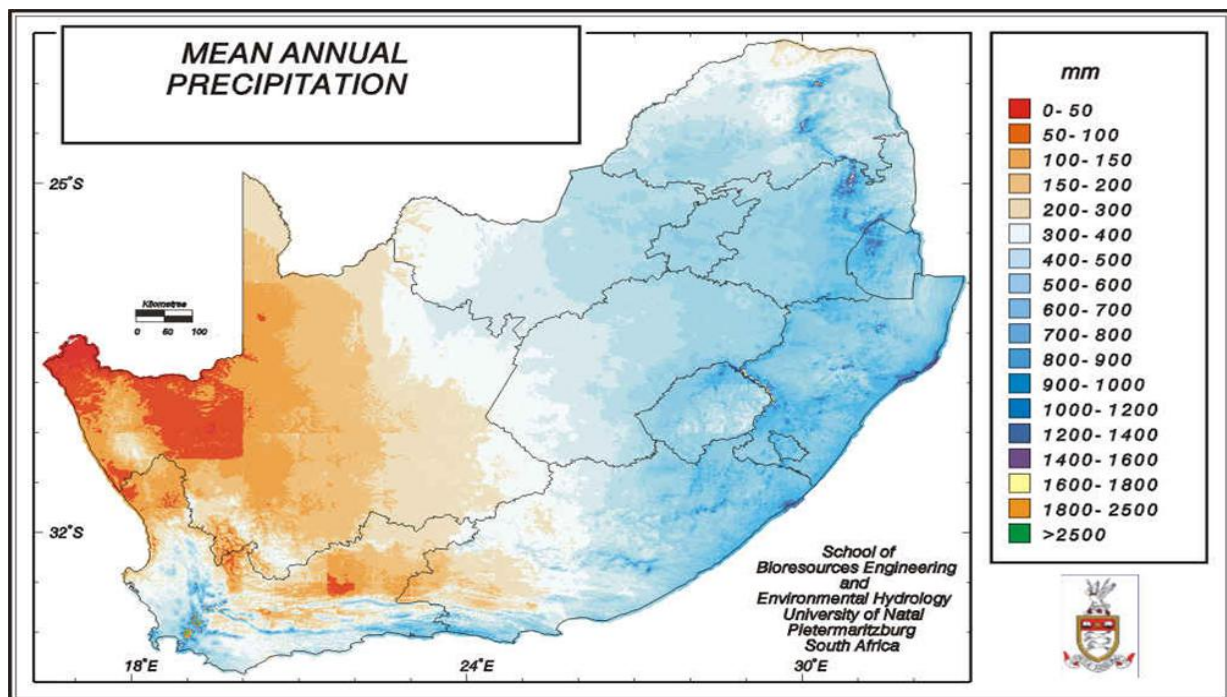


Figure 8-1: Mean annual Precipitation of Ermelo District

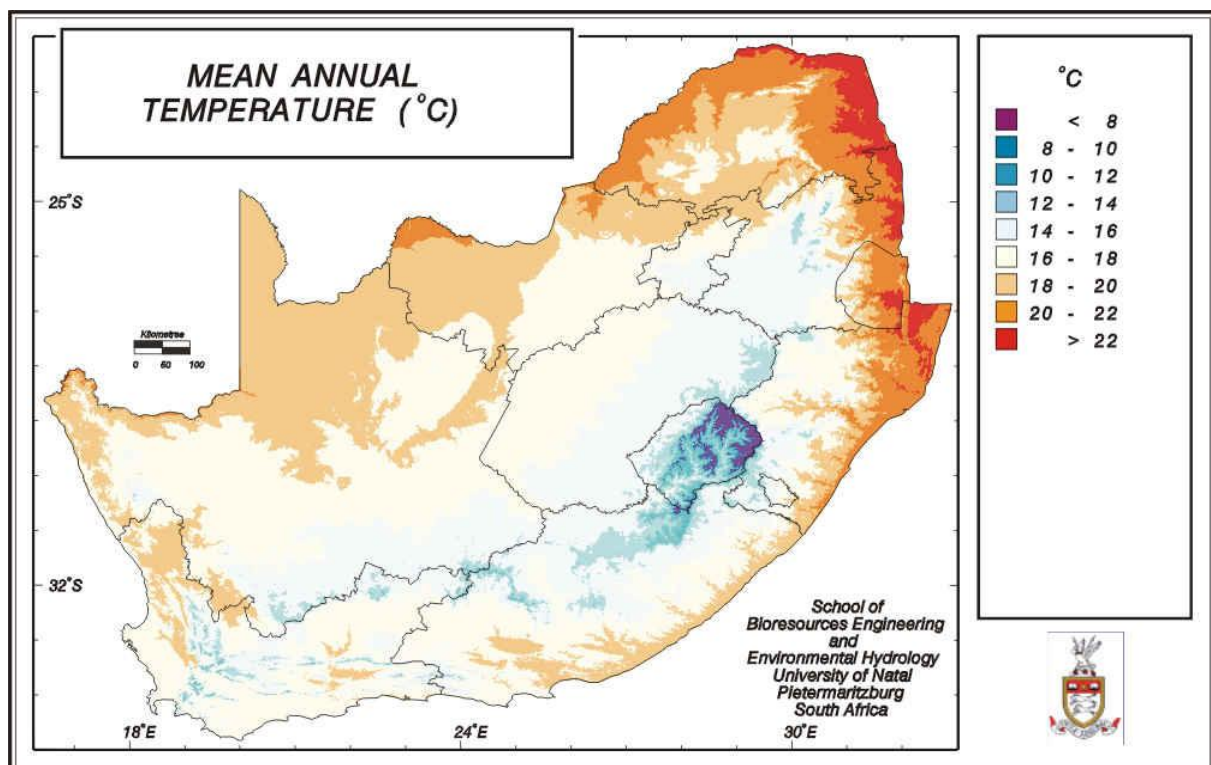


Figure 8-2: Mean annual Temperature of Ermelo District

## **8.2 GEOLOGY**

### **8.2.1 Methodology and Data Sources**

The geological analysis was undertaken through desktop evaluation using a Geographic Information System (GIS) and relevant data sources (April 2009). The geological data was taken from the Environmental Potential Atlas Data from the Department of Environmental Affairs (DEA).

### **8.2.2 Regional Description**

The site falls within the Carboniferous to early Jurassic aged Karoo Basin, a geological feature that covers much of South Africa. Sediments in this part of Mpumalunga Province fall within the Permo-Triassic aged Northern facies of the Ecca Series, forming part of the Karoo sequence (Truswell, 1977). Sediments of the Vryheid formation comprise the local geology. The sediments of the Vryheid Formation were deposited in a fluvio-deltaic environment where swamps and marshes existed, in which peat accumulated. Shales, mudstones, siltstones and sandstones constitute the bulk of the formation, with interlayering of these sediments throughout. The coal seams have relatively high dirt content. Coal measures currently mined in the area form part of the Highveld Coal Field.

Late Triassic to Middle Jurassic aged Dolerite sills and feeder dykes are common in the Karoo Basin, which intruded the Vryheid Formation. Numerous minor faults, many of which are water bearing, interrupt the coal seams. Small fracture zones, which frequently are associated with the upper and lower contacts of sills, also are commonly water bearing, and occur throughout the power station area. Previous investigations identified the presence of a near surface, slightly weathered to fresh dolerite sill. The extent of the sill is, however, unknown.

The type and distribution of site soils appears to be, in part, controlled by parent rock material. Soils overlying doleritic material are typically highly plastic and dark brown to black in colour, while those on Karoo sediments are typically lighter in colour and moderate to highly reactive in character. Shrinkage cracks can, however be expected to develop in site soils irrespective of parent material during periods of prolonged dry weather.

### **8.2.3 Study area Description**

The two candidate sites identified all fall within the sediments of the Vryheid Formation consisting of grit, sandstone, shale and coal seams. Dolerite intrusions form a major part of candidate site 2. Large sacrificial deposits of ferricrete are visible on the ground with outcrops visible on the north eastern side of candidate site 3.

## **8.3 TOPOGRAPHY**

### **8.3.1 Data Collection**

The topography data was obtained from the Surveyor General's 1:50 000 toposheet data for the region. Contours were combined from the topographical mapsheets to form a combined contours layer. Using the GIS the contour information was used to develop a digital elevation model of the region as shown in Figure 8-3 below.

### **8.3.2 Regional Description**

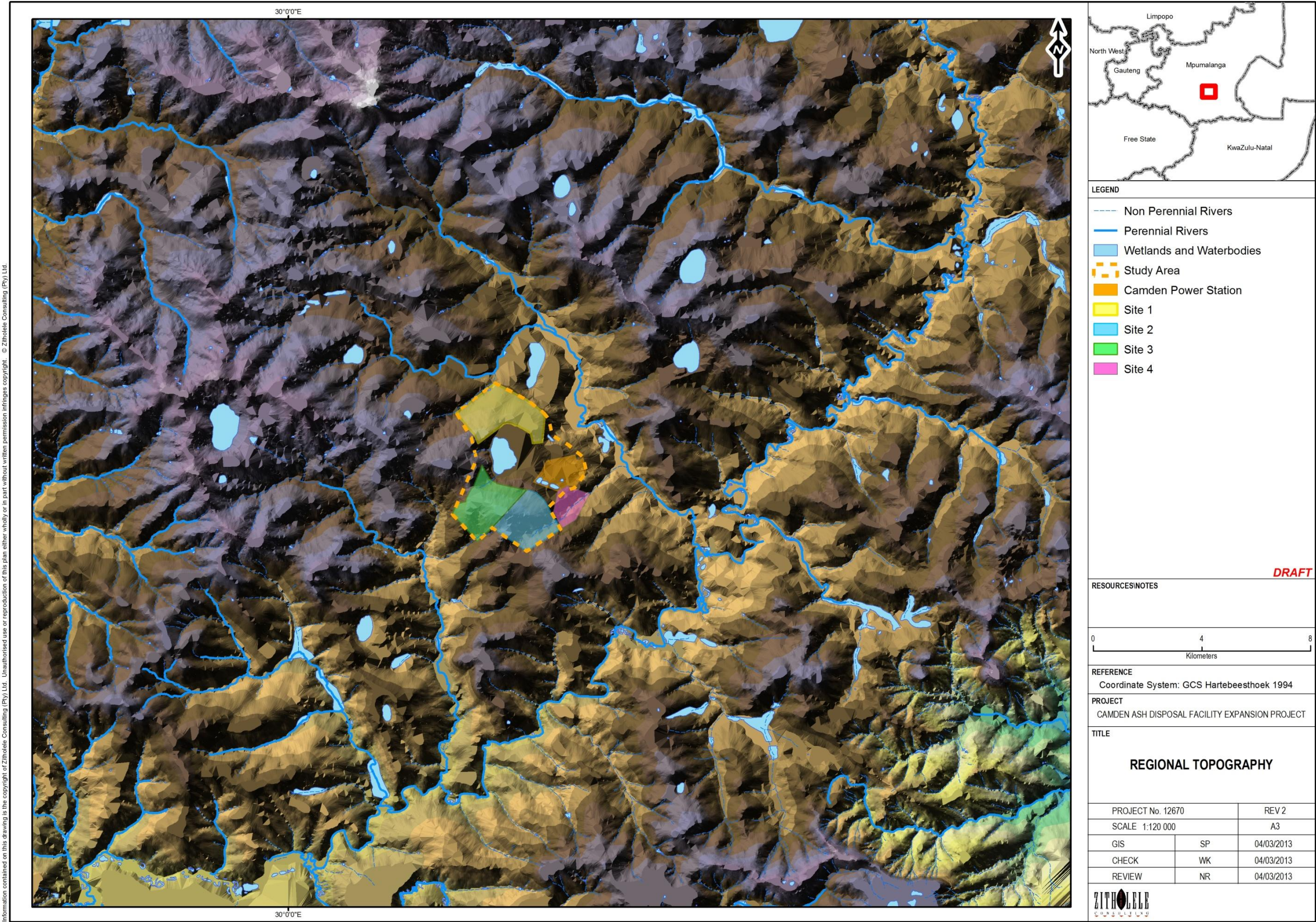
The study area ranges from 1 620 Metres Above Mean Sea Level (mamsl) to 1 760 mamsl. The highest parts of the study area are northern west of the site and the lowest parts are in the south eastern portions of the study area, south of the Vaal River. The topogrphahy is undulating with shallow incised valleys where the main watercourses flow. Several pans are found throughout the area, especially on the sandstone geology. Figure 8-3 provides an illustration of the topography of the site.

### **8.3.3 Study area Description**

The study area drains towards the southeast where the water is intercepted by the Vaal River. The topography at Alternative 1 is relatively flat and rolling, gently sloping to existing site in the south. Alternatives 2 and 3 are located south of the De Jagers Pan, which is a natural pan/depression in the landscape. Both Alternatives 2 and 3 drain northwards to the depression as they are located on relatively steep slopes.

### **8.3.4 Sensitivities**

Sensitivities associated with the topography are mainly in the form of ridges, which do not occur on any of the alternatives. Other associated impacts include the visibility and drainage of the sites, which will be assessed in more detail in the following sections.



## **8.4 SOILS**

### **8.4.1 Data Collection**

A site visit was conducted from October 2011 – February 2012. Soils were augered at 150m intervals over the proposed alternative sites using a 150 mm bucket auger, up to refusal or 1.2 m. Soils were identified according to Soil Classification; a taxonomic system for South Africa (Memoirs on the Natural Resources of South Africa, no. 15, 1991). The following soil characteristics were documented:

- Soil horizons;
- Soil colour;
- Soil depth;
- Soil texture (Field determination);
- Wetness;
- Occurrence of concretions or rocks; and
- Underlying material (if possible).

### **8.4.2 Regional Description**

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

Generally these geological structures will decompose in-situ, forming residual soils that may be silty and clayey, with the possibility of expansive soil being present. These soils are often blanketed by a considerable thickness of transported soils of colluvial origin that consist of silty and clayey fine sands.

### **8.4.3 Study area Description**

During the site visit large quantities of soil forms were identified. The soils forms were grouped into management units and are described in detail in the sections below and Figure 8-5 illustrates the location of the soil types. The management units are broken up into:

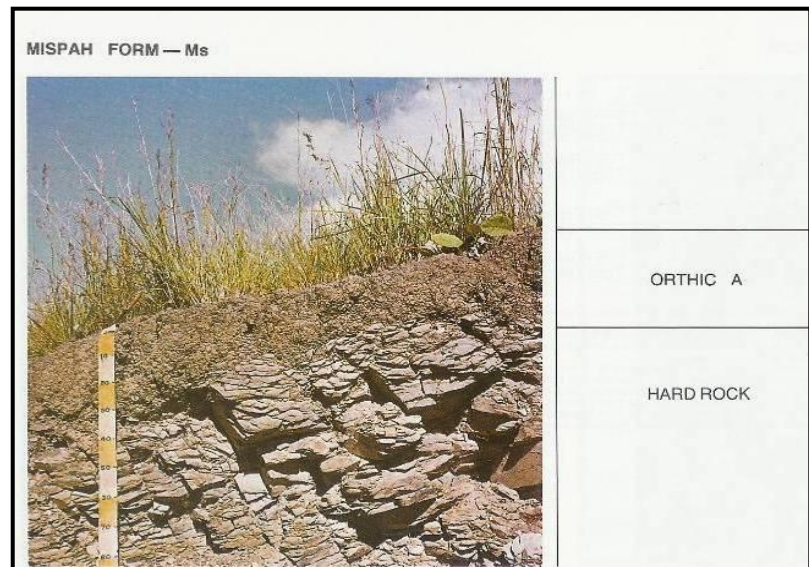
- Agricultural Soils;
- Shallow Soils;
- Transitional and Poor Transitional Soils; and
- Disturbed Soils / Hard Rock.

#### 8.4.4 Shallow (Rocky) Soils

The rocky soils are generally shallow and overlie an impeding layer such as hard rock or weathering saprolite. These soils are not suitable for cultivation and in most cases are only usable as light grazing. The main soil form found in rocky soils was the Mispah and Dresden soil forms as described below.

##### Mispah soil form

The Mispah soil form is characterised by an Orthic A – horizon overlying hard rock. Mispah soil is horizontally orientated, hard, fractured sediments which do not have distinct vertical channels containing soil material. There is usually a red or yellow-brown apedal horizon with very low organic matter content. Please refer to Figure 8-4 for an illustration of a typical Mispah soil form.



**Figure 8-4: Mispah soil form (Soil Classification, 1991).**

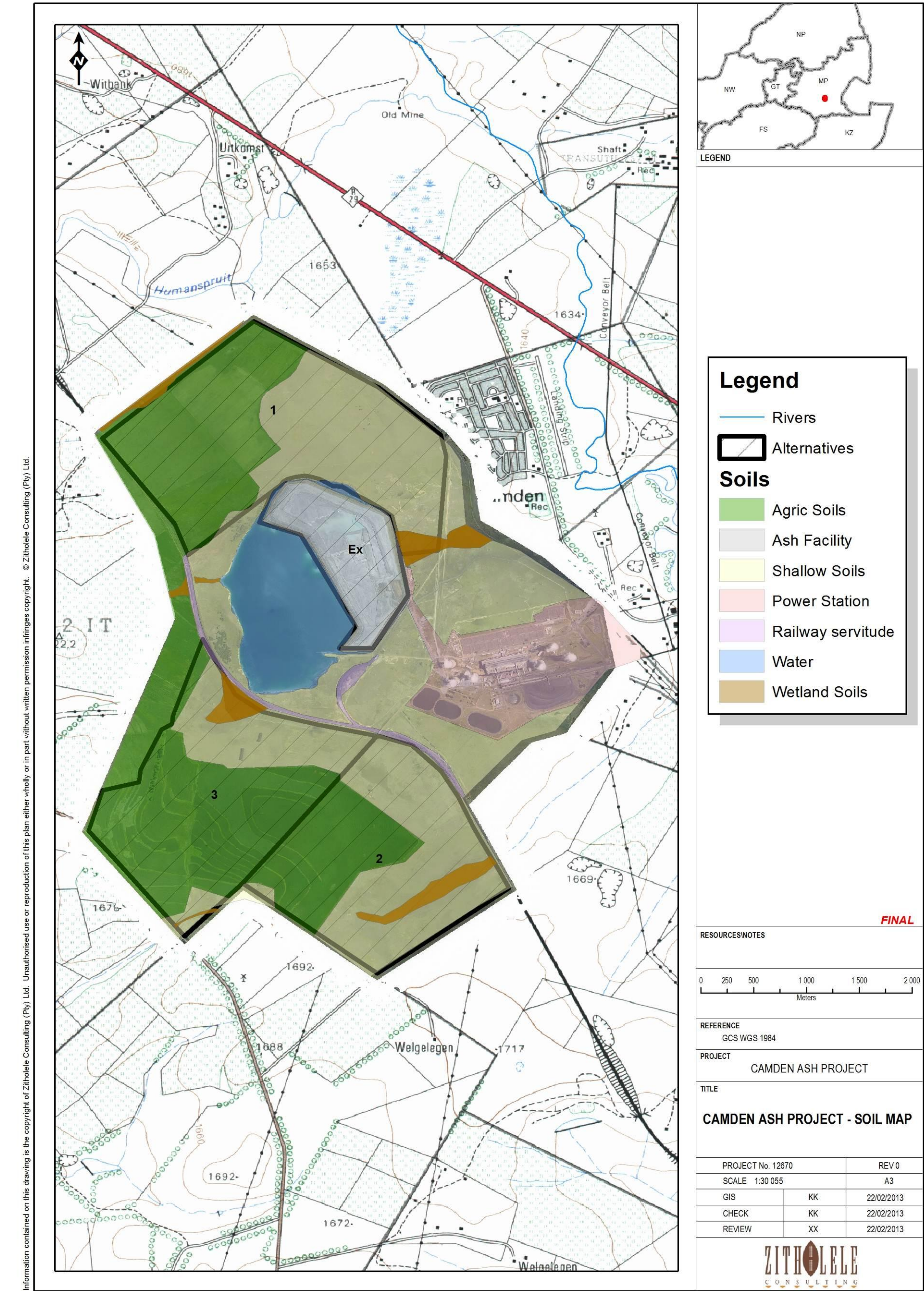
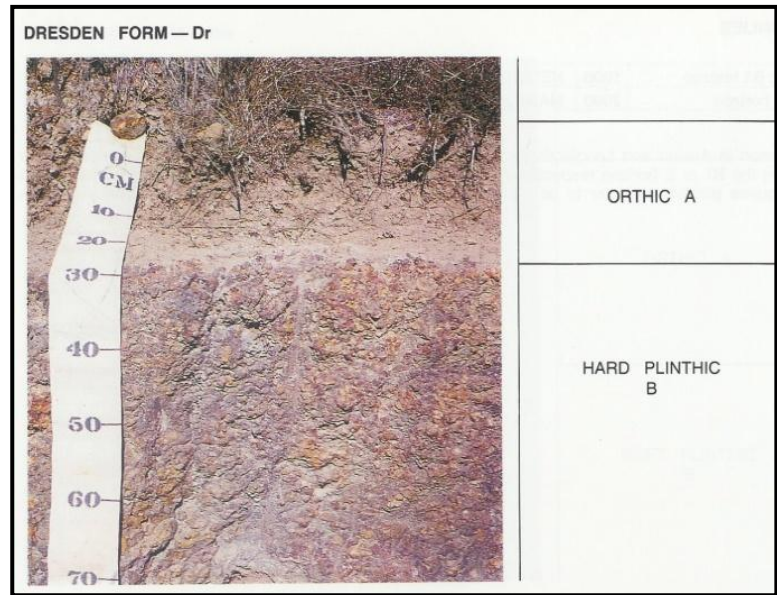


Figure 8-5: Soil Type Map

### Dresden Soil Form

The Dresden soil form is typified by an Orthic A-horizon over a Hard Plinthic B-horizon. The Hard Plinthic B-horizon develops when a Soft Plinthic horizon is subjected to a prolonged dry period and the accumulated Fe and Mn colloidal matter hardens, almost irreversibly. This B-horizon has similar characteristics to hard rock and has a very low agricultural potential, refer to Figure 8-6 for an illustration.



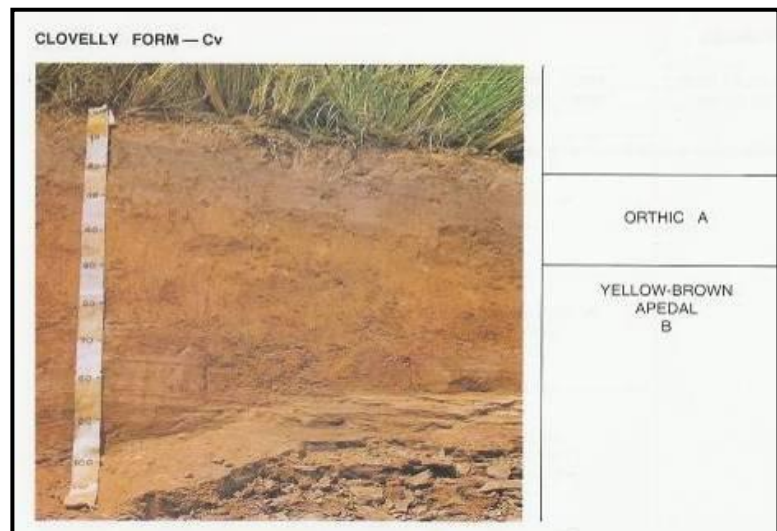
**Figure 8-6: Dresden Soil Form (Soil Classification, 1991)**

### **8.4.5 Agricultural Soils**

The agricultural soils found on site support an industry of commercial maize/legume production. These soils include Hutton, Clovelly and Avalon. These soils have deep yellow-brown B-horizons with minimal structure. These soils drain well and provide excellent to moderate cultivation opportunities. Each of the soils are described in more detail below.

### Clovelly Soil Form

Clovelly soils can be identified as an apedal “yellow” B-horizon as indicated in Figure 8-7. These soils along with Hutton soils are the main agricultural soil found within South Africa, due to the deep, well-drained nature of these soils. The soils are found on the valley slopes of the site.



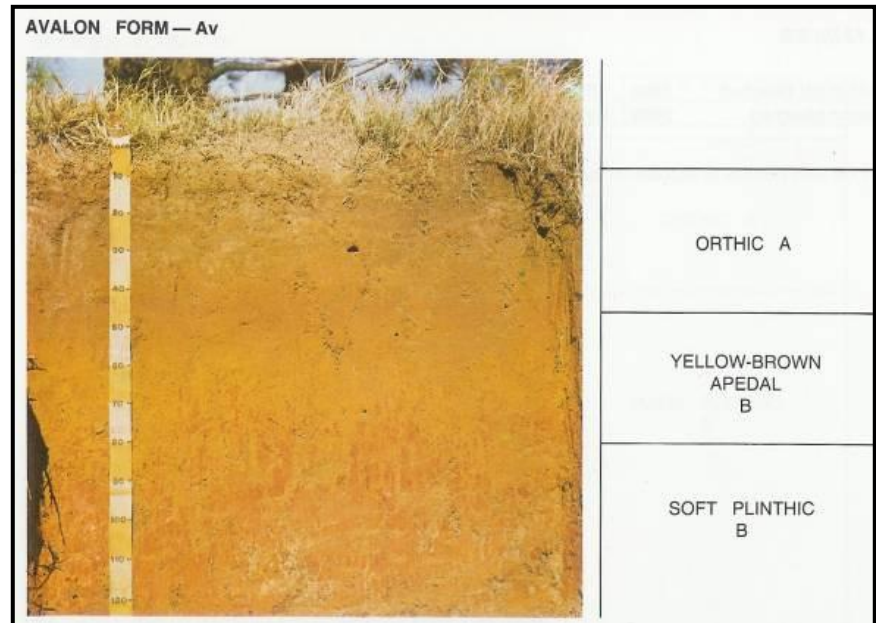
**Figure 8-7: Clovelly soil form (Soil Classification, 1991)**

### Avalon Soil Form

The Avalon soil form is characterised by the occurrence of a yellow-brown apedal B-horizon over a soft plinthic B – horizon (See Figure 8-8). The yellow-brown apedal horizon is the same as described for the Clovelly soil form and the plinthic horizon has the following characteristics:

- Has undergone localised accumulation of iron and manganese oxides under conditions of a fluctuating water table with clear red-brown, yellow-brown or black strains in more than 10% of the horizon;
- Has grey colours of gleying in or directly underneath the horizon; and
- Does not qualify as a diagnostic soft carbonate horizon.

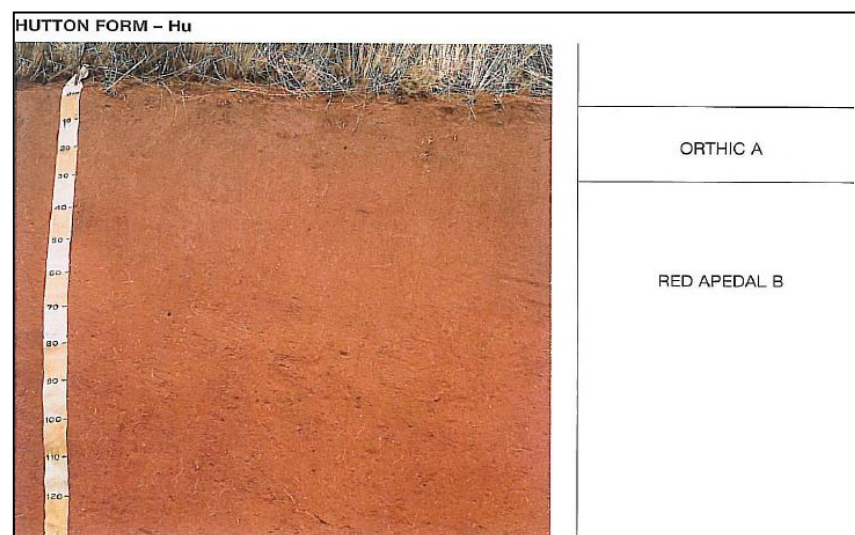
These soils are found lower down the slopes than the Clovelly soils and indicate the start of the soils with clay accumulation.



**Figure 8-8: Avalon Soil Form (Soil Classification, 1991)**

### Hutton Soil Form

Hutton's are identified on the basis of the presence of an apedal (structureless) "red" B-horizon as indicated in Figure 8-9. These soils are the main agricultural soil found in South Africa, due to the deep, well-drained nature of these soils.



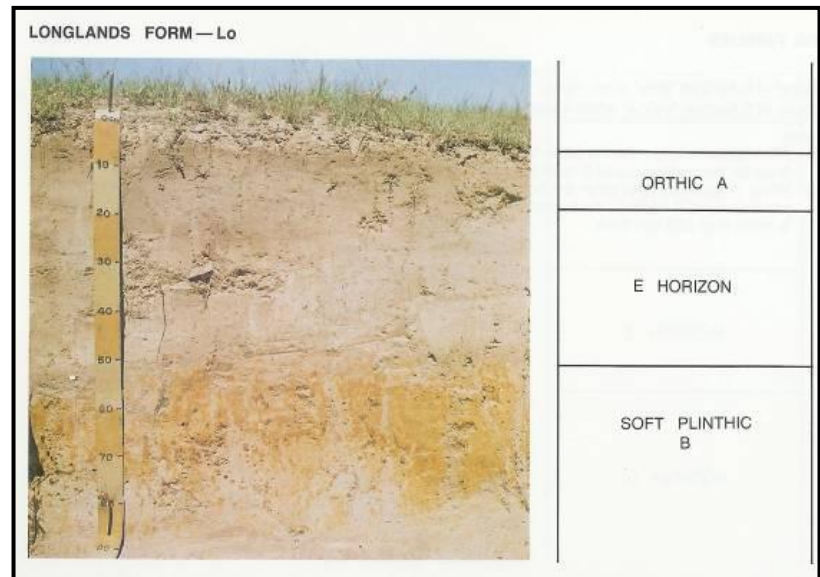
**Figure 8-9: Hutton Soil Form (Soil Classification, 1991)**

#### 8.4.6 Transitional Soils

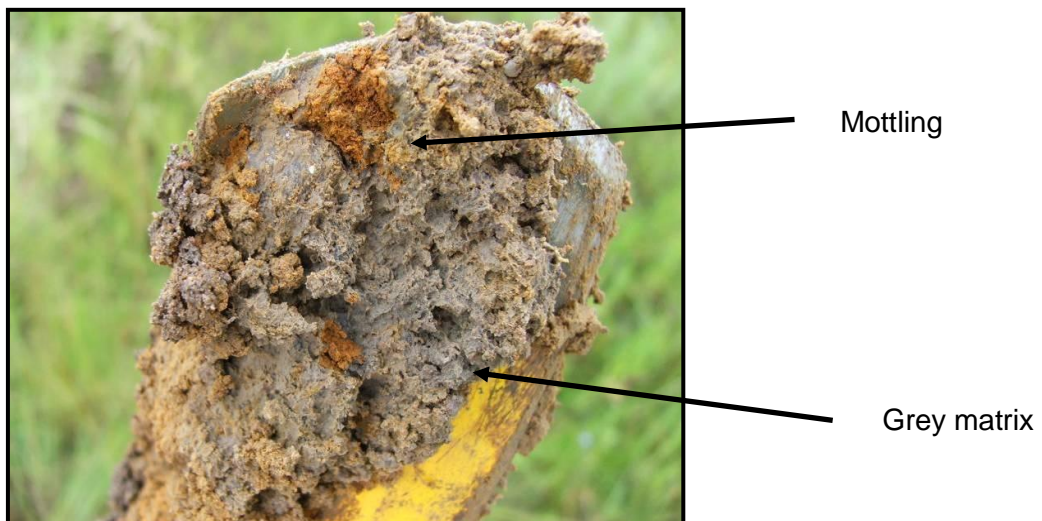
The transitional soil management unit comprises the soils found between clay soils and the agricultural soils. These soils often have signs of clay accumulation or water movement in the lower horizons. These soils are usually indicative of seasonal or temporary wetland conditions. The main soil forms found in transitional soils were Wasbank, Longlands and Westleigh, each form is described below.

##### Longlands Soil Form

The Longlands soil forms are all typified by an eluvial (E) horizon over a soft plinthic horizon (as described above). The E-horizon is a horizon that has been washed clean by excessive water movement through the horizon and the plinthic horizon as undergone local accumulation of colloidal matter (refer photo below). Please refer to Figure 8-10 and Figure 8-11 for an illustration of this soil form.



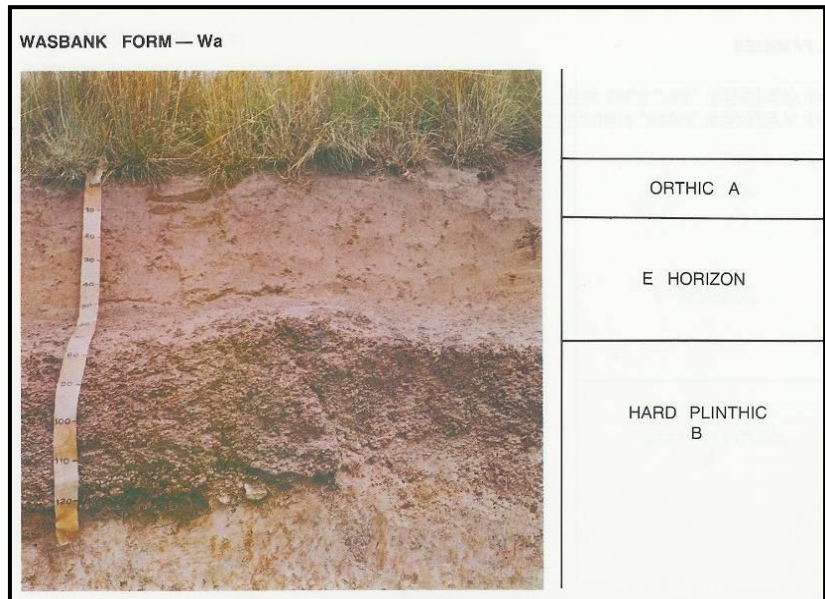
**Figure 8-10: Longlands Soil Form (Soil Classification, 1991)**



**Figure 8-11: Soft plinthic B-horizon**

### Wasbank Soil Form

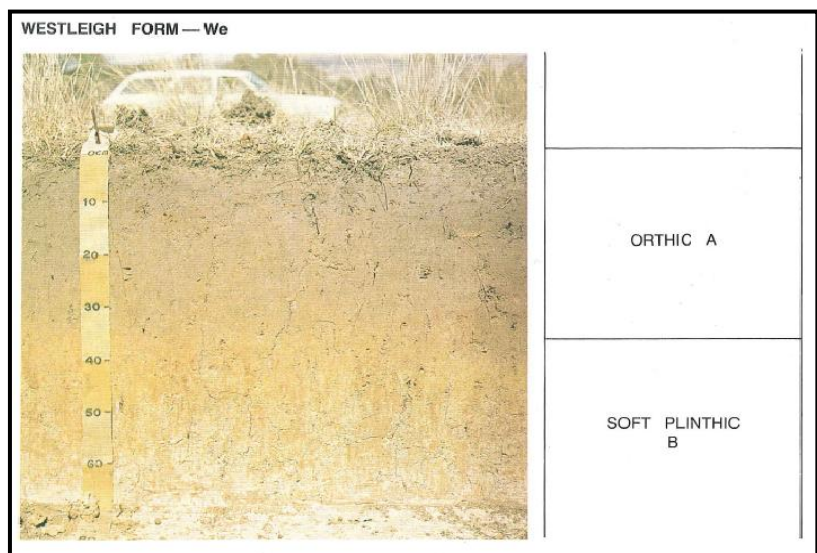
The Wasbank soil form is found in close proximity to the Longlands soil form and is typified by an Orthic A-horizon over an E-horizon (as described above) over a Hard Plinthic B-horizon. The Hard Plinthic B-horizon develops when a Soft Plinthic horizon is subjected to a prolonged dry period and the accumulated colloidal matter hardens, almost irreversibly. The Wasbank soil form is illustrated in Figure 8-12.



**Figure 8-12: Wasbank Soil Form (Soil Classification, 1991)**

### Westleigh Soil Forms

Westleigh soils are characterised by an orthic A-horizon over a soft plinthic B-horizon and is found in areas between good agricultural soils and clay soils and the movement of water determines the characteristics of the soil. Refer to Figure 8-13 for an illustration.



**Figure 8-13: Westleigh Soil Form (Soil Classification 1991)**

### **8.4.7 Clay Soils**

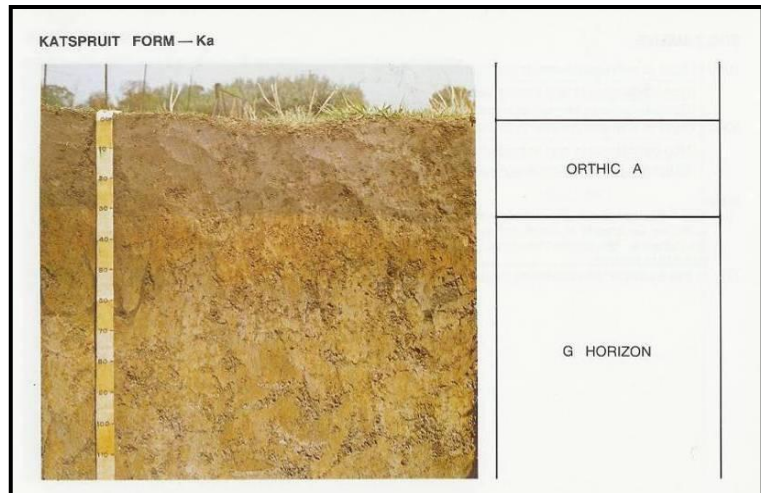
The clay soil management unit is found in areas where clays have accumulated to such an extent that the majority of the soil matrix is made up of clay particles. These soils are usually indicative of seasonal or permanent wetland conditions. The main soil forms found in clay soils were Katspruit and Willowbrook, each form is described below. These soils are saturated with water and must be noted to be unstable for construction and are sensitive. Although clay is required as part of the

liner of the proposed ash facility, building on top of clay is never recommended as the material can shift, crack and is generally regarded as unstable.

### Katspruit Soil Form

The Katspruit soil form is most commonly found in areas of semi-permanent wetness. The soil is made up of an Orthic A-horizon over a diagnostic G-horizon and is indicated in Figure 8-14. The G-horizon has several unique diagnostic criteria as a horizon, namely:

- It is saturated with water for long periods unless drained;
- Is dominated by grey, low chroma matrix colours, often with blue or green tints, with or without mottling;
- Has not undergone marked removal of colloid matter, usually accumulation of colloid matter has taken place in the horizon;
- Has a consistency at least one grade firmer than that of the overlying horizon;
- Lacks saprolitic character; and
- Lacks plinthic character.

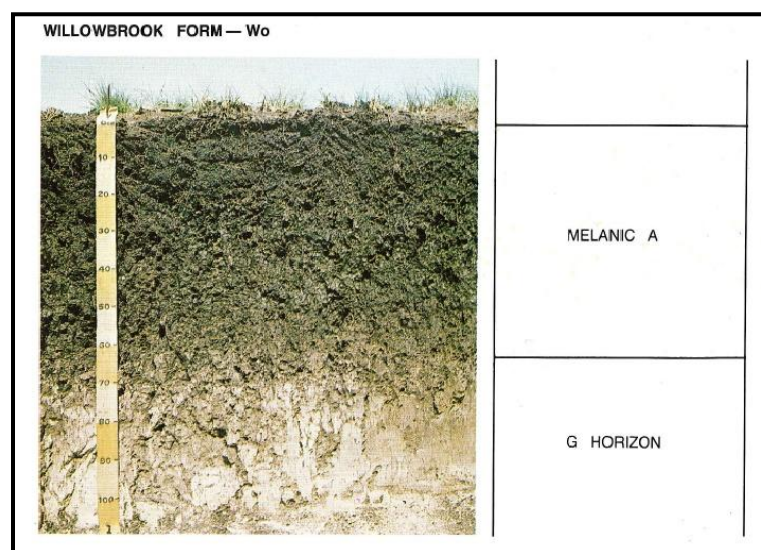


**Figure 8-14: Katspruit Soil form (Soil Classification, 1991)**

### Willowbrook Soil Form

Willowbrook soils are characterised by Melanic A-horizon over a G-horizon. The G-horizon is invariably firm or very firm and its characteristics are described above. Refer to Figure 8-15 for an illustration. The Melanic horizon has several unique diagnostic criteria as a horizon, namely:

- Has dark colours in the dry state.
- Lack slickensides that are



**Figure 8-15: Willowbrook Soil Form (Soil Classification 1991)**

diagnostic of vertic horizons.

- Has less organic carbon than required for diagnostic organic O horizon.
- Has structure that is strong enough so that the major part of the horizon is not both massive and hard or very hard when dry.

#### 8.4.8 Disturbed Soils

The disturbed soil management unit is found in areas where human disturbance has influenced the soil that developed on site. This is the case at dumping sites, roadsides, beneath buildings and mined areas. Refer to Figure 8-16 for an illustration.

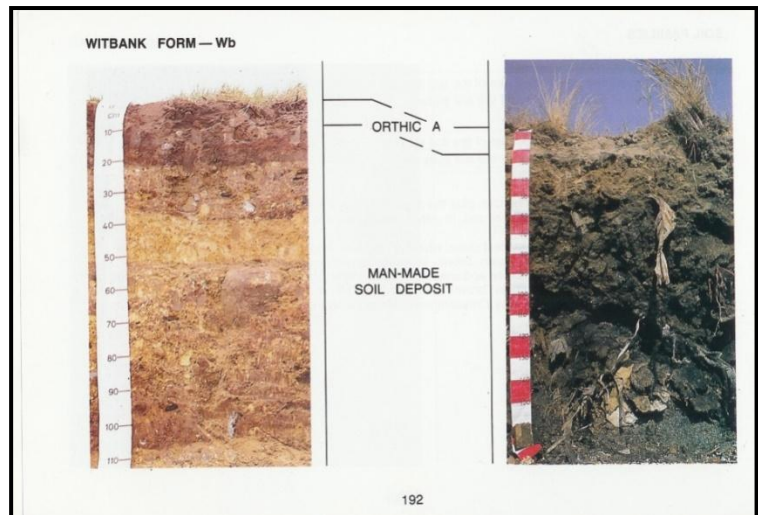


Figure 8-16: Witbank Soil Form (Soil Classification 1991)

### 8.5 AGRICULTURAL POTENTIAL (LAND CAPABILITY)

#### 8.5.1 Data Collection

A literature review was conducted in order to obtain any relevant information concerning the area, including information from the Environmental Potential Atlas (ENPAT), Weather Bureau and Department of Agriculture. Results from the soil study were taken into account when determining the agricultural potential also known as the land capability of the site. The land capability assessment methodology as outlined by the National Department of Agriculture was used to assess the soil's capability to support agriculture on site. (Refer to Table 8-1 and Figure 8-17 below)

#### 8.5.2 Regional Description

The regional land capability is mostly Class II or IV soils with few limitations. This is evident in the large number of cultivated lands found in the region. In the areas where the soil is too shallow or too wet to cultivate, livestock are grazed.

### 8.5.3 Study area Description

According to the land capability methodology, the potential for a soil to be utilised for agriculture is based on a wide number of factors. These are listed in Table 8-1 below along with a short description of each factor.

**Table 8-1: Agricultural Potential criteria**

Criteria	Description
Rock Complex	If a soil type has prevalent rocks in the upper sections of the soil it is a limiting factor to the soil's agricultural potential
Flooding Risk	The risk of flooding is determined by the closeness of the soil to water sources.
Erosion Risk	The erosion risk of a soil is determined by combining the wind and water erosion potentials.
Slope	The slope of the site could potentially limit the agricultural use thereof.
Texture	The texture of the soil can limit its use by being too sandy or too clayey.
Depth	The effective depth of a soil is critical for the rooting zone for agricultural crops.
Drainage	The capability of a soil to drain water is important as most grain crops do not tolerate submergence in water.
Mechanical Limitations	Mechanical limitations are any factors that could prevent the soil from being tilled or ploughed.
pH	The pH of the soil is important when considering soil nutrients and hence fertility.
Soil Capability	This section highlights the soil type's capability to sustain agriculture.
Climate Class	The climate class highlights the prevalent climatic conditions that could influence the agricultural use of a site.
Land Capability / Agricultural Potential	The land capability or agricultural potential rating for a site combines the soil capability and the climate class to arrive at the site's potential to support agriculture.

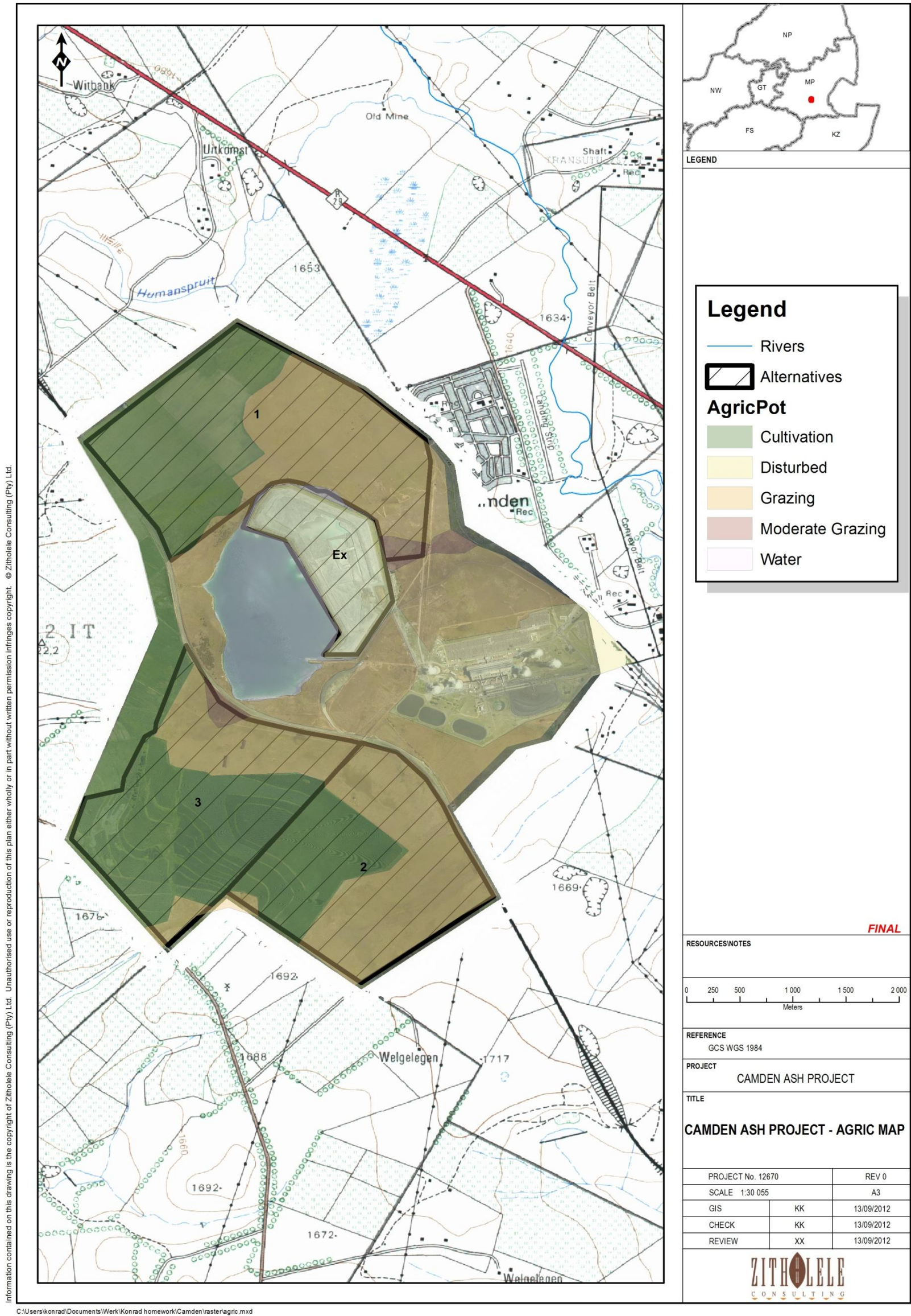
The soils identified in Section 8.4 above were classified according to the methodology proposed by the Agricultural Research Council – Institute for Soil, Climate and Water (2002). The criteria mentioned above were evaluated in the Table 8-2 below. The site is made up of several land capability classes, namely Class II, III, IV, V, VI and VII. The Class II - III soils are suitable for cultivation and can be used for a range of agricultural applications in the case of Class II. Class IV – V soils have features that reduce their potential for agricultural use, this can be flood hazards, erosion risk, texture or drainage. The Class VI and VII soils have continuing limitations that cannot be corrected; in this case rock complexes, flood hazard, stoniness, and a shallow rooting zone constitute these limitations. Table 8-2 illustrates the various land capability units within the study area.

**Table 8-2: Land Capability of the soils within the study area**

<b>Soil</b>	<b>Good Agricultural</b>	<b>Agricultural</b>	<b>Transitional</b>	<b>Poor Transitional</b>	<b>Shallow Soil</b>	<b>Disturbed / Hard Rock</b>
% on Site	8	28	12	40	11	1
Rock Complex	None	None	None	None	Yes	None
Flooding Risk	No	Moderate	Moderate	Moderate	No	Very Limiting
Erosion Risk	Low	Moderate	High	High	High	Very Low
Slope %	3.9	3.7	3.7	3.7	4.0	0.5
Texture	Loam	Loam	Loam	Clay/Clayey Loam	Sandy Loam	Rock/Sandy
Effective Depth	> 100 cm	> 60 cm	> 60 cm	< 60 cm	< 60 cm	< 10 cm
Drainage	Good	Imperfect	Imperfect	Poor	Poorly drained	Poorly drained
Mech Limitations	None	None	None	None	Rocks	Rocks
pH	> 5.5	> 5.5	> 5.5	> 5.5	> 5.5	> 5.5
<b>Soil Capability</b>	Class II	Class III	Class IV	Class V	Class VI	Class VIII
<b>Climate Class</b>	Mild	Mild	Mild	Mild	Mild	Mild
<b>Land Capability</b>	Class II – Arable Land	Class III – Moderately Arable Land	Class IV – Poor Arable Land	Class V – Good Grazing Land	Class VI – Moderately Grazing Land	Class VII – Wildlife

No limitation	Low	Moderate	High	Very Limiting
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For an illustration of the land capability please refer to Figure 8-17.



## **8.6 SURFACE WATER**

### **8.6.1 Data Collection**

The surface water data was obtained from the Department of Water Affairs National database of Freshwater Ecosystem Priority Areas (FEPAs) for river ecosystems and wetlands. The data used included catchments, wetlands, water bodies, river alignments and ecological status of these sources.

### **8.6.2 Regional Description**

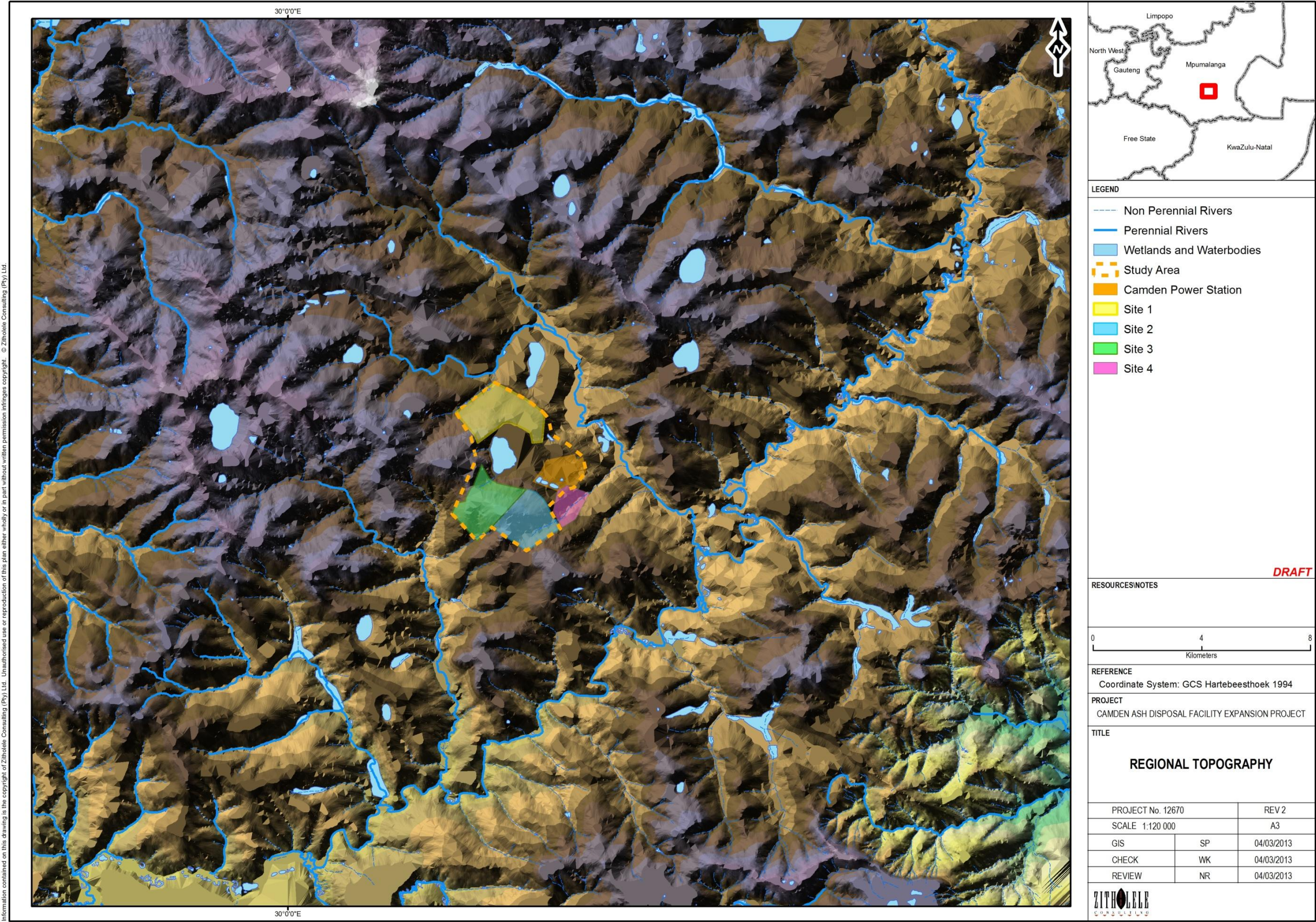
The main drainage features of the area are the Witpuntspruit which drains south-eastwards to the Vaal River, which is located some 6 km from Camden Power Station. Several unnamed tributaries are also found in the area. In addition to the streams, several wetlands and pans can also be found in the region as illustrated in Figure 8-18 below. The streams and their associated pans and wetlands support a number of faunal and floral species uniquely adapted to these aquatic ecosystems, and therefore all surface water bodies are earmarked as sensitive features and should be avoided as far as possible.

### **8.6.3 Study area Description**

From Figure 8-18 below, it is evident that there are water bodies or streams in close proximity to the study area. The De Jagers Pan is a natural depression/pan that is located adjacent to the existing ash disposal site. This pan is used as a return water dam as part of the approved water management system for the station. In addition to the pan there are small non-perennial drainage lines on all three alternative sites. In order to identify the exact location and status of these features a wetland and riparian delineation study was undertaken as described in Section 8.6.4 below.

### **8.6.4 Sensitivities**

All the surface water features are seen as sensitive and should be avoided by the ash disposal site. A detailed delineation study was undertaken to determine the extent of the surface water features. The results of the delineation are shown in Figure 8-18. A summary of the wetland and surface water delineation study is provided below, and more detailed description is included in the attached Biophysical Specialist Study (refer to Appendix I).



## Riparian Zones vs. Wetlands

### **Wetlands**

The riparian zone and wetlands were delineated according to the Department of Water Affairs (DWA, previously known as the Department of Water Affairs and Forestry -DWAF) guideline, 2003: A practical guideline procedure for the identification and delineation of wetlands and riparian zones. According to the DWA guidelines a *wetland* is defined by the National Water Act as:

*“land which is transitional between terrestrial and aquatic systems where the water table is usually at or near surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.”*

In addition the guidelines indicate that wetlands must have one or more of the following attributes:

- Wetland (hydromorphic) soils that display characteristics resulting from prolonged saturation;
- The presence, at least occasionally, of water loving plants (hydrophytes); and
- A high water table that results in saturation at or near surface, leading to anaerobic conditions developing in the top 50 centimetres of the soil.

During the site investigation the following indicators of potential wetlands were identified:

- Terrain unit indicator;
- Soil form indicator;
- Soil wetness indicator; and
- Vegetation indicator.

### **Riparian Areas**

According to the DWA guidelines a *riparian area* is defined by the National Water Act as:

*“Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas”*

## **The difference between Riparian Areas and Wetlands**

According to the DWA guidelines the difference between a wetland and a riparian area is:

*“Many riparian areas display wetland indicators and should be classified as wetlands. However, other riparian areas are not saturated long enough or often enough to develop wetland characteristics, but also perform a number of important functions, which need to be safeguarded... Riparian areas commonly reflect the high-energy conditions associated with the water flowing in a water channel, whereas wetlands display more diffuse flow and are lower energy environments.”*

### **Delineation**

The site was investigated for the occurrence / presence of wetlands and riparian areas, using the methodology described in Section 3.8.2 above and described in more detail in the DWA guidelines.

### **Terrain Unit Indicator**

The topography of the site is described in Section 8.3 of this report and is also shown in Figure 8-3. According to the DWA guidelines the valley bottom is the terrain unit where wetlands are most likely to occur, but the occurrence of wetlands is not excluded from any of the other terrain units.

The bulk of the area drains towards De Jager's Pan, which represents the valley bottom, and this is the area in which most wetlands are expected.

### **Soil Form Indicator**

Of the soils identified the clay and transitional soils could potentially be wetland soils as they have clay accumulation. The clay soils are mostly typical of the permanent and seasonal wetland zone while the transitional soils can be found in temporary wetland zones.

### **Soil Wetness Indicator**

The soils on site were subjected to a soil wetness assessment. If soils showed signs of wetness within 50 cm of the soil surface, it was classified as a hydromorphic soil and divided into the following zones:

#### **Temporary Zone**

- Minimal grey matrix (<10%);
- Few high chroma mottles; and

- Short periods of saturation.

### Seasonal Zone

- Grey matrix (>10%);
- Many low chroma mottles present; and
- Significant periods of wetness (>3 months / annum).

### Permanent Zone

- Prominent grey matrix;
- Few to no high chroma mottles;
- Wetness all year round; and
- Sulphuric odour.

### Vegetation Indicator

The vegetation units on site are described in Section 8.7.2 below and illustrated in Figure 8-20. The vegetation found in the moist grassland vegetation unit has species present to indicate the presence of wetlands

### Delineated Wetlands and Buffer Zones

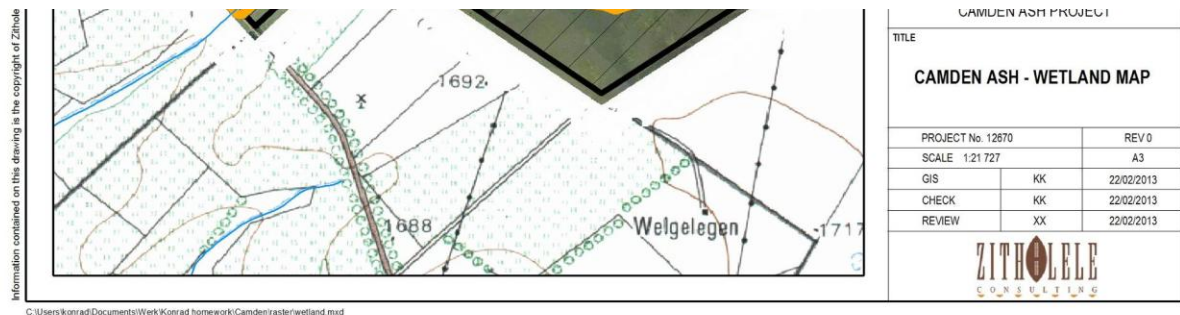


Figure 8-19 below illustrates the various wetland and riparian zones as well as the buffers placed along the edge of the temporary zone.

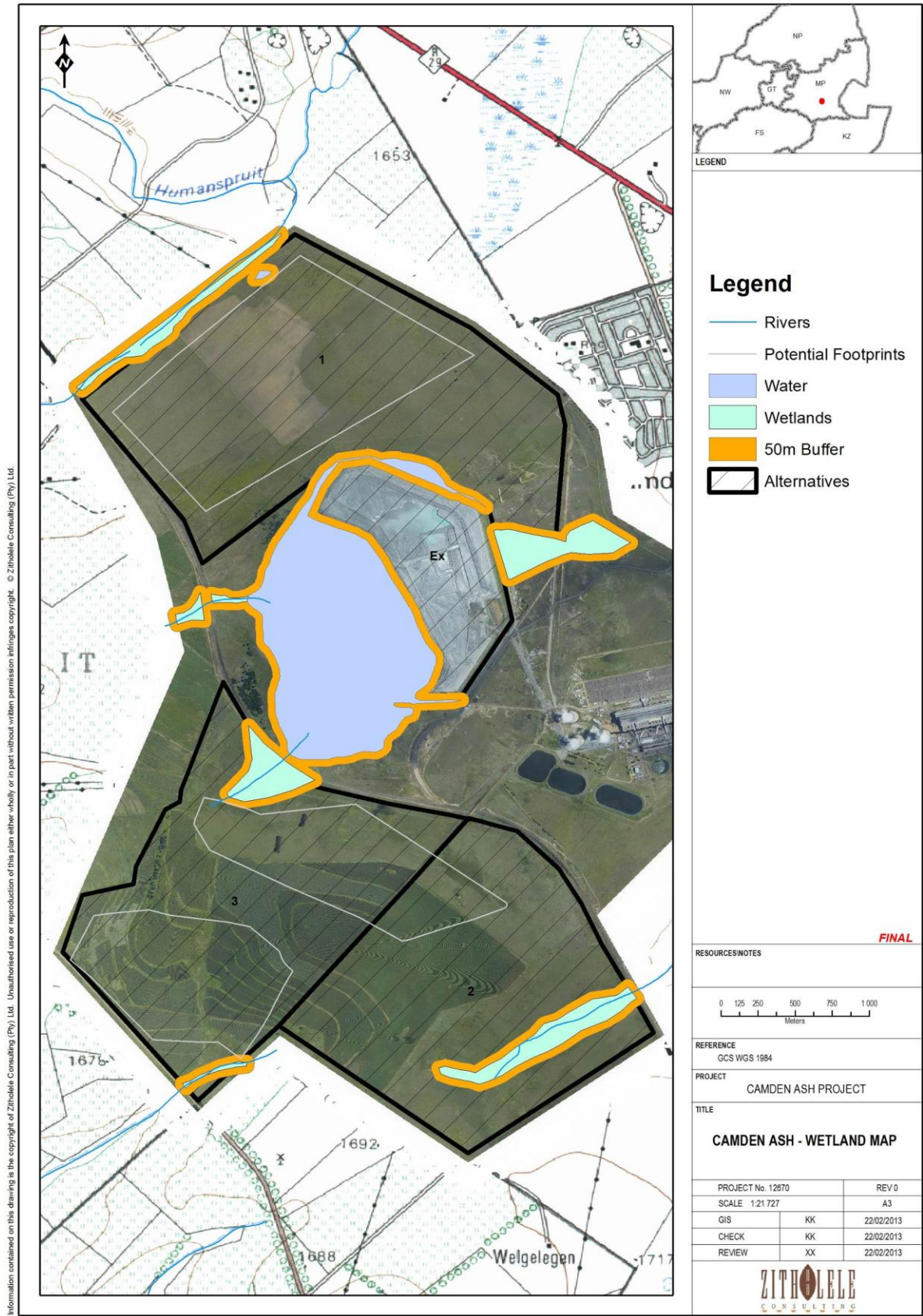


Figure 8-19: Wetlands and Riparian Zones including buffer

## 8.7 TERRESTRIAL ECOLOGY

### 8.7.1 Data Collection

A literature review of the faunal and floral species that could occur in the area was conducted. C-Plan data provided from the Mpumalanga provincial department was used to conduct a desktop study of the area. This data consists of terrestrial components; ratings provide an indication as to the importance of the area with respect to biodiversity.

The study involved extensive fieldwork, a literature review and a desktop study utilizing GIS. Site investigations were conducted from October 2011 to March 2012, from spring to summer. The area within the servitude was sampled using transects placed at 100 m intervals. At random points along these transect an area of 20 m x 20 m was surveyed. All species within the 20 m x 20 m quadrant were identified, photographed and their occurrence noted. Sensitive features such as ridges or wetlands were sampled by walking randomly through the area concerned and identifying all species within the area.

The floral data below is taken from The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford (2006)). Also, while on site, the following field guides were used:

- Guide to Grasses of Southern Africa (Van Oudtshoorn,F, (1999));
- Field Guide to Trees of Southern Africa (Van Wyk, B and Van Wyk,P (1997));
- Field Guide to the Wild Flowers of the Highveld (Van Wyk,B and Malan,S, (1998));
- Problem Plants of South Africa (Bromilow,C, (2001)); and
- Medicinal Plants of South Africa (Van Wyk,B.E, Van Oudtshoorn,B and Gericke,N, (2002))

Species lists were obtained from the SIBIS (*South African National Biodiversity Institute - Accessed through the SIBIS portal, [sibis.sanbi.org](http://sibis.sanbi.org), 2012-01-25*). In addition the following faunal guides were used on site and while compiling this report:

- Die Natuurlewe van Suider-Afrika, 'n veldgids tot diere en plante van die streek (Carruthers,V, (1997));
- Birds of Southern Africa (Sinclair,I (1994));
- Smithers' Mammals of Southern Africa, a field guide (Ed. Peter Apps, (2000));
- Sasol Owls and Owling in Southern Africa (Tarboton, W and Erasmus, R (1998));
- Bats of Southern Africa (Taylor, P.J, (2000)).

## **8.7.2 Vegetation**

### **Regional Description**

The area under investigation is located within the Grassland Biomes. Each biome comprises several bioregions which in turn has various vegetation types within the bioregion. The Grassland Biome is represented by Mesic Highveld Grassland and Inland Azonal Vegetation bioregions as described below. These descriptions are adapted from Mucina and Rutherford, 2006.

#### **Mesic Highveld Grassland**

Mesic Highveld Grassland is found mainly in the eastern, high rainfall regions of the Highveld, extending all the way to the northern escarpment. These are considered to be “sour” grasslands and are dominated by primarily andropogonoid grasses. The different grassland types are distinguished on the basis of geology, elevation, topography and rainfall. Shrublands are found on outcrops of rock within the bioregion, where the surface topography creates habitat in which woody vegetation is favoured above grasses.

#### **Inland Azonal Vegetation**

The Azonal Vegetation bioregion is characterised by those vegetation units that is associated with inland water features such as riparian and wetland vegetation. Along the proposed route only one vegetation type was identified, namely Eastern Temperate Freshwater Wetlands.

### **Study area Description**

The vegetation types identified on site are indicated in Figure 8-20 below and described in detail below.

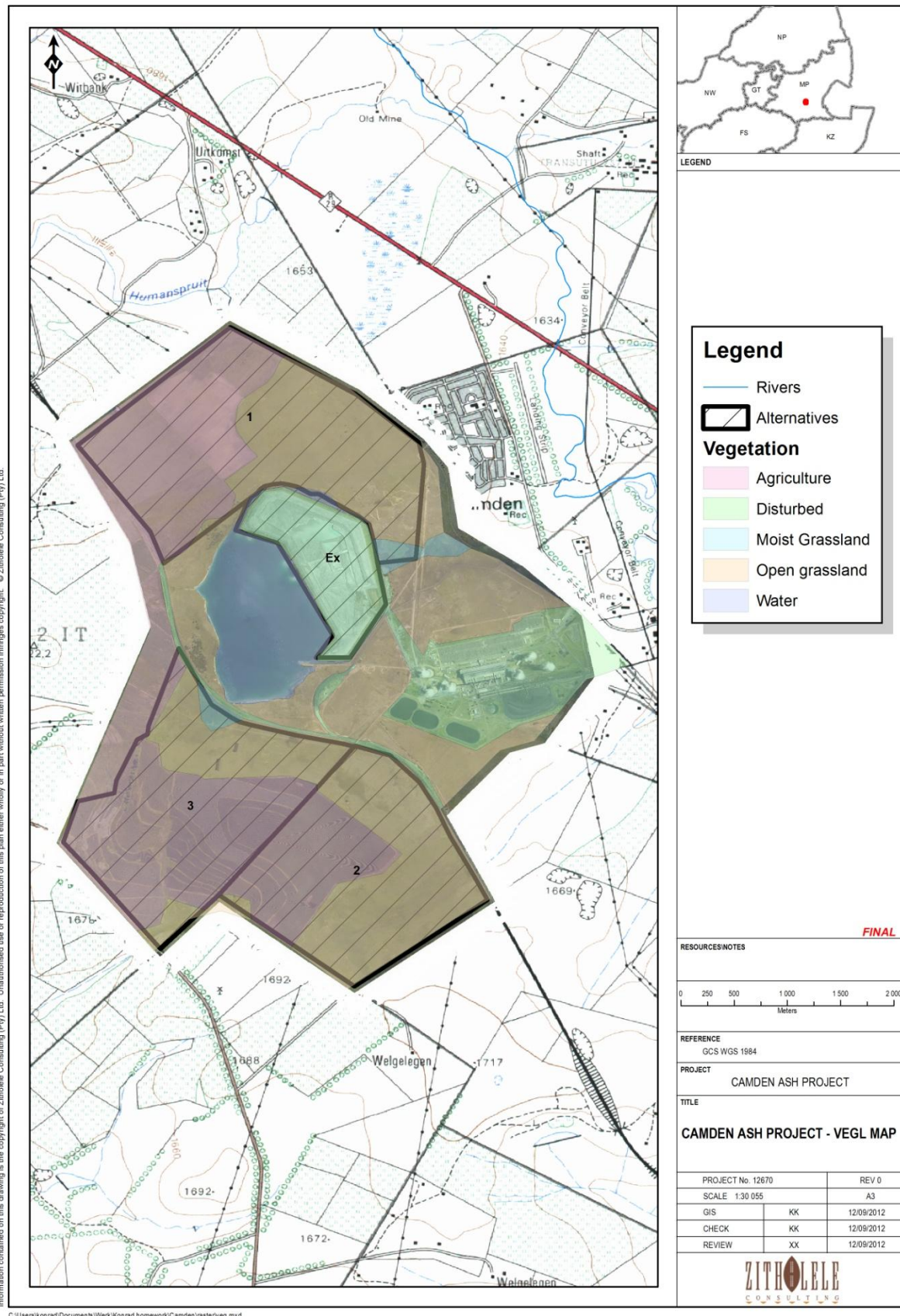


Figure 8-20: Vegetation map of the study area

### Eastern Temperate Freshwater Wetlands

This vegetation unit is found throughout the Northern Cape, Eastern Cape, Free State, North-West, Gauteng, Mpumalanga and KwaZulu-Natal Provinces as well as in the neighbouring Lesotho and Swaziland. It is based around water bodies with stagnant water (lakes, pans, periodically flooded vleis, and edges of calmly flowing rivers) and embedded within the Grassland Biome. These water bodies support zoned systems of aquatic and hygrophilous vegetation of temporary flooded grasslands and ephemeral herblands.

Due to the recent efforts of organisations such as Ramsar, this vegetation unit is now 4.6 % conserved and rated as least threatened. The following alien species are encountered in this type of wetland: *Bidens bidentata*, *Cirsium vulgare*, *Conyza bonariensis*, *Oenothera rosea*, *Physalis viscosa*, *Plantago lanceolata*, *Rumex crispus*, *Sesbania punicea*, *Schkuhria pinnata*, *Stenotaphrum secundatum* (native on South African coast, alien on Highveld), *Trifolium pratense*, *Verbena bonariensis*, *V. brasiliensis*, and *Xanthium strumarium*.

In terms of the vegetation on site, there are 3 distinct areas within the study area that fall into this vegetation unit. The first is De Jager's Pan (shown in Figure 8-21), the large pan in the centre of the site. This pan is classified as a wetland and wetlands are of a more permanent nature and occur in low-lying areas such as tributaries of streams and rivers. Here hydrophytes are found. Typical plants are the Orange River Lily (*Crinum bulbispermum*), bulrush (*Typha capensis*) and reeds (*Phragmites australis*), sedges of the *Cyperus*, *Fuirena* and *Scirpus* genera also occur. Due to the use of the pan as a dirty water return dam for the power station over the 40 odd years of operation, the vegetation around the pan has been disturbed as the water quality was reduced.



**Figure 8-21: De Jager's Pan with the existing ash facility in the foreground**

The other two areas (shown in Figure 8-22) are the inflow into the pan from the south and the man-made outflow to the north-northeast of the pan and existing ash disposal site. These areas around drainage lines/seepage areas were also added to this unit because of the similar vegetation that occur in these areas. The seepage area is seasonally wet and is found to the south of the site, where the bowl-shaped topography drains to a central point that enters under the Richard Bay railway line and drains into the pan. These areas are usually covered by hygrophytes such as sedges and reeds. The dominant sedge in the study area is *Juncus rigidus*. Sometimes bulrush (*Typha capensis*) and reeds (*Phragmites australis*) also occurs. The photos below show these areas.



**Figure 8-22: Moist Grassland found at the bottom of the southern slopes prior to joining De Jager's Pan**

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 lucidodes subspecies lycioides*, *Parinari capensis*, *Protea caffra*, *P. Welwitschii* and *Rhus magalismsontanum*).

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 (Holkransse, 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**

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

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

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 8-4 have 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
<b>Category of Viewer</b>	
Static	Farms, homesteads or industries
Dynamic	Travelling along road
<b>View Elevation</b>	
Above	Higher elevation than proposed power lines.
Level	Level view with power lines
Below	Lower elevation than power lines viewed
<b>View Distance</b>	
Long	> 5 km
Medium	1 – 5 km
Short	200 m – 1 000 m
Very Short	< 200 m
<b>Period of View</b>	
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)

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## 9 COMPARATIVE ASSESSMENT OF ALTERNATIVES

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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		Risidual Direction of Impact	Residual Degree of Certainty	Project Impact - Unmitigated	Project Impact - Mitigated	Status Quo - Baseline Impact	Cumulative Impact	Residual Impact	Risidual Direction of Impact	Residual Degree of Certainty	Project Impact - Unmitigated	Project Impact - Mitigated	Status Quo - Baseline Impact	Cumulative Impact	Residual Impact	Risidual 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, Palaeontology, 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		Residual Direction of Impact	Residual Degree of Certainty	Project Impact - Unmitigated	Project Impact - Mitigated	Status Quo Baseline Impact	Cumulative Impact	Residual Impact	Residual Direction of Impact	Residual Degree of Certainty	Project Impact - Unmitigated	Project Impact - Mitigated	Status Quo Baseline Impact	Cumulative Impact	Residual Impact	Residual Direction of Impact	Residual Degree of Certainty	Project Impact - Unmitigated	Project Impact - Mitigated	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, Palaeontology, 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.

ALTERNATIVE:

**ZITHOLELE CONSULTING**

## 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		Risidual Direction of Impact	Residual Degree of Certainty	Residual Impact	Risidual Direction of Impact	Residual Degree of Certainty	Residual Impact	Risidual 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 <i>(The direction of the project impact is positive, although the residual impact remains negative)</i>	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, Palaeontology, 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 be 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 is 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 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 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

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## **10 ENVIRONMENTAL IMPACT STATEMENT**

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### **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<sup>2</sup>) 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	<i>Development Site / Isolated Site</i>	The impact will affect an area no bigger than the servitude.
2	STUDY	<i>Study Area</i>	The impact will affect a route corridor not exceeding the boundary of the corridor.
3	LOCAL	<i>Local</i>	The impact will affect an area up to 5 km from the proposed route corridor.
4	REG	<i>Regional / Provincial</i>	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	<i>Global / National</i>	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	<u>NO IMPACT</u>	Not Applicable / No Impact
1	INC	<u>Incidental</u>	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	SHORT	<u>Short-term</u>	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	<u>Medium term</u>	The environmental impact identified will operate for the duration of life of the line.
4	LONG	<u>Long term</u>	The environmental impact identified will operate beyond the life of operation.
5	PERM	<u>Permanent</u>	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:

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 Eccca 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:

ALTERNATIVES:

Reviewed By:				Site 1						
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk	
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	Negative	Definite		1.2	0.6	3	3	1	
	(If mitigation is effective / possible this rating wil decrease )				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:				ALTERNATIVES:					
				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
T-1	Topography								
	<b>CONSTRUCTION PHASE</b>			5					
Impact 1	Alteration of surface water drainage patterns	Negative	Probable	5	3	2	5	5	3.3
Mitigation Measures:	Stormwater management measures, have only one facility, site to drain only in one direction				MOD	STUDY	PERM	OCCUR	HIGH
					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
<b>TOTAL</b>	<b>1731.4</b>	<b>100.0</b>	<b>216.7</b>	<b>12.5</b>	<b>1729.0</b>	<b>100.0</b>

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 that 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:				ALTERNATIVES:					
				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
SLC-1	Soil and Land Capability								
	<b>CONSTRUCTION PHASE</b>			5					
Impact 1	Sterilisation of agricultural land	Negative	Definite	5	3	1	5	5	3
Mitigation Measures:	Use Site (smaller area), Stockpile all useable topsoil & Subsoil				MOD	ISO	PERM	OCCUR	MOD
					3	1	5	5	3
Impact 2	Loss of soil resources - erosion	Negative	Definite	3	3	1	5	5	3
Mitigation Measures:	Place soil stockpiles out of water courses, Revegetate Stockpiles, Stormwater Management				MOD	ISO	PERM	OCCUR	MOD
					2	1	5	3	1.6
Impact 3	Pollution of soils	Negative	Definite	3	3	1	4	4	2.1
Mitigation Measures:	Hydro-carbon management, waste management, Access Control				MOD	ISO	LONG	VLIKE	MOD
					1	1	1	1	0.2
Impact 4	Net loss of soil volumes and utilisation potential (chemical properties, nutrients, structure etc)	Negative	Definite	3	3	1	4	5	2
Mitigation Measures:	Strip and stockpile maximum top soil and subsoil for rehabilitation use. Rehabilitate all areas outside of Dam's storage area.				VLOW	ISO	LONG	OCCUR	LOW
					1	1	4	5	2
Impact 5	Compaction of soils	Negative	Definite	3	3	1	4	5	2.7
Mitigation Measures:	Appropriate ripping and amelioration of construction impacted areas, outside of the Dam's storage area.				MOD	ISO	LONG	OCCUR	MOD
					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
	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	VLIKE	LOW
					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		ALTERNATIVES:							
Reviewed By:		Site 1							
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	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
Mitigation Measures:	MOD				STUDY	SHORT	OCCUR	MOD	
	Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.				1	1	1	3	0.6
Impact 2	Decreased water quantity - runoff contained in "dirty" area.	Negative	Definite	5	VLOW	ISO	INCID	COULD	VLOW
Mitigation Measures:	3				2	4	5	3	
	Clean water cut-off close to facility. Locate facility high on water shed. Use Site 1 (smaller area). Line contaminated areas.				MOD	STUDY	LONG	OCCUR	MOD
Impact 3	Sedimentation of wetlands and surface water resources	Negative	Definite	5	2	2	4	5	2.7
Mitigation Measures:	LOW				STUDY	LONG	OCCUR	MOD	
	Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.				3	2	2	5	2.3
Impact 4	Reduction in habitat integrity of downstream wetland areas	Negative	Probable	5	MOD	STUDY	SHORT	OCCUR	MOD
Mitigation Measures:	1				1	1	2	0.4	
	Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.				VLOW	ISO	INCID	UNLIKE	VLOW
COMBINED WEIGHTED RATING	BEFORE MITIGATION	Negative	Definite		1	2	2	3	1
	AFTER MITIGATION (If mitigation is effective / possible this rating wil decrease )	Negative	Definite		VLOW	STUDY	SHORT	COULD	VLOW
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		1	1	1	2	0.4
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, BEFORE MITIGATION	Negative	Probable		VLOW	ISO	INCID	UNLIKE	VLOW
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, AFTER MITIGATION	Negative	Probable		2.5	2	2.5	4.5	2.1
					MOD	STUDY	MED	OCCUR	MOD
					1.3	1.3	1.8	3	0.9
					LOW	STUDY	SHORT	COULD	VLOW
					4	3	4	5	3.7
					HIGH	LOCAL	LONG	OCCUR	HIGH
					4	3	4	5	3.7
					HIGH	LOCAL	LONG	OCCUR	HIGH
					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 could occur. 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<sup>9</sup> 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

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<sup>9</sup> 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:				ALTERNATIVES:					
				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
GW-1	Groundwater								
	<b>CONSTRUCTION PHASE</b>			5					
Impact 1	Decreased water quality (suspended solids, turbidity, hydrocarbon, 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 will 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
<b>TOTAL</b>	<b>1731.4</b>	<b>100.0</b>	<b>216.7</b>	<b>12.5</b>	<b>1729.0</b>	<b>100.0</b>

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 section 10.1 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		ALTERNATIVES:							
Reviewed By:		Site 1							
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	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
Impact 2	Loss of faunal populations	Negative	Definite	3	LOW	ISO	PERM	OCCUR	MOD
					2	1	1	3	0.8
Mitigation Measures:	Search and Rescue, Alien invasive control, Rehab Temp Impact Areas				LOW	ISO	INCID	COULD	VLOW
Impact 3	Loss of biodiversity	Negative	Definite	2	1	1	1	2	0.4
					VLOW	ISO	INCID	UNLIKE	VLOW
Mitigation Measures:	Harvest Seeds, Alien invasive control, Indigenous Seedmix-Rehab areas, Separate topsoil stripping / stockpiling (including seedbed)				2	1	5	3	1.6
Impact 4	Loss of habitat and habitat fragmentation	Negative	Definite	5	LOW	ISO	PERM	COULD	LOW
					1	1	5	1	0.5
Mitigation Measures:	Consecutive Rehab of Dam				VLOW	ISO	PERM	IMPOS	VLOW
Impact 5	Loss of species diversity	Negative	Definite	2	3	1	4	5	2.7
					MOD	ISO	LONG	OCCUR	MOD
Mitigation Measures:	Search and Rescue Operations, Seedbank, Separate topsoil stripping and replacement (including seedbed)				2	1	4	5	2.3
Impact 6	Increase in alien invasive species	Negative	Definite	3	LOW	ISO	LONG	OCCUR	MOD
					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
	AFTER MITIGATION (If mitigation is effective / possible this rating wil decrease )	Negative	Definite		LOW	ISO	MED	COULD	VLOW
					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:

ALTERNATIVES:

IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Site 1					
				Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
AF-1	Avifauna								
	<b>CONSTRUCTION PHASE</b>			5					
Impact 1	Loss of foraging / breeding habitat	Negative	Definite	5	3	2	4	4	2.4
Mitigation Measures:	Use Site 3.				MOD	STUDY	LONG	VLIKE	MOD
					3	2	4	4	2.4
Impact 2	Electrocutions of birds (will be the same as existing Tx lines)	NO ADDITIONAL IMPACT	Definite		0				0
Mitigation Measures:	Eskom transmission line bird impact reduction standards to be implemented.				NO				NO
					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:				ALTERNATIVES:					
				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
AQ-1	Air Quality								
	<b>CONSTRUCTION PHASE</b>			5					
Impact 1	Greenhouse gas emissions	Negative	Possible	3	2	2	2	5	2
Mitigation Measures:	Reduce energy consumption, Regular vehicle maintenance, Consecutive Rehab				LOW	STUDY	SHORT	OCCUR	LOW
					1	2	2	3	1
Impact 2	Nuisance and fall out dust	Negative	Possible	4	4	3	2	5	3
Mitigation Measures:	Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.				HIGH	LOCAL	SHORT	OCCUR	MOD
					2	2	2	3	1.2
Impact 3	Increased particulate matter (PM2.5 and PM10)	Negative	Possible	5	2	3	2	3	1.4
Mitigation Measures:	Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.				LOW	LOCAL	SHORT	COULD	LOW
					2	1	2	2	0.7
COMBINED WEIGHTED RATING	BEFORE MITIGATION	Negative	Possible		2.1	2.2	1.6	3.3	1.3
	AFTER MITIGATION	Negative	Possible		MOD	LOCAL	SHORT	VLIKE	LOW
	(If mitigation is effective / possible this rating wil decrease )				1.4	1.3	1.6	2.1	0.6
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 section 10.1 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:

ALTERNATIVES:

Reviewed By:				Site 1								
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	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			
Mitigation Measures:	6am - 6pm construction time, No Construction on Sundays				MOD	LOCAL	SHORT	VLIKE	MOD			
					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	Negative	Probable		1.2	0.6	0.6	1.8	0.3			
	(If mitigation is effective / possible this rating wil decrease )				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	<ul style="list-style-type: none"> <li>Increased pressure on local services &amp; infrastructure</li> <li>Increased incidence of STD's, HIV &amp; AIDS</li> <li>Disruption to existing power relationships and decision-making structures</li> <li>Social nuisance e.g. prostitution, damage to property, discrepancy in income of workers</li> </ul>	<ul style="list-style-type: none"> <li>Vulnerable communities</li> <li>Surrounding towns</li> <li>Tourism</li> <li>Farmers</li> </ul>
Resettlement	<ul style="list-style-type: none"> <li>Range of social impacts – specific procedures to be followed, best to be avoided</li> <li>Uncertainty about future</li> </ul>	<ul style="list-style-type: none"> <li>Vulnerable communities</li> </ul>

<b>Social Change Process</b>	<b>Possible Social Impact</b>	<b>Affected stakeholder group</b>
Change in land use	<ul style="list-style-type: none"> <li>• Decreased access to sources of livelihood resulting in poverty and/or drop in standard of living</li> <li>• Loss of productive land leading to loss of profit leading to job losses</li> <li>• Long term conflict about management of servitudes</li> <li>• Environmental nuisance e.g. noise, dust</li> <li>• Safety hazards</li> <li>• Communication and arrangements surrounding access to properties &amp; management of servitude – can be positive or negative</li> <li>• Loss of sense of place</li> </ul>	<ul style="list-style-type: none"> <li>• Industry</li> <li>• Farmers</li> <li>• Vulnerable communities</li> <li>• Tourism</li> </ul>
Deviant social behaviour	<ul style="list-style-type: none"> <li>• Increase in crime and disorder</li> <li>• Acts of sabotage</li> <li>• Breakdown of traditional values</li> </ul>	<ul style="list-style-type: none"> <li>• Vulnerable communities</li> <li>• Farmers</li> <li>• Industry</li> <li>• Tourism</li> <li>• Surrounding towns</li> </ul>
Employment opportunities	<ul style="list-style-type: none"> <li>• Loss of workers to construction process because of higher pay</li> <li>• Opportunity for local low skill employment</li> <li>• Indirect employment opportunities</li> <li>• Retention of jobs</li> </ul>	<ul style="list-style-type: none"> <li>• Vulnerable communities</li> <li>• Farmers</li> <li>• Industry</li> <li>• Tourism</li> <li>• Surrounding towns</li> </ul>
Legal processes	<ul style="list-style-type: none"> <li>• Uncertainty resulting from EIA process (selection of route)</li> <li>• Fear and anxiety related to the land acquisition process</li> <li>• Feelings related to past experiences of management of servitude – Eskom's social license to operate.</li> </ul>	<ul style="list-style-type: none"> <li>• Industries</li> <li>• Farmers</li> <li>• Vulnerable communities</li> <li>• Tourism</li> <li>• Surrounding towns</li> </ul>

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:

ALTERNATIVES:

IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Site 1					Impact Risk
				Weighting	Magnitude	Spatial	Temporal	Probability	
SOC-1	Social Environment								
	<b>CONSTRUCTION PHASE</b>			5					
Impact 1	Camden Close Down - loss of employment, loss of electricity	Negative	Definite		0				0
Mitigation Measures:	Don't close down the power station.				NO				NO
					0				0
					NO				NO
Impact 2	Retention of Jobs	Positive	Definite	5	3	3	3	5	3
Mitigation Measures:	None possible				MOD	LOCAL	MED	OCCUR	MOD
					3	3	3	5	3
					MOD	LOCAL	MED	OCCUR	MOD
Impact 3	Employment Opportunities - direct and indirect	Positive	Definite	5	2	3	2	2	0.9
Mitigation Measures:	Employ Unemployed Locals				LOW	LOCAL	SHORT	UNLIKE	VLOW
					3	3	3	4	2.4
					MOD	LOCAL	MED	VLIKE	MOD
Impact 4	Public Uncertainty	Negative	Definite	1	3	2	2	3	1.4
Mitigation Measures:	Frequent communication, EO/ELO to be appointed, Complaints Register and Feedback, Community Relations Programme				MOD	STUDY	SHORT	COULD	LOW
					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
Mitigation Measures:	Employ Unemployed Locals, Community Policing Forum, No workers housed in site, Access and Work Monitoring, STD				MOD	LOCAL	SHORT	COULD	LOW
					1	2	2	1	0.3
					VLOW	STUDY	SHORT	IMPOS	VLOW
Impact 6	Environmental nuisance	Negative	Definite	2	3	3	2	4	2.1
Mitigation Measures:	Complaints register and Feedback, Fines for breaking rules				MOD	LOCAL	SHORT	VLIKE	MOD
					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
Mitigation Measures:	Demarcate impact footprint				MOD	ISO	PERM	OCCUR	MOD
					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
	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	Magnitude	Spatial	Temporal	Probability	Impact Risk
EC-1	Economic								
	<b>CONSTRUCTION PHASE</b>			5					
Impact 1	Camden Close Down - Loss of Economic Development	Negative	Definite		0				0
Mitigation Measures:	Don't close down the power station.				NO				NO
					0				0
					NO				NO
Impact 2	Employment Opportunities - direct and indirect	Positive	Definite	5	2	3	2	2	0.9
Mitigation Measures:	Employ Unemployed Locals				LOW	LOCAL	SHORT	UNLIKE	VLOW
					3	3	3	4	2.4
					MOD	LOCAL	MED	VLIKE	MOD
Impact 3	Retention of Jobs	Positive	Definite	5	3	3	3	5	3
Mitigation Measures:	None possible				MOD	LOCAL	MED	OCCUR	MOD
					3	3	3	5	3
					MOD	LOCAL	MED	OCCUR	MOD
Impact 4	Loss of agricultural production	Negative	Definite	1	3	1	5	5	3
Mitigation Measures:	None possible				MOD	ISO	PERM	OCCUR	MOD
					3	1	5	5	3
					MOD	ISO	PERM	OCCUR	MOD
Impact 5	Development Cost	Negative	Definite	3	2	1	3	5	2
Mitigation Measures:	Develop Site 1.				LOW	ISO	MED	OCCUR	LOW
					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	Positive	Probable		2	1.7	2.2	3.3	1.3
	(If mitigation is effective / possible this rating wil decrease )				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	Magnitude	Spatial	Temporal	Probability	Impact Risk
INF-1	Infrastructure								
	<b>CONSTRUCTION PHASE</b>			5					
Impact 1	Interruption of Electrical Services	Negative	Definite	5	5	5	2	5	4
Mitigation Measures:	Construct Tx lines before switching				VHIGH	NAT	SHORT	OCCUR	HIGH
					0				0
Impact 2	Traffic interruptions	Negative	Possible	5	3	2	2	3	1.4
Mitigation Measures:	None required				MOD	STUDY	SHORT	COULD	LOW
					1	2	2	3	1
					VLOW	STUDY	SHORT	COULD	VLOW
COMBINED WEIGHTED RATING	BEFORE MITIGATION	Negative	Definite		5	5	2	5	4
	AFTER MITIGATION	No Impact	Definite		VHIGH	NAT	SHORT	OCCUR	HIGH
	(If mitigation is effective / possible this rating wil decrease )				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					ALTERNATIVES:					
Reviewed By:					Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk	
INF-1	Infrastructure									
	CONSTRUCTION PHASE			5						
Impact 1	Interruption of Electrical Services	Negative	Definite	5	5	5	2	5	4	
Mitigation Measures:	Construct Tx lines before switching				VHIGH	NAT	SHORT	OCCUR	HIGH	
					0				0	
					NO				NO	
Impact 2	Traffic interruptions	Negative	Possible	5	3	2	2	3	1.4	
Mitigation Measures:	None required				MOD	STUDY	SHORT	COULD	LOW	
					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 **definitely** 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 **definitely** 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	ALTERNATIVES:					
				Site 1					
V-1	Visual			Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
	<b>CONSTRUCTION PHASE</b>			5					
Impact 1	Visual impact of barrier system installation (all infrastructure)	Negative	Definite	5	3	2	2	5	2.3
Mitigation Measures:	Revegetate topsoil stockpiles, construction site screening				MOD	STUDY	SHORT	OCCUR	MOD
					2	2	2	5	2
Impact 2	Visual impact of starter wall - Ash Dam	Negative	Definite	5	3	2	2	5	2.3
Mitigation Measures:	None possible				MOD	STUDY	SHORT	OCCUR	MOD
					2	2	2	5	2
Impact 3	Visual impact of Ash Return Water Dam	Negative	Definite	5	3	2	2	5	2.3
Mitigation Measures:	Revegetate exposed areas, construction site screening				MOD	STUDY	SHORT	OCCUR	MOD
					2	2	2	5	2
Impact 4	Visual impact of relocated Tx Lines	Negative	Definite	3	0				0
Mitigation Measures:	None required.				NO				NO
					0				0
Impact 5	Visual impact of construction of associated infrastructure	Negative	Definite	3	3	2	2	4	1.9
Mitigation Measures:	Revegetate exposed areas, construction site screening				MOD	STUDY	SHORT	VLIKE	LOW
					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
	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 be 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:

ALTERNATIVES:

Reviewed By:				Site 1						
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	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	No Impact	Definite		0	0	0	0	0	
	(If mitigation is effective / possible this rating wil decrease )				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:				ALTERNATIVES:					
				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
SLC-2	Soil and Land Capability								
	<b>OPERATIONAL PHASE</b>			5					
Impact 1	Pollution of soils - leachate	Negative	Definite	5	4	1	5	4	2.7
Mitigation Measures:	Install leachate collection system				HIGH	ISO	PERM	VLIKE	MOD
					2	1	5	3	1.6
Impact 2	Erosion of soils	Negative	Definite	3	LOW	ISO	PERM	COULD	LOW
Mitigation Measures:	Place soil stockpiles out of water courses, Revegetate Stockpiles, Stormwater Management				3	1	5	5	3
					MOD	ISO	PERM	OCCUR	MOD
		Negative	Definite	3	2	1	5	3	1.6
					LOW	ISO	PERM	COULD	LOW
					2.9	0.8	4	3.5	1.8
COMBINED WEIGHTED RATING	BEFORE MITIGATION	Negative	Definite		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 probably 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 be 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				ALTERI					
Reviewed By:				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
SWW-2	Surface Water and Wetlands								
	<b>OPERATIONAL PHASE</b>			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
Mitigation Measures:	Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.				HIGH	LOCAL	MED	OCCUR	HIGH
					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
Mitigation Measures:	Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.				LOW	STUDY	MED	VLIKE	LOW
					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
Mitigation Measures:	Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.				VLOW	ISO	MED	COULD	VLOW
					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
	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 coarse, 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 Footprint	
	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 %
<b>TOTAL</b>	<b>239,6 ha</b>	<b>13.8%</b>	<b>164.1 ha</b>	<b>9.4%</b>	<b>301.9</b>	<b>17.4 %</b>

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		ALTERNATIVES:							
Reviewed By:		Site 1							
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	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
Mitigation Measures:	Install leachate collection, Install Barrier System				MOD	LOCAL	LONG	VLIKE	MOD
					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:

ALTERNATIVES:

Reviewed By:				Site 1						
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk	
TE-2	Terrestrial Ecology									
	OPERATIONAL PHASE			5						
Impact 1	Consecutive rehabilitation	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:

				ALTERNATIVES:					
				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
AQ-2	Air Quality								
	<b>OPERATIONAL PHASE</b>			5					
Impact 1	Greenhouse gas emissions	Negative	Possible	3	2	1	2	3	1
Mitigation Measures:	Reduce energy consumption, Regular vehicle maintenance, Consecutive Rehab				LOW	ISO	SHORT	COULD	VLOW
					1	1	2	3	0.8
Impact 2	Nuisance and fall out dust	Negative	Possible	3	VLOW	ISO	SHORT	COULD	VLOW
Mitigation Measures:	Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.				3	3	3	5	3
					MOD	LOCAL	MED	OCCUR	MOD
Impact 3	Increased particulate matter (PM2.5 and PM10)	Negative	Possible	5	3	1	3	5	2.3
Mitigation Measures:	Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.				MOD	ISO	MED	OCCUR	MOD
					3	4	3	5	3.3
		Negative	Possible	5	MOD	REG	MED	OCCUR	HIGH
					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 will 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	<ul style="list-style-type: none"> <li>• Long term conflict about management of servitudes</li> <li>• Safety hazards</li> <li>• Communication and arrangements surrounding access to properties &amp; management of servitude – can be positive or negative</li> </ul>	<ul style="list-style-type: none"> <li>• Industry</li> <li>• Farmers</li> <li>• Vulnerable communities</li> </ul>
Deviant social behaviour	<ul style="list-style-type: none"> <li>• Acts of sabotage</li> </ul>	<ul style="list-style-type: none"> <li>• Vulnerable communities</li> <li>• Farmers</li> <li>• Industry</li> <li>• Tourism</li> <li>• Surrounding towns</li> </ul>
Employment opportunities	<ul style="list-style-type: none"> <li>• Indirect employment opportunities</li> <li>• Retention of jobs</li> </ul>	<ul style="list-style-type: none"> <li>• Vulnerable communities</li> <li>• Farmers</li> <li>• Industry</li> <li>• Tourism</li> <li>• Surrounding towns</li> </ul>

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				ALTERNATIVES:					
Reviewed By:				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
SOC-2	Social Environment								
<b>OPERATIONAL PHASE</b>				5					
Impact 1	Employment Opportunities - direct and indirect	Positive	Probable	5	1	3	3	2	0.9
Mitigation Measures:	Employ Unemployed Locals				VLOW	LOCAL	MED	UNLIKE	VLOW
					2	3	3	3	1.6
Impact 2	Less environmental nuisance	Positive	Probable	1	2	3	3	2	1.1
Mitigation Measures:	Maintain - (Complaints register and Feedback, Fines for breaking rules)				LOW	LOCAL	MED	UNLIKE	LOW
					3	3	3	4	2.4
<b>COMBINED WEIGHTED RATING</b>	<b>BEFORE MITIGATION</b>	Positive	Probable		0.7	1.8	1.8	1.2	0.3
	<b>AFTER MITIGATION</b>				VLOW	STUDY	SHORT	UNLIKE	VLOW
	(If mitigation is effective / possible this rating wil decrease)	Positive	Probable		1.3	1.8	1.8	1.9	0.6
<b>STATUS QUO</b>	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Positive	Probable		2	3	3	5	2.7
					LOW	LOCAL	MED	OCCUR	MOD
<b>CUMULATIVE IMPACT</b>	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, <b>BEFORE MITIGATION</b>	Positive	Probable		2	3	3	5	2.7
					LOW	LOCAL	MED	OCCUR	MOD
<b>RESIDUAL IMPACT</b>	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, <b>AFTER MITIGATION</b>	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				ALTERNATIVES:					
Reviewed By:				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
V-2	Visual								
<b>OPERATIONAL PHASE</b>				5					
Impact 1	Visual impact - Ash Dam	Negative	Definite	5	3	2	2	5	2.3
Mitigation Measures:	Revegetate exposed areas consecutively, clean litter and waste				MOD	STUDY	SHORT	OCCUR	MOD
					2	2	2	5	2
Impact 2	Visual Impact - Associated Infrastructure	Negative	Definite	5	3	2	2	5	2.3
Mitigation Measures:	Maintain revegetated areas, clean litter and waste				MOD	STUDY	SHORT	OCCUR	MOD
					2	2	2	5	2
COMBINED WEIGHTED RATING	BEFORE MITIGATION	Negative	Definite		3	2	2	5	2.3
	AFTER MITIGATION	Negative	Definite		2	2	2	5	2
	(If mitigation is effective / possible this rating wil decrease)	Negative	Definite		LOW	STUDY	SHORT	OCCUR	LOW
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		4	3	4	5	3.7
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, BEFORE MITIGATION	Negative	Definite		4	3	4	5	3.7
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, AFTER MITIGATION	Negative	Definite		4	3	4	5	3.7

### 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:				ALTERNATIVES:					
				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
T-3	Topography								
	<b>CLOSURE PHASE</b>			5					
Impact 1	Alteration of surface water drainage patterns - stormwater runoff from rehabilitated areas	Positive	Probable	5	2	2	4	3	1.6
Mitigation Measure:	Ensure suitable soil cover, vegetation covers, free draining areas, storm water attenuation, Regular surveying during profiling				LOW	STUDY	LONG	COULD	LOW
					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:

				ALTERNATIVES:					
				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
SLC-3	Soil and Land Capability								
	<b>CLOSURE PHASE</b>			5					
Impact 1	Pollution of soils - hydrocarbon / chemical spills, spills from pipelines during rehabilitation	Negative	Definite	5	2	1	5	5	2.7
Mitigation Measure:	Hydrocarbon and Chemical Management				LOW	ISO	PERM	OCCUR	MOD
					1	1	1	3	0.6
Impact 2	Erosion of soils	Negative	Definite	3	VLOW	ISO	INCID	COULD	VLOW
Mitigation Measure:	Fertilize soils prior to seeding, Water seeded areas, ensure slopes are not steeper than 1:3, Water seeded areas				3	1	5	5	3
					MOD	ISO	PERM	OCCUR	MOD
Impact 3	Low soil fertility and usability	Negative	Definite	5	2	1	5	3	1.6
Mitigation Measure:	Ameliorate soils prior to resume in capping facility.				LOW	ISO	PERM	COULD	LOW
					3	1	4	4	2.1
		Negative	Definite	5	MOD	ISO	LONG	VLIKE	MOD
					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
	AFTER MITIGATION (If mitigation is effective / possible this rating will decrease)	Negative	Definite		MOD	ISO	LONG	VLIKE	LOW
					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 occurred 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	Magnitude	Spatial	Temporal	Probability	Impact Risk
SWW-3	Surface Water and Wetlands								
	<b>CLOSURE PHASE</b>			5					
Impact 1	Decreased water quality (suspended solids, turbidity, hydro-carbon, chemical, and microbiological)	Negative	Definite	5	2	2	4	4	2.1
Mitigation Measure:	Rehab of unnecessary infrastructure, Water treatment of De Jager's Pan, Slope not exceed 1:3				LOW	STUDY	LONG	VLIKE	MOD
					1	1	1	4	0.8
Impact 2	Reduction in habitat integrity of downstream wetland areas	Negative	Probable	3	3	2	4	4	2.4
Mitigation Measure:	Fertilise topsoil, Indigenous Seeding, Water rehabed areas				MOD	STUDY	LONG	VLIKE	MOD
					1	1	4	4	1.6
Impact 3	Sedimentation of wetlands and surface water resources	Negative	Probable	3	2	2	2	5	2
Mitigation Measure:	Fertilise topsoil, Indigenous Seeding, Water rehabed areas				LOW	STUDY	SHORT	OCCUR	LOW
					1	1	1	2	0.4
COMBINED WEIGHTED RATING	BEFORE MITIGATION	Negative	Probable		1.7	1.5	2.5	3.1	1.2
	AFTER MITIGATION				LOW	STUDY	MED	VLIKE	LOW
	(If mitigation is effective / possible this rating wil decrease)	Positive	Definite		0.7	0.7	1.3	2.5	0.5
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		4	3	4	5	3.7
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, BEFORE MITIGATION	Negative	Probable		4	3	4	5	3.7
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

Reviewed By:

				ALTERNATIVES:					
				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
GW-3	Groundwater								
	<b>CLOSURE PHASE</b>			5					
Impact 1	Decreased water quality - hydrocarbon / chemicals used on site during the closure phase	Negative	Definite	5	2	1	4	3	1.4
Mitigation Measure:	Hydrocarbon / Chemical Management				LOW	ISO	LONG	COULD	LOW
					1	1	1	2	0.4
Impact 2	Surface water ingress into the ash body producing polluted ground water	Negative	Probable	3	VLOW	ISO	INCID	UNLIKE	VLOW
Mitigation Measure:	Topsoil layer >300mm, Sustainable Indigenous Vegetation Cover				3	1	4	4	2.1
					MOD	ISO	LONG	VLIKE	MOD
					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 will 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 reseedling 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:

				ALTERNATIVES:					
				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
TE-3	Terrestrial Ecology								
	<b>CLOSURE PHASE</b>			5					
Impact 1	Capping of the waste body	Positive	Probable	5	2	1	4	2	0.9
Mitigation Measure:	Alien invasive control, Ameliorate soils replaced, Indigenous seedmix				LOW	ISO	LONG	UNLIKE	VLOW
					3	1	4	5	2.7
Impact 2	Increase in alien invasive species	Negative	Probable	3	MOD	ISO	LONG	OCCUR	MOD
Mitigation Measure:	Alien invasive control, Indigenous Seedmix - Rehab area				3	1	4	5	2.7
					MOD	ISO	LONG	OCCUR	MOD
					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		ALTERNATIVES:							
Reviewed By:		Site 1							
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
AQ-3	Air Quality								
	CLOSURE PHASE			5					
Impact 1	Greenhouse gas emissions	Negative	Possible	3	2	1	2	3	1
Mitigation Measure:	Reduce energy consumption, Regular vehicle maintenance, Consecutive Rehab				LOW	ISO	SHORT	COULD	VLOW
					1	1	1	3	0.6
Impact 2	Nuisance and fall out dust	Negative	Possible	3	VLOW	ISO	INCID	COULD	VLOW
Mitigation Measure:	Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.				3	3	3	5	3
					MOD	LOCAL	MED	OCCUR	MOD
Impact 3	Increased particulate matter (PM2.5 and PM10)	Negative	Possible	5	3	1	3	5	2.3
Mitigation Measure:	Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.				MOD	ISO	MED	OCCUR	MOD
					3	4	3	5	3.3
					MOD	REG	MED	OCCUR	HIGH
					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:

				ALTERNATIVES:					
				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnitude	Spatial	Temporal	Probability	Impact Risk
V-3	Visual								
	<b>CONSTRUCTION PHASE</b>			5					
Impact 1	Capping of Ash Dam	Positive	Probable	5	1	2	2	2	0.7
Mitigation Measure:	Utilise indigenous seedmix				VLOW	STUDY	SHORT	UNLIKE	VLOW
					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**

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

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## 11 EAP OPINION

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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.

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## 12 CONCLUSION AND WAY FORWARD

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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**