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SOILS & AGRICULTURE SPECIALIST REPORT
FOR THE EIA FOR
THE PROPOSED EXPANSION OF ASH DISPOSAL FACILITY,
KRIEL POWER STATION, MPUMALANGA

EIR PHASE REPORT

Report by
Johann Lanz

June 2017

Johann Lanz
Professional profile

Education

• M.Sc. (Environmental Geochemistry)	University of Cape Town	1996 - June 1997
• B.Sc. Agriculture (Soil Science, Chemistry)	University of Stellenbosch	1992 - 1995
• BA (English, Environmental & Geographical Science)	University of Cape Town	1989 - 1991
• Matric Exemption	Wynberg Boy's High School	1983

Professional work experience

I am registered as a Professional Natural Scientist (Pri.Sci.Nat.) in the field of soil science, registration number 400268/12, and am a member of the Soil Science Society of South Africa.

- **Soil Science Consultant** **Self employed** **2002 - present**

  I run a soil science consulting business, servicing clients in both the environmental and agricultural industries. Typical consulting projects involve:

- Soil specialist study inputs to EIA's, SEA's and EMPR's. These have focused on impact assessments and rehabilitation on agricultural land, rehabilitation and re-vegetation of mining and industrially disturbed and contaminated soils, as well as more general aspects of soil resource management. Recent clients include: CSIR; SRK Consulting; Aurecon; Mainstream Renewable Power; SiVEST; Savannah Environmental; Subsolar; Red Cap Investments; MBB Consulting Engineers; Enviroworks; Sharples Environmental Services; Haw & Inglis; BioTherm Energy; Tiptrans.
- Soil resource evaluations and mapping for agricultural land use planning and management. Recent clients include: Cederberg Wines; Unit for Technical Assistance - Western Cape Department of Agriculture; Wedderwill Estate; Goedgedacht Olives; Zewenwacht Wine Estate, Lourensford Fruit Company; Kaarsten Boerdery; Thelema Mountain Vineyards; Rudera Wines; Flagstone Wines; Solms Delta Wines; Dornier Wines.
- I have conducted several recent research projects focused on conservation farming, soil health and carbon sequestration.
- I have project managed the development of soil nutrition software for Farmsecure Agri Science.

- **Soil Science Consultant** **Agricultural Consultors International (Tinie du Preez)** **1998 - end 2001**

  Responsible for providing all aspects of a soil science technical consulting service directly to clients in the wine, fruit and environmental industries all over South Africa, and in Chile, South America.

- **Contracting Soil Scientist** **De Beers Namaqualand Mines** **July 1997 - Jan 1998**

  Completed a contract to make recommendations on soil rehabilitation and re-vegetation of mined areas.

Publications

- Lanz, J. 2012. Soil health: sustaining Stellenbosch's roots. In: M Swilling, B Sebitosi & R Loots (eds). *Sustainable Stellenbosch: opening dialogues*. Stellenbosch: SunMedia.
- Lanz, J. 2010. Soil health indicators: physical and chemical. *South African Fruit Journal*, April / May 2010 issue.
- Lanz, J. 2009. Soil health constraints. *South African Fruit Journal*, August / September 2009 issue.
- Lanz, J. 2009. Soil carbon research. *AgriProbe*, Department of Agriculture.
- Lanz, J. 2005. Special Report: Soils and wine quality. *Wineland Magazine.*

I am a reviewing scientist for the *South African Journal of Plant and Soil*.

Specialist Declaration

I, Johann Lanz, as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- I act as the independent specialist in this application;
- I perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I have no vested interest in the proposed activity proceeding;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- I have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of company: Johann Lanz – Soil Scientist

Professional Registration (including number): SACNASP Reg. no. 400268/12

Date: 6 June 2017

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EXECUTIVE SUMMARY

The objective of this study is to identify potential impacts of the proposed development on agricultural resources, including soils, and agricultural production potential. This assessment is a desktop study that utilises soil information contained in a 2012 report on a soil investigation of the site (Nepid report).

The proposed development is on land zoned and used for agriculture. South Africa has very limited arable land and it is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable for agricultural production.

The key findings of this study are:

- Soils on the site are predominantly moderately deep, sandy loams of the Clovelly, Glencoe and Pinedene soil forms. The site and general area has been highly impacted historically from mining and industrial use. The site includes previously rehabilitated soils.
- The site includes 79 hectares of land that has been utilised for cultivation within the last ten years.
- These cultivated areas have a higher agricultural sensitivity because of the value of this land from an agricultural production point of view. The rest of the site, much of which is probably unsuitable for cultivation due to historical impact, has low sensitivity.
- In terms of the land type data, land capability of the site is classified as Class 2 which is high potential arable land.
- There is uncertainty as to the validity of the land capability categorisation presented in the Nepid report, in which 69% of the soil surface of the site is classified as wilderness capability, which is the lowest possible capability. This may be the result of an error, or it may be the result of something that is not identified and made clear in that report.
- The permanent loss of 7.7 hectares of agriculturally suitable, arable land is the only identified agricultural impact of the development. Due to the small extent, its loss as agricultural land is assessed as being of low significance.
- Mitigation does not change the significance of the impact but it allows for some degree of rehabilitation to occur after closure. Mitigation involves the stockpiling of topsoil plus suitable subsoil to enable the covering of ash dumps with soil, followed by vegetation establishment on them.
- Because of the low agricultural impact, there are no restrictions relating to agriculture which should preclude authorisation of the proposed development.

1 INTRODUCTION

Kriel Power Station proposes to expand the existing Ash Disposal Facility to include a fourth Ash Disposal Facility, which will have sufficient capacity for the remaining operational life of the power station until the power station decommissioning from 2041 to 2045. The Ash Disposal Facility is a final disposal mechanism at the end of the energy generation process (see **Annexure 1** for the generic project description).

The project requires the following components:

- An expanded Ash Disposal Facility;
- An AWR dam from where decant and drained water would be pumped back to the power station for re -use;
- An AWR transfer dam;
- Delivery and return infrastructure, including pipelines, transfer houses, pump stations;
- Powerlines;
- Access roads; and
- Clean and dirty water collection channels/trenches.

Eskom initiated an EIA process for the development of an expanded Ash Disposal Facility. The process to date has assessed site alternatives and has recommended a preferred alternative, which is now being assessed in the EIR phase of the EIA. As part of the process a soil study, based on a field survey, was completed of the proposed site. The report on the pedological, land capability and agronomic land potential survey by Nepid Consultants CC is dated February 2012. This assessment utilises the soil data contained in that study.
The objective of this study is to identify potential impacts of the proposed development on agricultural resources, including soils, and agricultural production potential, and to provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts. Johann Lanz was appointed by Aurecon as an independent specialist to conduct this Soils and Agricultural Impact Assessment.

2 TERMS OF REFERENCE

The terms of reference for this assessment are:

- to conduct a specialist impact assessment for the EIR phase of the project utilising the information contained in the existing soil study of the site.
- it is confined to a desktop study, but will use the data that has already been collected from the site.
- the impact assessment will identify and assess all potential impacts (direct, indirect and cumulative) of the proposed development on soils and agricultural potential.
- it will also provide recommended mitigation measures, monitoring requirements, and rehabilitation guidelines for all identified impacts.
- the report will fulfil the requirements of Appendix 6 of the 2014 Environmental Impact Assessment (EIA) Regulations (See **Table 1**).

Table 1. Compliance with Appendix 6 of the 2014 EIA Regulations

Requirements of Appendix 6 – GN R982	**Addressed in the Specialist Report**
• A specialist report prepared in terms of these Regulations must contain ◦ details of- ▪ the specialist who prepared the report; and ▪ the expertise of that specialist to compile a specialist report including a curriculum vitae;	Title page CV within report
◦ a declaration that the specialist is independent in a form as may be specified by the competent authority;	At beginning of report
◦ an indication of the scope of, and the purpose for which, the report was prepared;	Section 1 and 2
◦ the date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 3.1
◦ a description of the methodology adopted in preparing the report or carrying out the specialised process;	Section 3
◦ the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure;	Sections 6
◦ an identification of any areas to be avoided, including buffers;	Section 9
◦ a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 3
◦ a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4
◦ a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment;	Section 6, 7 & 9
◦ any mitigation measures for inclusion in the EMPr;	Section 7 & 8
◦ any conditions for inclusion in the environmental authorisation;	Section 9
◦ any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Not applicable
◦ a reasoned opinion- ▪ as to whether the proposed activity or portions thereof should be authorised; and ▪ if the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 9 Section 8
◦ a description of any consultation process that was undertaken during the course of preparing the specialist report;	Not applicable
◦ a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	Not applicable
◦ any other information requested by the competent authority.	Not applicable

3 METHODOLOGY OF STUDY

3.1 Methodology for assessing soils and agricultural potential

Soil fieldwork was conducted in July 2011 by Nepid consultants CC and reported on by them in February 2012. Soil investigation was aimed at soil classification for mapping on a 1:10,000 scale. Soil observation points were located on a 150 x 150 metre grid. The majority of observations used to classify the soils were made using a hand operated bucket auger and Dutch (clay) augers. In addition to the grid point observations, a representative selection of the different soil forms was chosen, and re-assessed using pit excavations. In all cases, the observation points were excavated to a depth of 1.5 metres or until refusal. The identification and classification of soil profiles were carried out using the South African Taxonomic Soil Classification System (Soil Classification Working Group, 1991).

The land capability of the study area was classified into four classes (wetland, arable land, grazing land and wilderness) according to the criteria given in Chamber of Mines Guidelines, (2007). These criteria are included in the Nepid soil report.

Agronomic potential, included in the Nepid soil report, was based on long term yields of different crops for relative homogeneous farming areas based on land type information.

An assessment of soils (soil mapping) and long-term agricultural potential is in no way affected by the season in which the assessment is made, and therefore the fact that the assessment was done in winter (July) has no bearing on its results.

3.2 Methodology for assessing impacts and determining impact significance

All potential impacts were assessed in terms of the following criteria:

CRITERIA	**CATEGORY**	**DESCRIPTION**
Extent or spatial influence of impact	Regional	Beyond a 10km radius of the proposed site.
	Local	Between 100 m and 10 km radius of the proposed site.
	Site specific	On site or within 100m of the proposed site.
Magnitude of impact (at the indicated spatial scale)	High	Natural and/ or social functions and/ or processes are severely altered
	Medium	Natural and/ or social functions and/ or processes are notably altered
	Low	Natural and/ or social functions and/ or processes are slightly altered
	Very low	Natural and/ or social functions and/ or processes are negligibly altered
	Zero	Natural and/ or social functions and/ or processes remain unaltered

CRITERIA	**CATEGORY**	**DESCRIPTION**
Duration of impact	Construction period	From commencement up to 2 years of construction
	Short term	Between 2and 5 years after construction
	Medium term	Between 5 and15 years after construction
	Long term	More than 15 years after construction

SIGNIFICANCE RATINGS	**LEVEL OF CRITERIA REQUIRED**
High	High magnitude with a regional extent and long term duration High magnitude with either a regional extent and medium term duration or a local extent and long term duration Medium magnitude with a regional extent and long term duration
Medium	High magnitude with a local extent and medium term duration High magnitude with a regional extent and construction period or a site specific extent and long term duration High magnitude with either a local extent and construction period duration or a site specific extent and medium term duration Medium magnitude with any combination of extent and duration except site specific and construction period or regional and long term Low magnitude with a regional extent and long term duration
Low	High magnitude with a site specific extent and construction period duration Medium magnitude with a site specific extent and construction period duration Low magnitude with any combination of extent and duration except site specific and construction period or regional and long term Very low magnitude with a regional extent and long term duration
Very low	Low magnitude with a site specific extent and construction period duration Very low magnitude with any combination of extent and construction or short term duration
Neutral	Zero magnitude with any combination of extent and duration

PROBABILITY RATINGS	**CRITERIA**
Definite	Estimated greater than 95 % chance of the impact occurring.
Probable	Estimated 5 to 95 % chance of the impact occurring.
Unlikely	Estimated less than 5 % chance of the impact occurring.

CONFIDENCE RATINGS	**CRITERIA**
Certain	Wealth of information on and sound understanding of the environmental factors potentially influencing the impact.
Sure	Reasonable amount of useful information on and relatively sound understanding of the environmental factors potentially influencing the impact.
Unsure	Limited useful information on and understanding of the environmental factors potentially influencing this impact.

REVERSIBILITY RATINGS	CRITERIA
Irreversible	The activity will lead to an impact that is in all practical terms permanent.
Reversible	The impact is reversible within 2 years after the cause or stress is removed.

4 ASSUMPTIONS, CONSTRAINTS AND LIMITATIONS OF STUDY

This assessment is based on the fieldwork as reported on in the soil report by Nepid Consultants, and is therefore constrained by the information contained in that report. There are limitations in terms of how the information was presented in that report. These are addressed in Section 6.1.1.

The intensity of the field investigation undertaken by Nepid consultants is considered adequate for the purposes of this study and is therefore not seen as a limitation.

The assessment rating of impacts is not an absolute measure. It is based on the subjective considerations and experience of the specialist, but is done with due regard and as accurately as possible within these constraints.

There are no other specific constraints, uncertainties and gaps in knowledge for this study.

5 APPLICABLE LEGISLATION AND PERMIT REQUIREMENTS

Approval in terms of the Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA) would normally be required for the development as it is on agriculturally zoned land that will need to be re-zoned. However in the case of a statutory body, such as Eskom, being the landowner and developer, there is exclusion from such approval. There is no formal application requirement for such exclusion. It will need to be done by way of a letter from Eskom to DAFF, motivating for the exclusion, and providing this agricultural assessment report as the background information on agricultural impact that DAFF will require.

6 BASELINE ASSESSMENT OF THE SOILS AND AGRICULTURAL CAPABILITY OF THE AFFECTED ENVIRONMENT

6.1 Summary of relevant information contained in previous soil study

This section summarises the soil information, contained in the Nepid report, that is considered by this author to be of relevance to the agricultural impact assessment. However, before presenting this information, the limitations of the previous study are identified, in order to provide context to the use of the data.

6.1.1 Limitations of previous soil study

The following limitations are relevant:

- In discussing the soils in section 3 of the report, the two separate sites considered in that report are not discussed separately, but are considered as a single study area. The section is arranged in terms of soil forms, which are discussed in general terms, with no distinction made between the soils of a form occurring on the one site and those of the same form occurring on the other site. This makes it extremely difficult to assess the specific soils of the single site which is now the focus of this assessment.

- The soil descriptions in the report are very general and the original data gathered in the field (soil profile logs at each sampling point) is not included in the report. Without access to the original soil data, it is difficult to make sense of some of the interpretations that are made in the report, for example of soil capability.

- In its classification of land capability, the report classifies large areas of land that have historically supported cultivation, as being only of wilderness capability. This seriously questions the validity of the land capability classification presented by the report, because historical cultivation is usually a fairly reliable indicator of land capability. With reference to the previous point, such classification is difficult to justify without the specific data to support it. It is not made clear in the report on what basis the land fulfils the criteria of wilderness land rather than of grazing or arable land. The report states that soils with a depth of less than 40 cm are categorised as wilderness capability, although the Chamber of Mines guidelines give less than 25 cm as the criteria. In addition, several soil map units of the Clovelly soil form with a depth of between 60 and 80 cm, and even one of the Glencoe form with depth 80 – 100 cm are categorised as wilderness land. This seems to directly contradict a statement made elsewhere in the report: "The dry land production potential of the Hutton and Clovelly Form soils is moderate to high under normal rainfall conditions."

- In several different places, the numbers and assertions provided in the report do not add up. For example it is stated in the abstract (and the same figures are given in the body of the report) that 36.6 ha of the site is considered to be of arable land potential, 28.2 ha of grazing land, and 150.2 ha of wilderness land. Then it is stated that the arable land was sub-divided into low, medium and high potential land in terms of maize production, giving the following results:

High Potential area = 15.1 ha
Medium potential = 36.5 ha
Low potential = 28.2 ha

The total of the above is 79.8 ha which in no way corresponds to the 36.6 ha of arable land.

- As another example, the conclusion states that the major soil forms encountered on the site are of the shallow orthic phase, Hutton, Clovelly, ferricrete Glencoe's and Fernwood's along with some hydromorphic forms, including the Pinedene, Avalon and Bloemdal. However, the breakdown of soil forms identified on site in Table 2, does not include Hutton, Fernwood or Bloemdal.

- The report classifies the soils of the site into the general soil forms of the South African Classification system, and discusses these. However it lacks a capacity for, and a focus on, extracting from the collected soil data, those aspects of the soil conditions on site that are of most relevance and importance for assessing the agricultural impact of the development.

- In general the report lacks clarity and focus and seems to contain numerous errors and contradictory statements.
- In terms of the latest project layout, much of the footprint of ash dump 4.2 occurs outside of the area covered by the Nepid soil survey.

6.1.2 Description of soil conditions

The Nepid report presents a soil map of the site (shown in **Figure 1**). The map uses a combination of soil form and depth to categorise different soil map units. The most common soil forms across the site are, in decreasing order, Clovelly, Glencoe and Pinedene. These three account for more than 95% of the soil surface area. The table giving the breakdown of surface coverage of the different map units is given in **Table 2**. This shows that 43% of the surveyed soil area are Clovelly soils of between 60 and 80 cm depth. Soils deeper than 60 cm account for 82% of the surface area. And yet the site is classified as predominantly wilderness land capability.

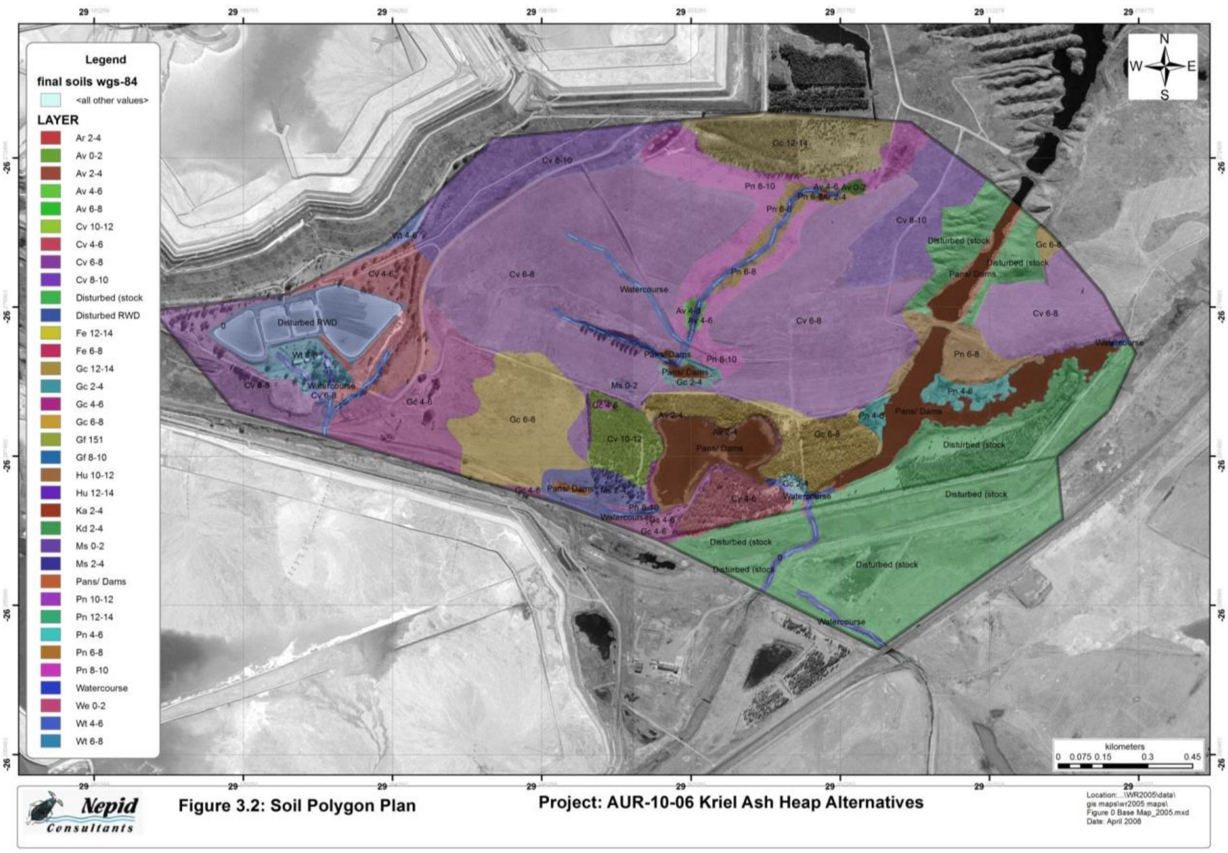

Figure 1. *The soil map presented in the Nepid report.*

The soils are generally underlain by hard rock. The topsoil clay content generally varies between 10 and 15%.

The Nepid report mentions, in passing, and only in the conclusion, that previously rehabilitated soils occur on the site, but it does not identify these soils or their location on the site in any further detail.

The assessed site in the Nepid report of 311 hectares included 95 hectares of non-natural soil which included stockpiles, water bodies and other land occupied by infrastructure.

Table 2. On-site surface coverage of the different soil map units shown in Figure 1.

Soil Map Unit	**Surface coverage**	
(based on soil form and depth (mm))	**hectares**	**%**
Clovelly 600-800	94.0	43.5
Glencoe 600-800	23.0	10.6
Clovelly 800-1,000	21.4	9.9
Pinedene 800-1,000	15.2	7.0
Glencoe 400-600	14.8	6.9
Clovelly 400-600	13.4	6.2

Glencoe 1,200-1,400	10.5	4.9
Pinedene 600-800	6.6	3.0
Clovelly 1,000-1,200	4.6	2.1
Mispah 200-400	3.3	1.5
Pinedene 400-600	2.8	1.3
Westleigh 600-800	2.7	1.2
Glencoe 200-400	1.2	0.6
Avalon 200-400	0.9	0.4
Westleigh 400-600	0.7	0.3
Avalon 400-600	0.4	0.2
Avalon 0-200	0.3	0.1
Mispah 0-200	0.3	0.1
Arcadia 200-400	0.1	0.0
Total	**216.2**	**100.0**

6.1.3 Assessment of agricultural soil suitability

The Nepid report presents a land capability map of the site (shown in **Figure 2**). All soils were categorised into four classes (wetland, arable land, grazing land and wilderness) according to the criteria given in Chamber of Mines Guidelines, (2007). The table giving the breakdown of surface coverage of the different capability categories is given in **Table 3**.

Table 3. On-site surface coverage of the 4 different land capability categories, shown in Figure 2.

Land capability category	**Surface coverage**	
	hectares	**%**
Arable	36.6	17
Grazing	28.2	13
Wilderness	150.2	69
Wetland	1.3	1
Total	**216.3**	**100**

As has been mentioned above, there are serious questions as to the validity of this land capability assessment that was presented in the Nepid report and shown in **Figure 2 and 3x**. It may be that there were errors in the inclusion of certain soil map units into the wilderness category, as fairly deep (>60 cm) Clovelly and Pinedene soils are included in this. It appears from the available information that these soils should be categorised at a higher capability.

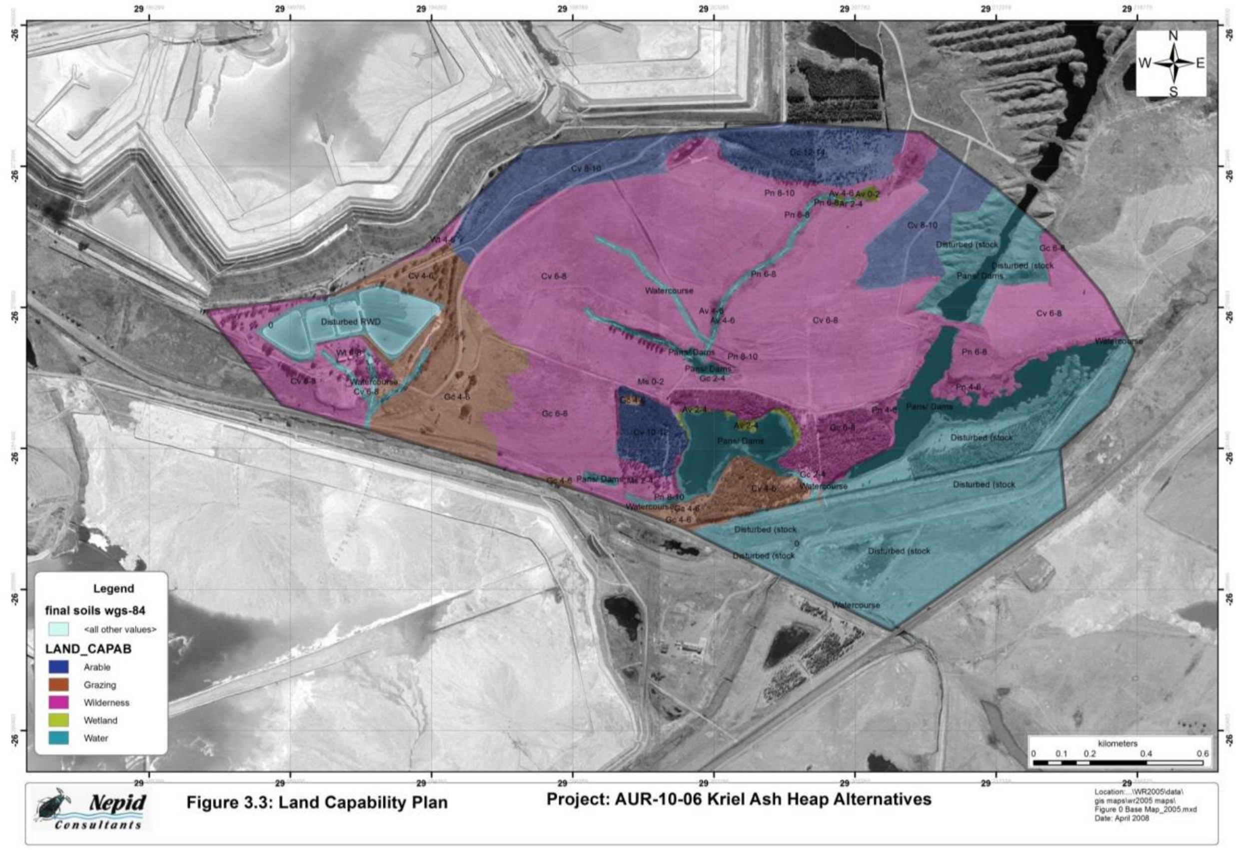

Figure 2. *The land capability map presented in the Nepid report.*

6.2 Additional information not contained in previous soil study

Two additional sources were used to validate the land capability and historical agricultural land use of the site, namely the land type inventory and land capability classification from AGIS, and historical satellite imagery, obtained from Google Earth, which indicates the history of cultivation on the site.

The land type classification is a nationwide survey that groups areas of similar soil, terrain and climatic conditions into different land types. The entire site and surrounding area falls into a single land type, namely Bb4. The soils of this land type are predominantly deep, reasonably drained, red and yellow, sandy loams to sandy clay loams. The soils would predominantly fall into the Plinthic soil group, followed by the Oxidic, according to the classification of Fey (2010). The Avalon soil form is the most predominant soil type. A summary detailing soil data for the land type is provided in **Table 4**.

Although the land type data is done at a large scale and therefore does not provide accurate site-specific soil information, it suggests that soils of this land type have a higher agricultural capability than is shown for the on-site soils in the Nepid report.

Table 4. Land type soil data for the site.

Land type	Land capability class	Soil series (forms)	Depth (cm)	Clay % A horizon	Clay % B horizon	Depth limiting layer	% of land type
Bb4	2	Avalon	80-120	15-20	15-35	sp	30
		Hutton	90-120	15-25	15-35	sp, hp	11
		Avalon	70-100	25-30	35-45	sp	9
		Glencoe	70-100	15-20	15-25	hp	9
		Mispah	20-40	10-20		hp	6
		Westleigh	30-50	15-25	35-45	sp	5
		Glenrosa	30-50	10-25		lo	5
		Mispah	20-40	10-25		R	5
		Glencoe	70-100	10-15	10-15	hp	5
		Longlands	70-100	10-15	30-40	sp	5
		Rensburg	40-50	40-60		gc	3
		Estcourt	30-50	10-20	40-50	pr	2
		Katspruit	30-40	15-30		gc	2
		Valsrivier	40-50	25-30	35-45	vp	1

Land capability classes: 2 = high potential arable land.
Depth limiting layers: R = hard rock; lo = partially weathered, relatively soft bedrock; hp = cemented hardpan plinthite (laterite); sp = soft plinthic horizon; pr = dense, prismatic clay layer; vp = dense, structured clay layer; gc = dense clay horizon that is frequently saturated.

The parts of the site that have been used for cultivation within the last ten years, are shown in the development layout map in **Figure 3**. Comparing this to the land capability map from the Nepid report (Figure 2) shows that large parts of the area categorised in that report as wilderness capability have been continuously cultivated during the last ten years. This suggests that they are of a higher land capability than wilderness category.

6.3 Land use and agricultural development on and surrounding the site

The site is located within a grain farming agricultural region. Maize is the principal crop and other crops include soya and sorghum. Almost all cultivation is dryland. The surrounding area including parts of the site is heavily impacted by mining and industrial activity. Seventy nine hectares are used for cultivation (see **Figure 3**).

6.4 Agricultural sensitivity to development

Agricultural sensitivity to development is defined by the value of the land from an agricultural production point of view. The more valuable the land is for production, the higher is its agricultural sensitivity to development and the more significant is the impact of its loss for agricultural production. The cultivated areas therefore have a higher sensitivity. The rest of the site, most of which is likely to be unsuitable for cultivation due to historical impact, has low sensitivity.

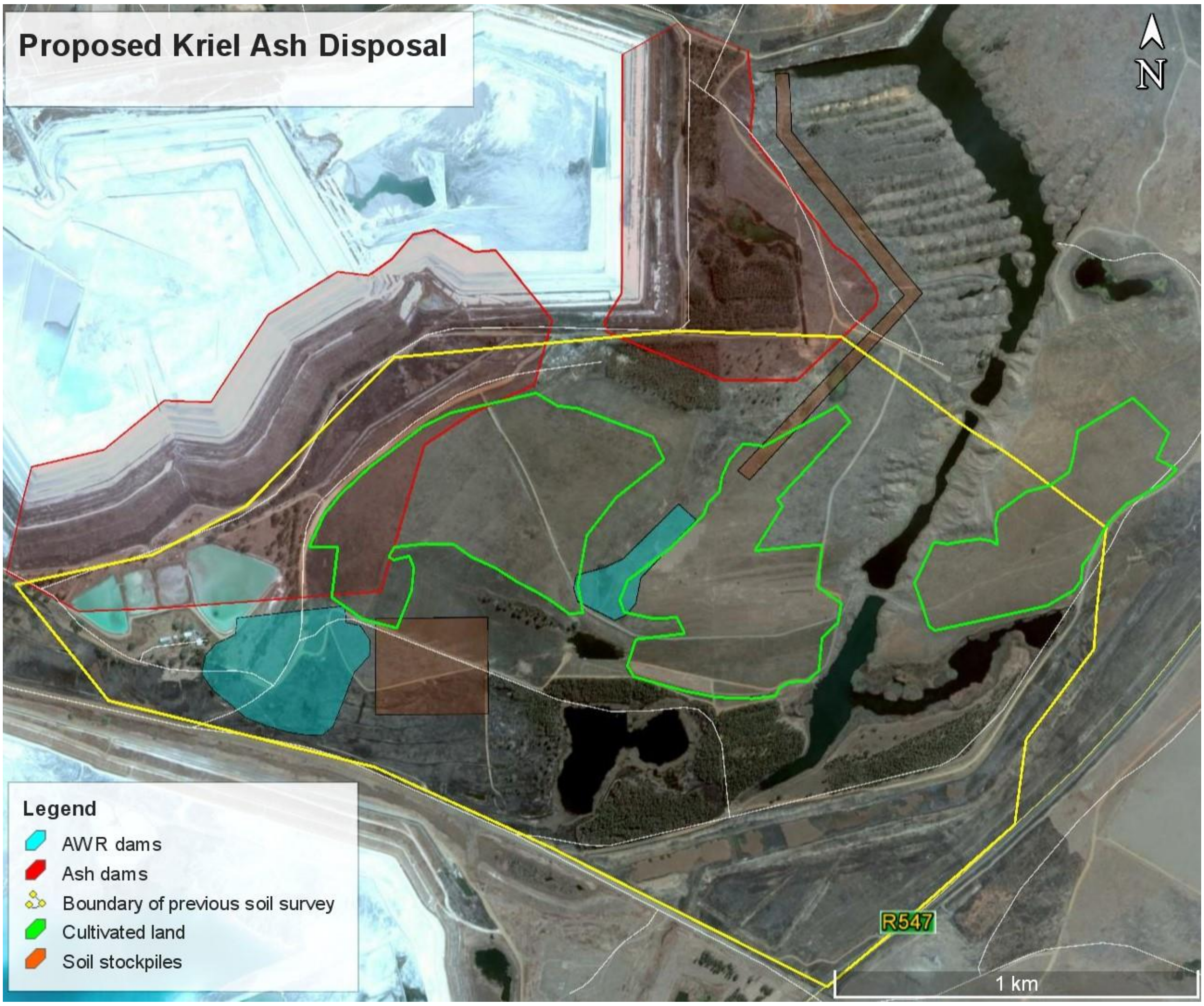

Figure 3. *Map of the proposed development layout, showing its impact on cultivated lands on the site.*

7 IDENTIFICATION AND ASSESSMENT OF IMPACTS ON AGRICULTURE

Despite the surface of the ash dumps being rehabilitated and top soiled after closure, they will nevertheless be unsuitable for cultivation. Standard Eskom rehabilitation of ash dumps involves the covering of the ash dumps with fertile soil and the planting of grass and trees. The areas are rehabilitated to the extent that they become a habitat for a variety of plant, animal and bird species (Eskom), but they are unlikely to be suitable for cultivation.

Once the land is buried under an ash dump or dam and therefore lost to agriculture, there can be no further impacts to the agricultural potential of that land. These impacts occur during construction, and there are therefore no further impacts during operation. Permanent loss of agricultural land from the footprint of the ash dumps and other infrastructure is therefore the only impact. Agriculture beyond the footprint of the development should be able to continue unaffected, as it has done in the past, and there is therefore no impact on it. Most of the footprint is on already highly impacted land, much of which is probably no longer suitable for cultivation. The most significant loss therefore occurs where the development footprint overlaps with areas of cultivated land (see **Figure 3**). The overlap is only 7.7 hectares of the 79 hectares of cultivated land.

The loss of agricultural land in South Africa needs to be assessed within the following context. The country has very limited arable land, less than is required for national food security. Furthermore, agricultural land located in the area of assessment is under high pressure from competing industrial, mining and other land uses, resulting in significant losses of agriculturally valuable land. It is therefore critical to ensure that development does not lead to an inappropriate loss of land that may be valuable for cultivation.

In this case, however, the fact that only a small extent (7.7 hectares) of agricultural land is lost as a result of the development, means that the agricultural impact is not of high significance.

The cumulative impact, of all developments which result in a loss of agricultural land within this agricultural region, is however significant, although the contribution of this project to cumulative loss is small. Cumulative impact is significant because of the importance of this region to contributing to South Africa's agricultural production.

Mitigation in this case does not change the significance of the impact. Whether there is mitigation or not, the land is still permanently lost to agricultural production. What mitigation does however do, is to allow for some degree of rehabilitation of the site to occur after closure. Mitigation involves the stockpiling of topsoil plus suitable subsoil to enable the covering of ash dumps with soil, followed by vegetation establishment on them.

The agricultural impact is assessed in table format below.

Table 5. Assessment of agricultural impact

	Preferred Alternative		**No Go Alternative**
Description	Permanent loss of 7.7 hectares of agricultural land is caused by direct occupation of the land by the ash dump and other infrastructure.		No loss of agricultural land is anticipated in the no go alternative.
	Assessment		
	Pre-Mitigation	**Post Mitigation**	
Nature	Negative	Negative	Neutral
Duration	Long term	Long term	
Extent	Site specific	Site specific	
Magnitude	Low	Low	
Probability	Definite	Definite	
Confidence	Sure	Sure	
Reversibility	Irreversible	Irreversible	
Mitigatability	Not possible		

Significance	Low	Low	
The significance of loss of agricultural land is low due to the fact that only a small extent of arable land is impacted.			

8 INPUTS TO THE ENVIRONMENTAL MANAGEMENT PLAN

The Chamber of Mines guidelines recommend that a detailed soil stripping plan be compiled of all areas form which soil will be stripped and stockpiled prior to construction. Soil should be stripped from the entire footprint of the development, excluding the stockpiles. Topsoil may however be severely limited across some of this area, particularly within the footprint of ash dump 4.2, as it appears to have been previously impacted.

The following recommendations in terms of a stripping plan and rehabilitation can be made:

1. Soil should be stripped prior to construction from the entire footprint of the development, excluding the stockpiles.
2. Stripping must only be done in the dry season.
3. Topsoil (wherever it occurs) should be stripped and stockpiled (to a depth of 25cm).
4. The topsoil stockpiles must be kept separate from any additional soil material that may also be stripped. Effective records of which stockpiles contain topsoil and which subsoil must be kept.
5. Additional subsoil material that is of a suitable nature for use in rehabilitation, should also be stripped and stockpiled.
6. The soil map in **Figure 1** indicates the depth to which such material should be stripped in the different soil map units. The first number in the soil map unit label, after the two letter soil form abbreviation, indicates the depth in decimetres, to which the subsoil can be stripped. Note that this is the total depth from surface, so it must take into account the 25 cm of topsoil that has been stripped from above it. For example, soil map unit Cv 6-8 can be stripped to a total depth from surface of 6 decimetres (or 60 cm).
7. Topsoil is a valuable and essential resource for rehabilitation and it should therefore be managed carefully to conserve and maintain it throughout the stockpiling and rehabilitation processes. Topsoil stockpiles should be protected against losses by water and wind erosion, and should therefore be vegetated. Additional erosion control measures, such as the planting of Vetiver grass hedges or any other suitable similar material, may be required. All soil sampling and associated chemical amelioration of the soils that will be used to cover the ash dumps after closure, should only be done at the point of their use for rehabilitation. There is no point in doing it prior to that.
8. During rehabilitation, the surface of all areas must be covered with a depth of 25 cm of topsoil. Stockpiled subsoil must only be used as fill and additional soil depth, underneath the topsoil, not at the surface.

9 CONCLUSION AND RECOMMENDATIONS

The permanent loss of 7.7 hectares of agriculturally suitable, arable land is the only identified agricultural impact of the development. Due to the small extent, its loss as agricultural land is assessed as being of low significance. There is some uncertainty over the land capability of the land that will be lost to agriculture. Although the previous soil study indicates part of the development footprint to be of only wilderness capability, there are questions as to the validity of this. It may be the result of an error in the report, or it may be the result of something that is not identified and made clear in that report.

Due to the small extent of impact, as well as the impracticality of moving any of the development infrastructure, no changes to the layout are recommended.

There are no conditions resulting from this assessment that need to be included in the environmental authorisation.

Because of the low agricultural impact, there are no restrictions relating to agriculture which should preclude authorisation of the proposed development.

10 **REFERENCES**

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Nepid Consultants. 2012. Report on the pedological, land capability and agronomic land potential survey for the scoping phase of the EIA for the proposed expansion of ash disposal facility, Kriel power station, Mpumalanga.

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Annexure 1:

Generic Project description Kriel Ash Disposal Facility

Project description	The construction of Kriel Power Station (owned by Eskom Holdings SOC Limited, Eskom) was completed in 1979 and was considered to be the largest coal-fired power station in the southern hemisphere at the time (see Figure 10-1). The 38 year old power station, with an installed capacity of 3 000 MW (Eskom, 2010), is located approximately 7 km west of the small town of Kriel (also known as Ga-nala) in the Mpumalanga Province. Through the process of electricity generation, coarse and fine ash is produced by burning coal. At full capacity, each of the six boilers can produce up to 740 000 tonnes/year of coarse ash/ boiler bottom ash (approximately 20% of total ash produced) ash and 2 960 000 tonnes/year of fly ash/ precipitator fly ash (approximately 80% of total ash produced).

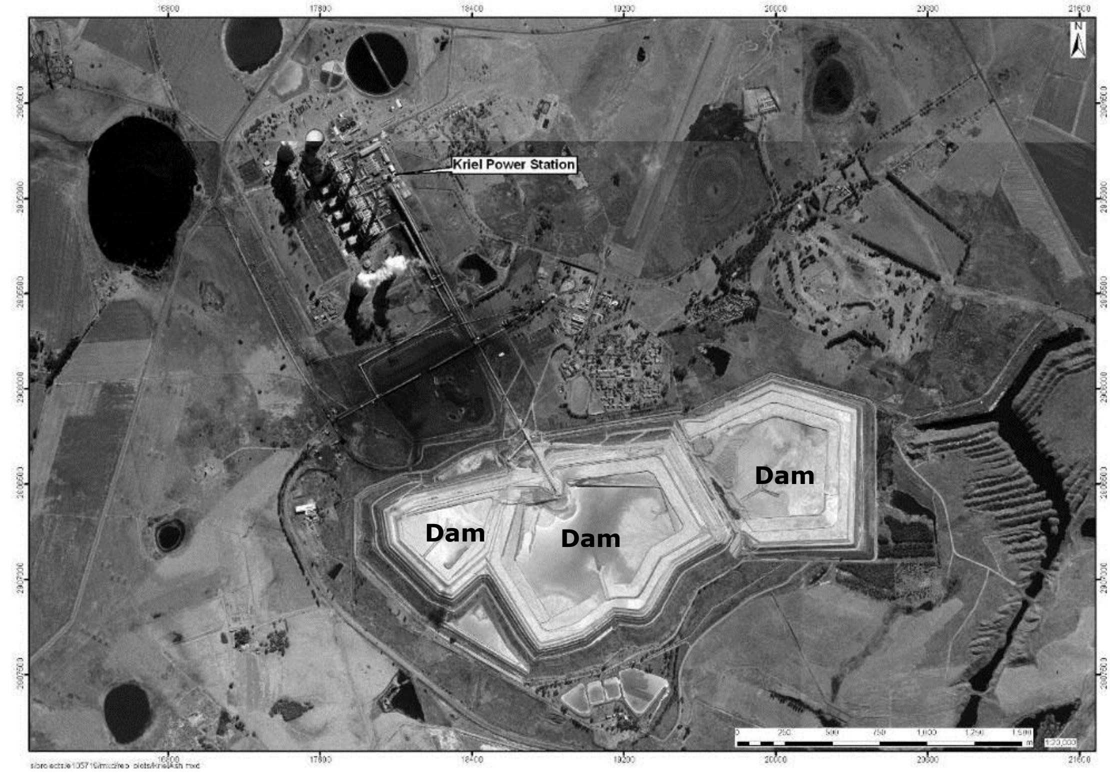

Figure 10-1| Location of the Kriel Power Station and current ash dam complex

Kriel Power Station makes use of a wet ashing process to dispose of its ash. Coarse ash is transferred with a small volume of fine ash (fly ash, to limit pipeline wear) from the Power Station to sumps, from where it is pumped as a slurry mixture to the Wet Ash Disposal Facilities (WADF)[1] (ash dams). The fine ash is transported separately to the existing ash dam complex, via two conveyors that are located south-east of Kriel Power Station. As mentioned above, Kriel uses wet ashing system, which involves conditioning fly ash and coarse ash with water for pneumatic transportation to the ash dams through conveyor belts and ash lines, respectively.

Upon reaching the ash dams, conditioning water, from ash, sluices into the designed lowest point of ash dam wherein it gets drained through penstocks. All the water collected from Kriel ash dams through the penstocks is stored in Ash Water Return (AWR) dams. From the AWR dams the ash water gravitates to a manifold and is then pumped back to a High Level AWR dam. From the High Level AWR dam the water gravitates to the pollution control dams known as the Borrow Pits and Swartpan. The Borrow Pits contain mainly excess ash water from High Level AWR dam while Swartpan contains mainly excess overflow ash water from the Borrow Pits. Both Swartpan and the Borrow Pits dams are part of ash water cycle and are used as emergency containment dams. This water is then pumped from Swartpan for re-use by the Power Station for ashing purposes (Kriel Power Station, 2016).

[1] Wet Ash Disposal Facility is also referred to as an Ash Dam

The three existing ash dams will reach their capacity by end July 2021. Eskom is, thus, proposing to expand its existing ash disposal facility by constructing and commission an additional ash disposal facility footprint before the existing ash dams reach their capacity in 2021.

The complete proposed expansion with new ash dams (AD4.1, AD4.2 and AD4.3) (see Figure 10-2) would fulfil the ash disposal requirements for the Power Station's extended -operational life, whereby decommissioning of the six generating units is planned to commence in 2039. AD4.3 is however located on a previously mined and backfilled area, which needs to be tested first for stability. The expansion project is, therefore, divided into two phases, namely Phase 1, which covers construction of AD4.1 and AD4.2 (the subject of this application) (see Figure 10-3) and Phase 2 which covers AD4.3. A Monitored Test Embarkment is underway for AD4.3 and therefore this EIA only deals with Phase 1. Once the stability of AD4.3 has been confirmed, depending on the results, an additional EIA may be undertaken for AD4.3. To smoothen the decommissioning process, a five year contingency has been allowed for, thus it is assumed that the Power Station will be operated for an additional five years, thereby allowing for the power station decommissioning from 2041 to 2045.

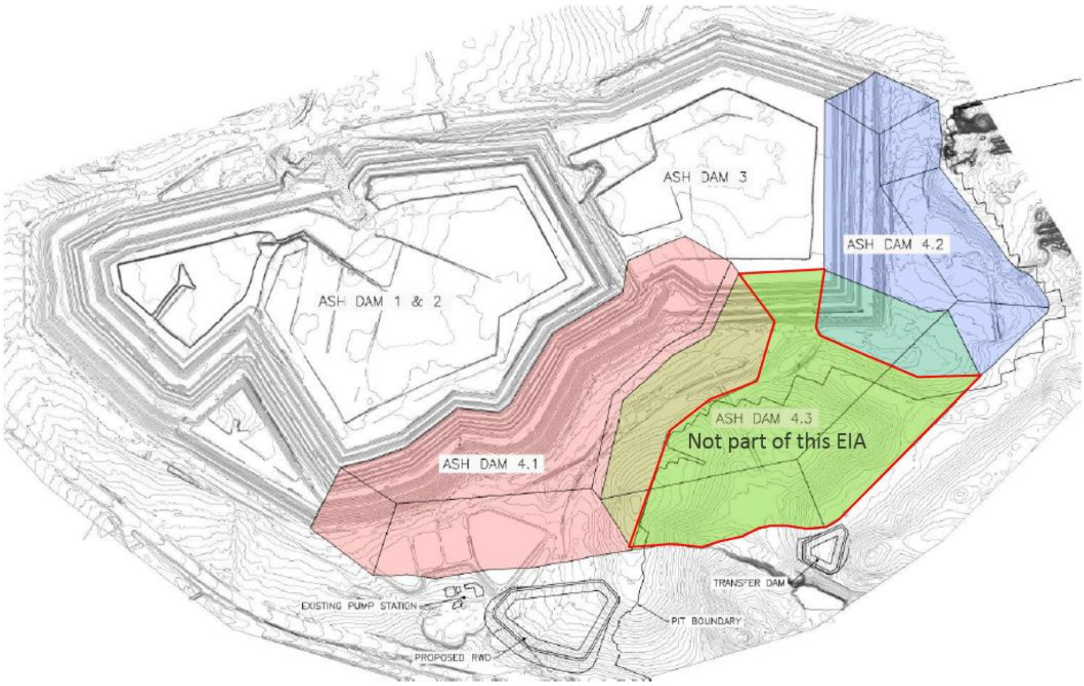

Figure 10-2| Ash Dam 4 Concept (Source: JW044/16/E821)

Figure 10-3| Phase 1, construction of AD4.1 and AD4.2 (the subject of this application)

The development of ash dam 4 will be sequenced to distribute large immediate capital expenditure cost. Dam 4.2 will be developed first in 2021 and will utilize a ring main system to distribute ash within the ash dam basin. Water generated on the dam will be decanted into solution trenches, running along the toe of the new dams, utilizing penstocks and subsoil drains. Ash water from Dam 4.2 will be gravitated to a transfer dam from where it will be pumped to the AWR dam.

Deposition was split between the existing and new dams in order to reduce the height of the preliminary starter walls, as well as the final height of the new dams. It was assumed that deposition on the existing dams will continue for 4 years after the commissioning of the first phase of AD4 (i.e. until the final phase of AD4 is commissioned). Once AD4.1, AD4.2 *and AD4.3*[2] are operational, the existing dams will be decommissioned, and rehabilitated. A period of two (2) years was allowed for between the construction phases of AD4 in order to defer large immediate capital costs. Thus, after AD4.2 is commissioned in July 2021, AD4.1 will be commissioned in July 2023, *and subsequently AD4.3 in July 2025*.

From the AWR dam, ash water will be pumped back to the power station and ash dam pump-house to be reused in the placement of ash from the power station.

Site reference	This EIA process covers only AD4.1 and AD4.2 as well as the associated infrastructure that will be developed, including a Transfer Dam. The infrastructure

[2] AD4.3 will be implemented if deemed feasible and needed

	includes pipes and a Transfer Dam that will be located on the mine backfilled area (*just South of the proposed siting for AD4.3*). A Class C liner has been provided for the ash dams (AD4.1 and AD4.2) and the Transfer Dam, which also has an addition of a concrete liner for maintenance purposes. Geotechnical studies will be conducted in the detail design phase and is expected to provide sufficient information to allow for the appropriate design of the transfer dam and infrastructure. Stability of the Transfer Dam (vetted by Designer & Chief Engineering Geotechnical Engineering): The Transfer Dam is not sized or designed to store any water. The Transfer Dam is designed to collect return water from Dam 4.2 and pump to the AWRD. This will be a continuous process and operations must comply as such; The design premise of the Transfer Dam's placement & construction is that the weight of the soil in that position (pre-construction) is heavier than the weight of water; The Transfer Dam position abuts the old Starter Wall of the Pit 2 backfills. Therefore, the Starter Wall would have been compacted and consolidated. The Basin of Transfer Dam is founded on the ash behind the Starter Wall, which would have consolidated after 20 years; It is also assumed that the soil/ash at that position has caused localised consolidation over time, so no loose soils are expecting directly under the Transfer Dam; and Therefore, <u>the Transfer Dam will not add weight to the environment & therefore not induce deep settlements</u>. Going forward in the design, the Transfer Dam will take the detailed geotechnical information into account to design layer works below the Transfer Dam's base. This should ensure that there are no settlements, as any settlement would misalign the pipeworks. *NB. Within the Transfer Dam design the liner is accessible and can be repaired if compromised.*
Site layout	The attached map (Figure 10-3) is based on the latest layout received from Eskom. Note that the layout of AD4.1 and AD4.2 has not changed – only the associated infrastructure has changed slightly. These locations for the ash dams were used by all specialists. The change in layout for the associated infrastructure did not affect the outcome of the specialist assessments.