Desktop Agricultural Potential Assessment for the proposed Lower Coerney Balancing Dam Project

Addo, Eastern Cape Province, South Africa

February 2023

CLIENT

GA Environment

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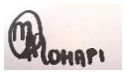
Report Name	**Desktop Agricultural Potential Assessment for the proposed Lower Coerney Balancing Dam Project**
Reference	**Coerney Dam**
Submitted to	GA Environment
Report Writer	**Maletsatsi Mohapi**  Maletsatsi Mohapi is a Soil scientist in the field of Natural and Agricultural sciences. Maletsatsi is a soil and wetland specialist, with an experience in soil identification, soil classification, wetland delineation and wetland monitoring. Maletsatsi completed her MSc in Agriculture at the University of the Free State in 2021. Maletsatsi is also a member of the Soil Science Society of South Africa (SSSSA).
Report Writer / Reviewer	**Andrew Husted**  Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 13 years' experience in the environmental consulting field.
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

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DECLARATION

I, Maletsatsi Mohapi, declare that:

- I act as the independent specialist in this application;
- I will 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;
- 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 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;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Maletsatsi Mohapi

Soil Scientist

The Biodiversity Company

February 2023

1 Introduction

The Biodiversity Company was appointed by GA Environment (Pty) Ltd to undertake a desktop agricultural potential assessment for the proposed development of Lower Coerney Balancing Dam project. According to the feasibility study conducted by the Department of Water and Sanitation (DWS), the Lower Coerney was found to be the most feasible and viable site for the construction of the required balancing dam for the Algoa Water Supply System (AWSS).

This assessment was conducted in accordance with the amendments to the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). The approach has taken cognisance of the published Government Notices (GN) 320 in terms of NEMA, dated 20 March 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation” (Reporting Criteria).

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities and enable informed decision making. This report aims to also present and discuss the findings from the soil resources identified within the regulated 50 m, the soil suitability and land potential of these soils, the land uses within the regulated area and also the risk associated with the proposed project.

1.1 Technical Information

The following technical information is as per information provided by GA Environment:

The existing Scheepersvlakte Dam was added to the Nelson Mandela Bay Municipality (NMBM) water supply when water requirements were exceeded. The capacity of this dam is however very low and additional water storage is required to limit the risk of failure to supply to NMBM. After geotechnical investigations the Coerney Dam location was recommended.

The infrastructure for the proposed project includes:

- *A new balancing dam with a capacity of 4.6 million m^3 on the farm Scheepersvlakte. The capacity includes an allowance of 100 000 m^3 for the requirements of a new citrus development on the farm;*
- *The dam will comprise an earth fill embankment. A concrete side channel spillway and an outlet works;*
- *Connecting pipelines of 1300 mm diameter and length of 940 m and 2460 m are required to supply water to the dam and connect to the existing pipeline supplying Nooitgedaght water treatment works. An access road with a length of about 1 km, following the route of an existing jeep track; and*
- *An electricity supply will be required for lightning, etc. in the outlet works and around the dam wall”.*

Aspect	Detail
Type of Dam:	Homogeneous Earth fill Embankment Dam.
Main advantage of dam site:	The dam will be filled and supply water under gravity (no need for water to be pumped).
Source of water:	Kirkwood Primary Canal via a new pipeline.
Wall height:	20.5 m
Storage capacity (before excavation):	4.69 million m^3
Maximum water depth (before excavation):	16.2 m
Hazard rating:	High
Hazard dam type:	Category III Dam
Materials required and not available on site:	Sand, gravel, rocks, and concrete aggregates (which all need to be imported).

2 Project Area

The proposed Lower Coerney Balancing Dam site is located between Kirkwood and Addo in the Sundays River Valley, about 75 km north of Port Elizabeth (Figure 2-1 and Figure 2-2). The project area is also found on Portion 7 of the Farm Scheepersvlakte No. 98, Farm 713 and Farm Enon Mission 574 (Remaining Extent of Farm 40). The approximate coordinates of the site are 33°26'29.77"S and 25°37'23.68"E. The proposed location of the Coerney Dam is upstream of the Coerney Siphon outlet in a valley east of and adjacent to the existing Scheepersvlakte Dam. The footprint of the proposed Coerney Dam is approximately 77.1 hectares, and a portion of this footprint overlaps with portions of the planned future development on Scheepersvlakte Farms. The current land uses within the proposed project are include agriculture (citrus production), watercourse (dams and rivers) and recreational area (Addo Elephant National Park).

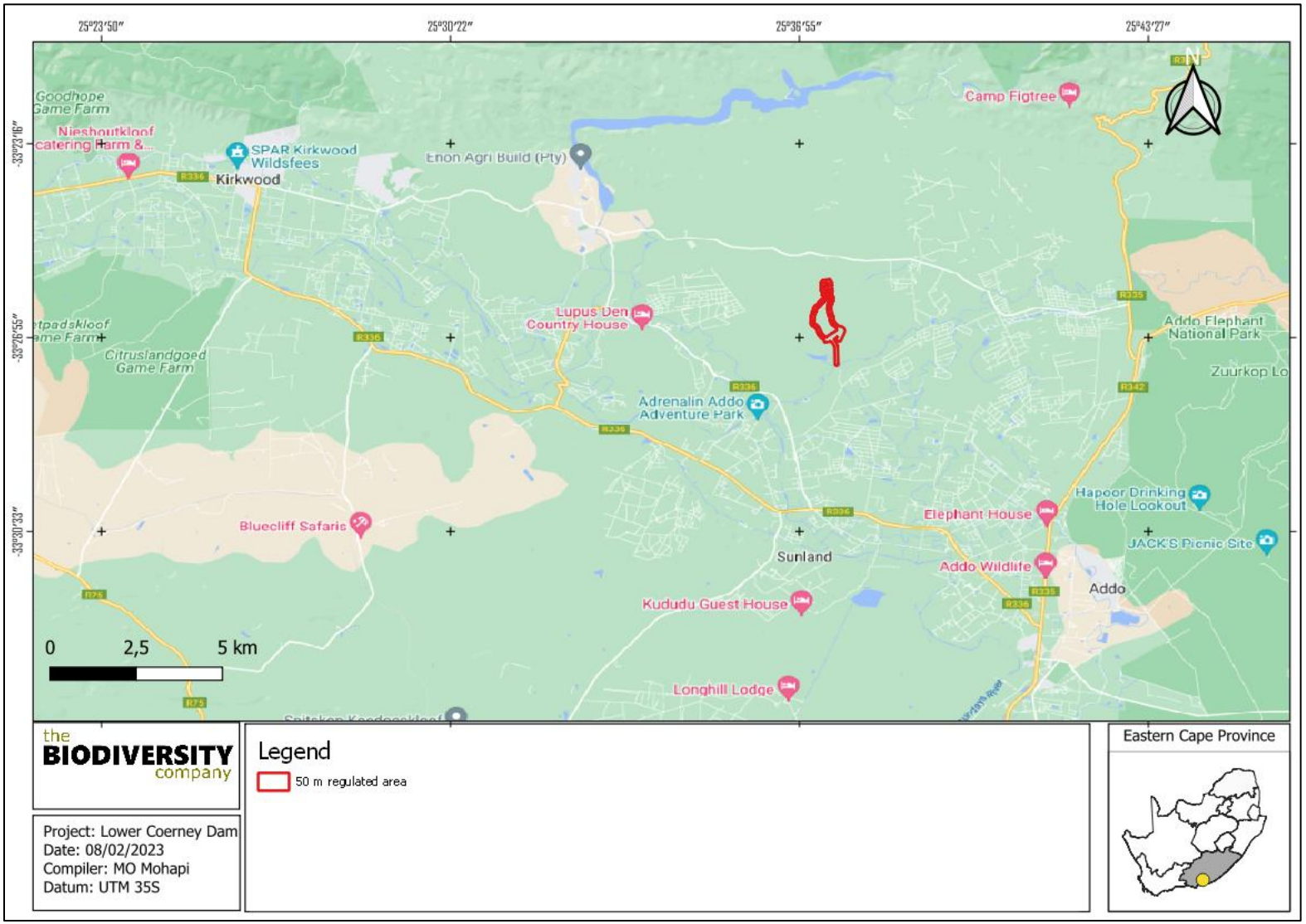

Figure 2-1 The location of the project area

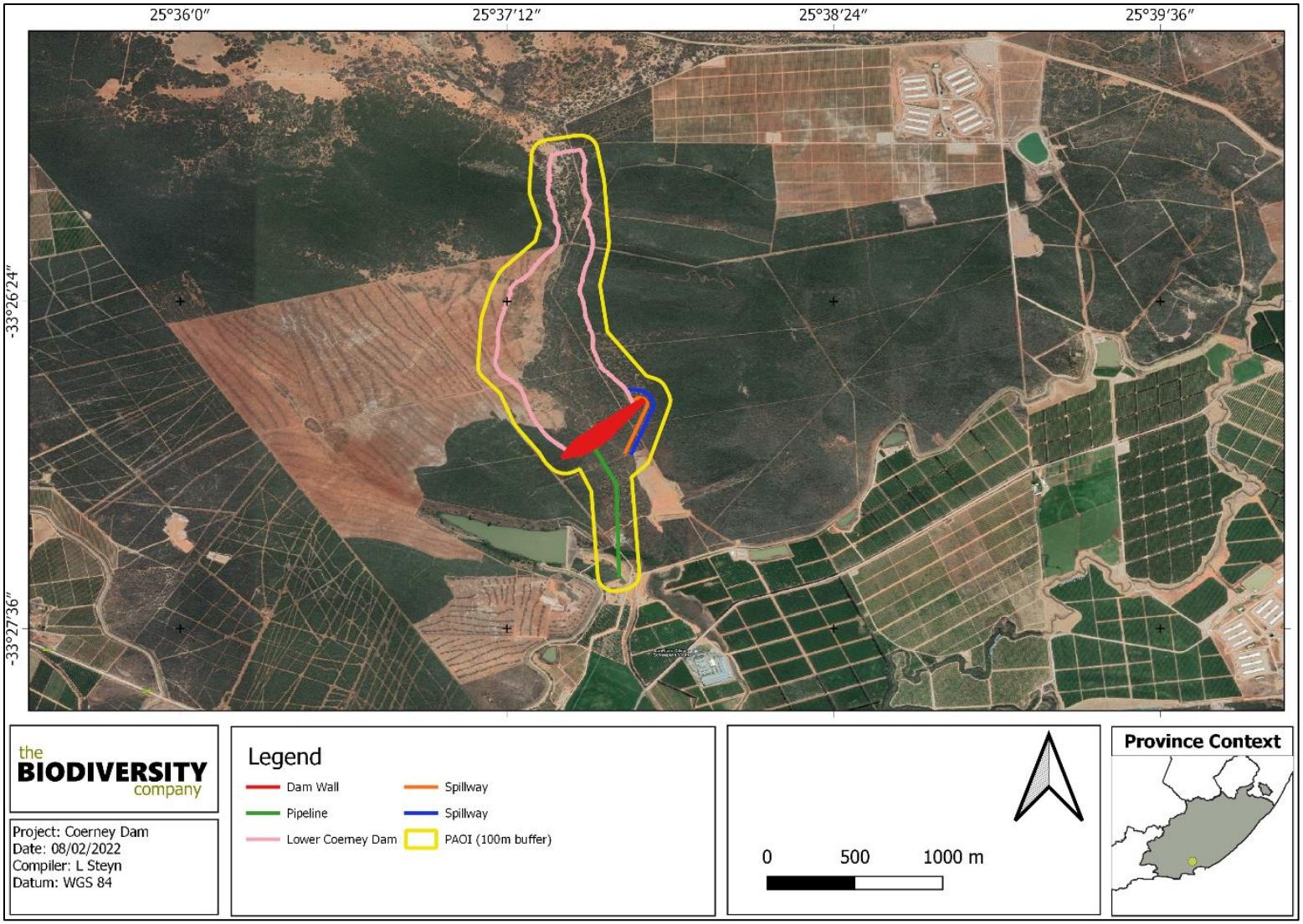

Figure 2-2 Locality map with the proposed infrastructure

2.1 Scope of Work

The scope of work includes the following:

- The feasibility of the proposed activities;
- Confirmation about the “Low” and “High” sensitivities;
- The effects that the proposed activities will have on agricultural production in the area;
- A map superimposing the proposed footprint areas, a 50 m regulated area as well as the sensitivities pertaining to the screening tool;
- Confirmation that no agricultural segregation will take place and that all options have been considered to avoid segregation;
- The specialist’s opinion regarding the approval of the proposed activities; and
- Any potential mitigation measures described by the specialist to be included in the EMPr.

3 Expertise of the Specialists

3.1 Andrew Husted

Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 13 years’ experience in the environmental consulting field.

3.2 Maletsatsi Mohapi

Maletsatsi Mohapi is a Soil scientist in the field of Natural and Agricultural sciences. Maletsatsi is a soil and wetland specialist, with an experience in soil identification, soil classification, wetland delineation and wetland monitoring. Maletsatsi completed her MSc in Agriculture at the University of the Free State in 2021. Maletsatsi is also a member of the Soil Science Society of South Africa (SSSSA).

4 Methodology

4.1 Desktop Assessment

As part of the desktop assessment, baseline soil information was obtained using published South African Land Type Data. Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff, 1972 - 2006). The land type data is presented at a scale of 1:250 000 and comprises of the division of land into land types. In addition, a Digital Elevation Model (DEM) as well as the slope percentage of the area was calculated by means of the NASA Shuttle Radar Topography Mission Global 1 arc second digital elevation data by means of QGIS and SAGA software.

4.2 Field Survey

An assessment of the soils present within the project area was based on previous literature field surveys (Land Type Survey Staff, 1972 – 2006). The site was traversed on foot. A soil auger was used to determine the soil form/family and depth. The soil was hand augured to the first restricting layer or 1,5 m. Soil survey positions were recorded as waypoints using a handheld GPS. Soils were identified to the soil family level as per the "Soil Classification: A Taxonomic System for South Africa" (Soil Classification Working Group, 2018). Landscape features such as existing open trenches were also helpful in determining soil types and depth.

4.3 Erosion Potential

The potential erosion was based on the expected sensitive soils that could be found within the proposed project area according to the Land Type Survey Staff (1972 – 2006). Erosion has been calculated by means of the (Smith, 2006) methodology. The steps in calculating the Fb1 ratings relevant to erosion potential is illustrated in Table 4-1 with the final erosion classes illustrated in

Table 4-2.

Table 4-1 Fb ratings relevant to the calculating of erosion potential (Smith, 2006)

Step 1- Initial value, texture of topsoil horizon				
Light (0-15% clay)		**Medium (15-35% clay)**		**Heavy (>35% clay)**
Fine sand	Medium/coarse sand	Fine Sand	Medium/coarse sand	All sands
3.5	4.0	4.5	5.0	6.0
Step 2- Adjustment value (permeability of subsoil)				
Slightly restricted		Moderately restricted		Heavily restricted
-0.5		-1.0		-2.0
Step 3- Degree of leaching (excluding bottomlands)				
Dystrophic soils, medium and heavy textures		Mesotrophic soils		Eutrophic or calcareous soils, medium and heavy textures
+0.5		0		-0.5
Step 4- Organic Matter				
Organic topsoil				Humic Topsoil
+0.5				+0.5
Step 5- Topsoil limitations				
Surface crusting				Excessive sand/high swell-shrink/self-mulching
-0.5				-0.5
Step 6- Effective soil depth				
Very shallow (<250 mm)				Shallow (250-500 mm)

[1] The soil erodibility index

-1.0	-0.5

Table 4-2 Final erosion potential class

Erodibility	Fb Rating (from calculation)
Very Low	>6.0
Low	5.0 - 5.5
Moderate	3.5 – 4.5
High	2.5 – 3.0
Very High	<3.0

4.4 Land Capability

Given the nature of the assessment statement and the fact that baseline findings correlate with the screening tool's sensitivities, land capability was solely determined by means of the National Land Capability Evaluation Raster Data Layer (DAFF, 2017). Land capability and land potential will also briefly be calculated to match to that of the screening tool to ultimately determine the accuracy of the land capability sensitivity from the DAFF, (2017) sensitivities.

Land capability and agricultural potential will briefly be determined by a combination of soil, terrain and climate features. Land capability is defined by the most intensive long-term sustainable use of land under rain-fed conditions. At the same time an indication is given about the permanent limitations associated with the different land use classes.

Land capability is divided into eight classes, and these may be divided into three capability groups. Table 4-3 shows how the land classes and groups are arranged in order of decreasing capability and ranges of use. The risk of use increases from class I to class VIII (Smith, 2006).

Table 4-3 Land capability class and intensity of use (Smith, 2006)

Land Capability Class	Increased Intensity of Use									Land Capability Groups
I	W	F	LG	MG	IG	LC	MC	IC	VIC	**Arable Land**
II	W	F	LG	MG	IG	LC	MC	IC		
III	W	F	LG	MG	IG	LC	MC			
IV	W	F	LG	MG	IG	LC				
V	W	F	LG	MG						**Grazing Land**
VI	W	F	LG	MG						
VII	W	F	LG							
VIII	W									**Wildlife**
W - Wildlife		**MG - Moderate Grazing**			**MC - Moderate Cultivation**					

F- Forestry		**IG - Intensive Grazing**	**IC - Intensive Cultivation**			
LG - Light Grazing		**LC - Light Cultivation**	**VIC - Very Intensive Cultivation**			

The land potential classes are determined by combining the land capability results and the climate capability of a region as shown in Table 4-4. The final land potential results are then described in Table 4-5.

Table 4-4 The combination table for land potential classification

Land capability class	Climate capability class							
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**
I	L1	L1	L2	L2	L3	L3	L4	L4
II	L1	L2	L2	L3	L3	L4	L4	L5
III	L2	L2	L3	L3	L4	L4	L5	L6
IV	L2	L3	L3	L4	L4	L5	L5	L6
V	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei	Vlei
VI	L4	L4	L5	L5	L5	L6	L6	L7
VII	L5	L5	L6	L6	L7	L7	L7	L8
VIII	L6	L6	L7	L7	L8	L8	L8	L8

Table 4-5 The Land Potential Classes

Land potential	Description of land potential class
L1	Very high potential: No limitations. Appropriate contour protection must be implemented and inspected.
L2	High potential: Very infrequent and/or minor limitations due to soil, slope, temperatures, or rainfall. Appropriate contour protection must be implemented and inspected.
L3	Good potential: Infrequent and/or moderate limitations due to soil, slope, temperatures, or rainfall. Appropriate contour protection must be implemented and inspected.
L4	Moderate potential: Moderately regular and/or severe to moderate limitations due to soil, slope, temperatures, or rainfall. Appropriate permission is required before ploughing virgin land.
L5	Restricted potential: Regular and/or severe to moderate limitations due to soil, slope, temperatures, or rainfall.
L6	Very restricted potential: Regular and/or severe limitations due to soil, slope, temperatures, or rainfall. Non-arable
L7	Low potential: Severe limitations due to soil, slope, temperatures, or rainfall. Non-arable
L8	Very low potential: Very severe limitations due to soil, slope, temperatures, or rainfall. Non-arable

The land capability of the proposed footprint was compared to the National Land Capability which was refined in 2014- 2016. The National Land Capability methodology is based on a spatial evaluation modelling approach and a raster spatial data layer consisting of fifteen (15) land capability evaluation values (Table 4-6), usable on a scale of 1:50 000 – 1:100 000 (DAFF, 2017). The previous system is based on a classification approach, with 8 classes (Table 4-3).

Table 4-6 National Land Capability Values (DAFF, 2017)

Land Capability Evaluation Value	Land Capability Description
1	Very low

2	
3	Very Low to Low
4	
5	Low
6	Low to Moderate
7	
8	Moderate
9	Moderate to High
10	
11	High
12	High to Very High
13	
14	Very High
15	

4.5 Limitations

- The assessment has been completed at a desktop level. It is assumed all datasets and information considered for the assessment is representative of the area and is well suited for the intended purposes of this soil compliance report;
- Soil field surveys can add more informed decision on the impact assessment report;
- The sensitivity map included in this report is based on desktop information alone; and
- This assessment has only considered pedological resources.

5 Project Area

5.1 Soil and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006), the proposed project area is characterised by the Fc 362 and Ia 85 land types (see Figure 5-2). The Fc 362 land types mainly have Mispah, Oakleaf, Valsrivier and Hutton soil forms according to the Soil classification working group, (2018), with the occurrence of other soils within the landscape. The Ia 85 land type is characterised with occurrence of Oakleaf, Hutton and Dundee soil forms associated to other soils in the terrain. The Fc 362 land types consist of shallow, lithic and hard rock soils forms, with the presence of lime in the entire landscape. The Ia 85 land types are characterised by miscellaneous land classes with undifferentiated deep deposits. The land terrain units for the featured Fc 362 land type are illustrated in Figure 5-2 with the expected soils listed in Table 5-1; the Ia 85 land types are illustrated in Figure 5-3 and the soils are shown in Table 5-2.

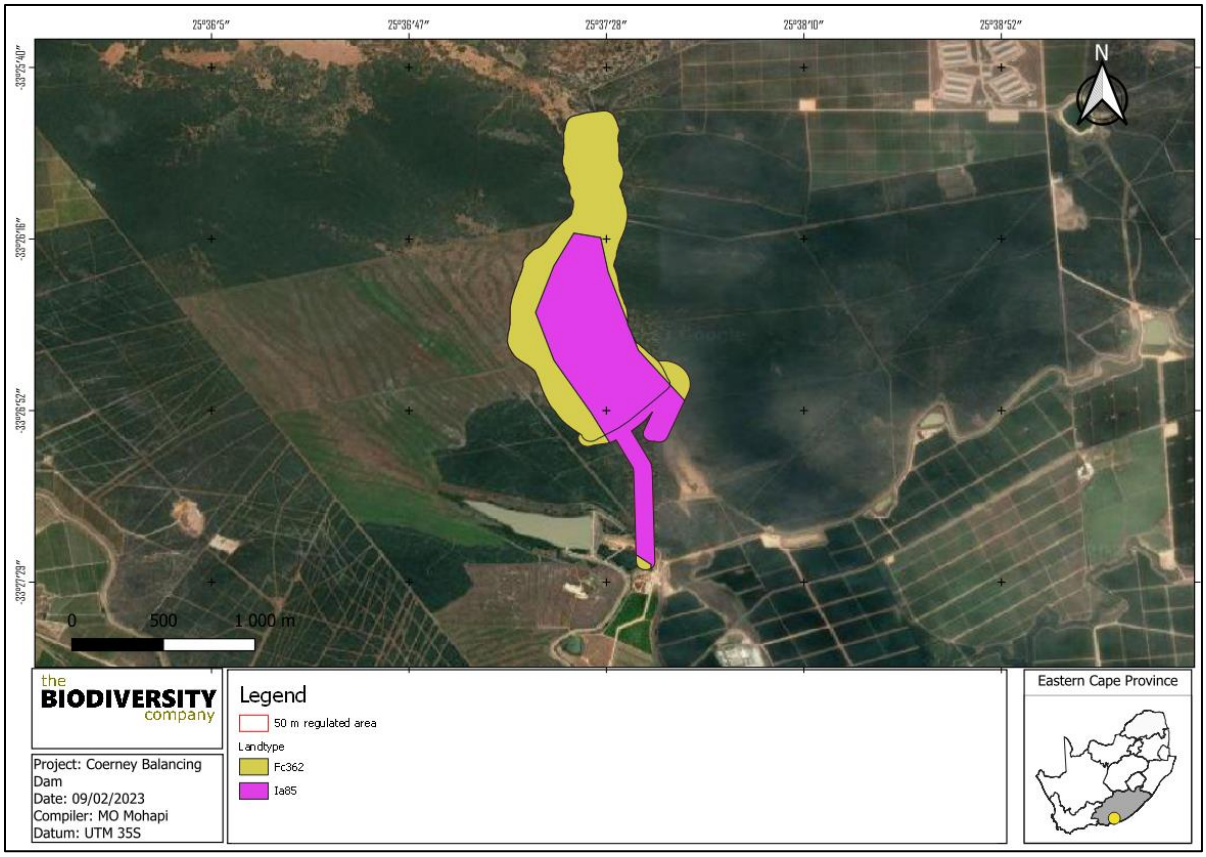

Figure 5-1 Land types found within the proposed project area

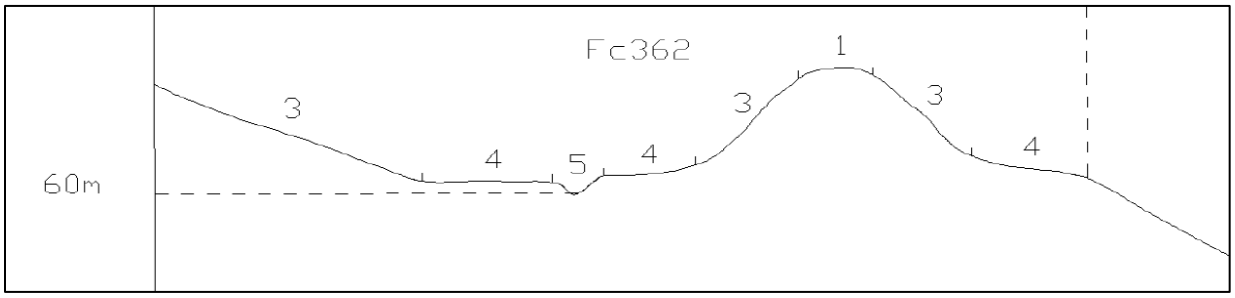

Figure 5-2 Illustration of land type Fc 362 terrain unit (Land Type Survey Staff, 1972 - 2006)

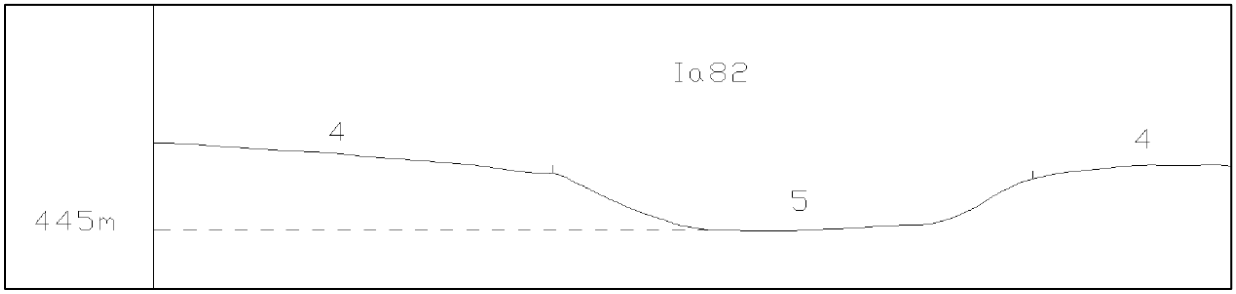

Figure 5-3 Illustration of land type Ia 85 terrain unit (Land Type Survey Staff, 1972 - 2006)

Table 5-1 Soils expected at the respective terrain units within the Fc 362 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units							
1 (10%)		**3 (60%)**		**4 (25%)**		**5 (5%)**	
Mispah	80%	Valsrivier	55%	Oakleaf	90%	Oakleaf	100%
Hutton	20%	Oakleaf	20%	Valsrivier	5%		
		Mispah	10%	Swartland	5%		
		Hutton	10%				
		Swartland	5%				

Table 5-2 Soils expected at the respective terrain units within the Ia 85 land type (Land Type Survey Staff, 1972 - 2006)

Terrain Units			
4 (35%)		**5 (65%)**	
Oakleaf	75%	Oakleaf	80%
Hutton	15%	Dundee	10%
Valsrivier	5%	Valsrivier	5%
Swartland	5%	Stream beds	5%

5.2 Terrain

The slope percentage of the project area has been calculated and is illustrated in Figure 5-4. Most of the project area is characterised by a slope percentage between 0 and 10%, with some smaller patches within the project area characterised by a slope percentage ranging from 10 to 31%. This illustration indicates a few irregularities in the topography in scattered areas the majority of the area being characterised by a gentle slope. The DEM of the project area (Figure 5-5) indicates an elevation of 83 to 122 Metres Above Sea Level (MASL).

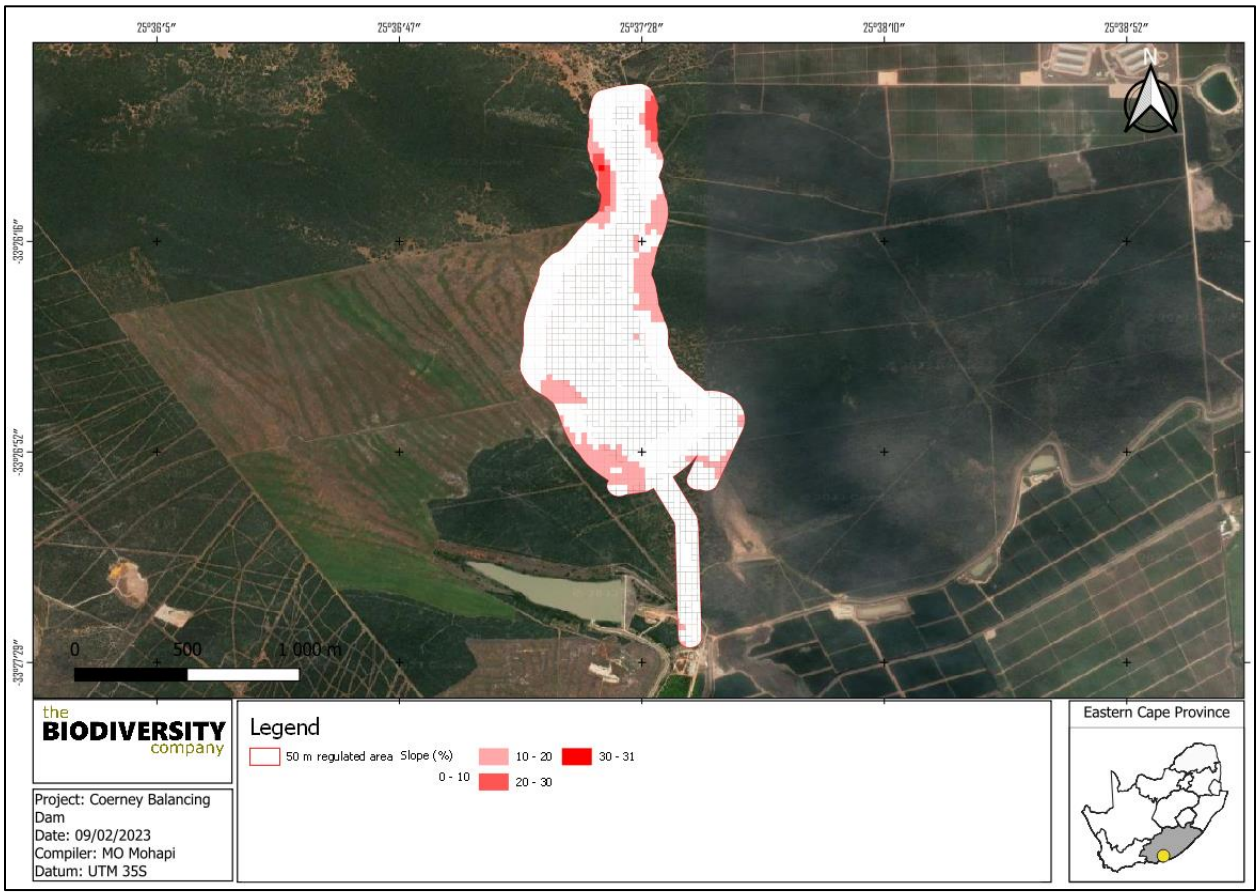

Figure 5-4 The slope percentage calculated for the project area

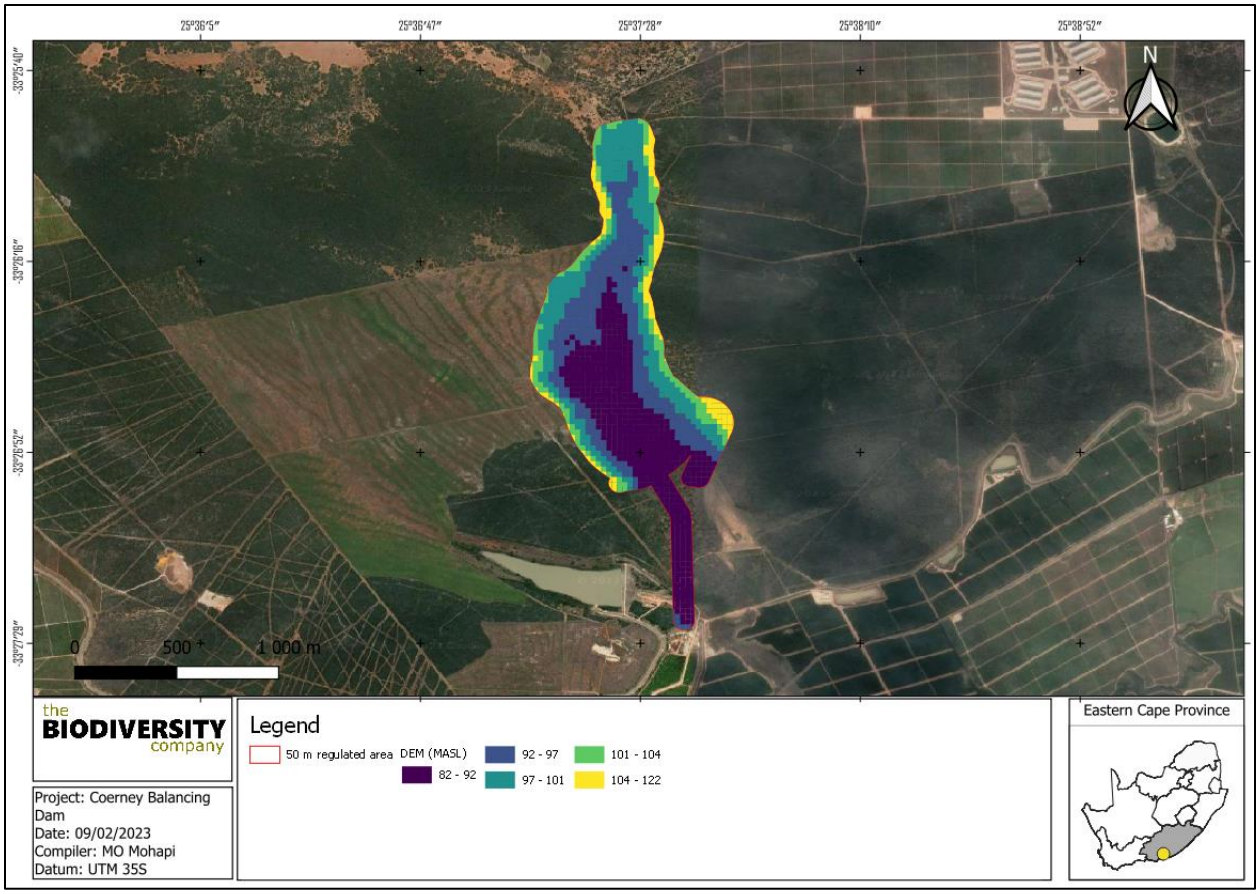

Figure 5-5 The DEM generated for the project area

6 Results and Discussion

6.1 Baseline Findings

The most sensitive soil forms that can be expected based on the Land Type Survey Staff, (1972 – 2006) soil forms data in Table 5-1 and Table 5-2 within the project area is the Hutton and Oakleaf soil forms, with other associated soils also occurring. The Hutton soil form consists of an orthic topsoil on top of a thick red apedal horizon. The Oakleaf soil form has an orthic topsoil underlain with a neocutanic subsurface diagnostic horizon.

The climate capability level of the above-mentioned soils has been determined to have a climate capability level “8”. This climate capability has low Mean Annual Precipitation (MAP) and high Mean Annual Potential Evapotranspiration (MAPE) rates. Commonly severe to moderate limitations occur due to soil, slope, temperatures, or rainfall in such areas.

6.2 Sensitivity Verification

Fifteen land capabilities have been digitised by (DAFF, 2017) across South Africa, of which five potential land capability classes are located within the proposed footprint area’s assessment corridor, including;

- Land Capability 6 to 8 (Low to Moderate Sensitivity); and
- Land Capability 9 to 10 (Moderate to High Sensitivity).

The land capability sensitivity (DAFF, 2017) indicates a range of sensitivities expected throughout the project focus area. The project area is predominately covered by “Low to moderate” sensitivities, with isolated areas of “Moderate to High” sensitivities (Figure 6-1). In the proposed project area, there is no segregation of agricultural lands or crop fields with high potential according to the DEFF (2023).

The limitations associated with a desktop assessment are associated with the ‘unknown’ regarding the soil property distribution. Soil properties are important in the determination of the land capability classes required for classifying the land potential classes (i.e., combination of climate capability level and land capability class).

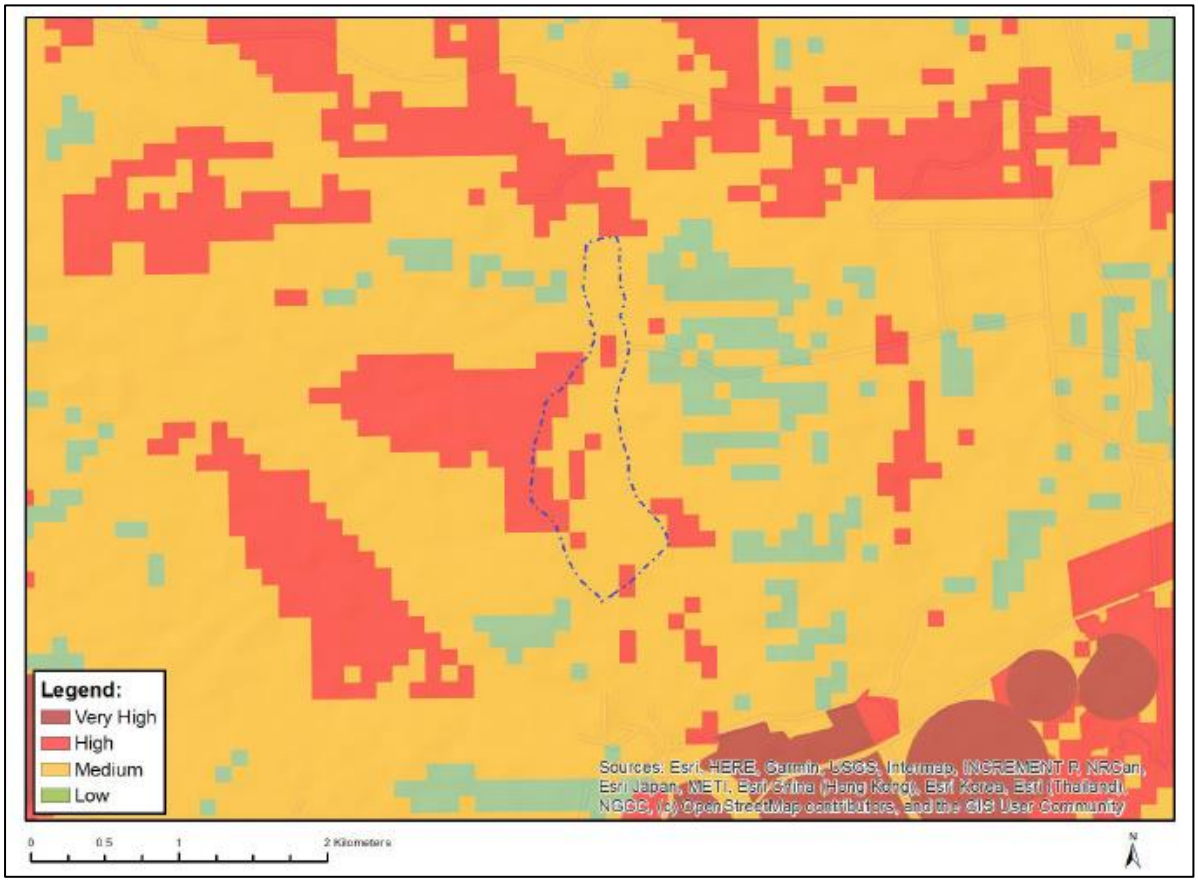

Figure 6-1 The land capability sensitivity (DAFF, 2017)

7 Impact Assessment

Infrastructure within the Lower Coerney Balancing Dam project assigned to the available land includes a dam with capacity of 4.6 million m^3, earth fill embankment, concrete side channel spillway, outlet works, connecting pipelines, access roads, and electricity supply.

Impacts were assessed in terms of the Lower Coerney Balancing Dam project and associated infrastructure's construction, operational and decommissioning phases. Mitigation measures were only applied to impacts deemed relevant.

7.1 Anticipated Activities

The proposed activities associated with the Lower Coerney Balancing Dam project can be seen overlaid with the overall sensitivity. The following activities will take place;

- Dam with the capacity of 4.6 million m3;
- Earth fill embankment;
- Concrete side channel spillway;
- Outlet works;
- Connecting pipelines;
- Access road; and
- Electricity supply.

7.1.1 Alternatives Considered

Four other sites were considered within the assessment area, however, the Lower Coerney site was deemed to be feasible and viable for the proposed activities.

7.1.2 Unplanned Events

The planned activities will have anticipated impacts as discussed; however, unplanned events may occur on any project and may have potential impacts which will need management. Table 7-1 is a summary of the findings of an unplanned event assessment from an agricultural potential perspective. Note, not all potential unplanned events may be captured herein, and this must therefore be managed throughout all phases according to recorded events.

Table 7-1 Summary of unplanned events

Unplanned Event	Potential Impact	Mitigation
Hydrocarbon spills into the surrounding environment	Contamination of soil as well as water resources associated with spillage.	A spill response kit must be available at all times. The incident must be reported on and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.

7.1.3 Planning Phase Impacts

The planning phase activities are considered a low risk as they typically involve desktop assessments and initial site inspections. This would include preparations and desktop work in support of waste management plans, environmental and social screening assessments, finalising well sites and facilities and consultation with various contractors involved with a diversity of proposed project related activities going forward.

7.2 Lower Coerney Balancing Dam

7.2.1 Construction Phase

During the construction phase, the topsoil will be cleared, stripped and stockpiled for the preparation of the dam's foundation, access roads and servitudes, construction camps and laydown areas. Furthermore, there will also be an alteration of the existing land use, from agriculture (citrus production) to watercourse (balancing dam development). This will consequently result in the loss of soil capability and erosion at the site and the surrounding areas. Potential erosion is expected during the construction phase due to some erodable soils that are expected to be within the footprint assessment area, such

as the Mispah soil forms (Table 5-1 and Table 5-2). The proposed activities will have an impact on areas expected to be high agricultural production (in some areas), with some aspects affecting the “Low to Moderate” sensitivity areas. It is also possible that suitable agricultural land could become fragmented, resulting in these smaller portions no longer being deemed feasible to farm. The removal of vegetation and changes to the local topography could result in an alteration to surface run-off dynamics.

Table 7-2 Impact assessment related to the loss of the land capability during the Lower Coerney Balancing Dam project construction phase – Pre-Mitigation

Impact	Pre-Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
	2	4	3	3	3	4	3	
Loss of Land Capability	Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	High cumulative impact: The impact would result in significant cumulative effects	High: Impact affects the continued viability of the system/ component, and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.	**Negative High Impact**

Table 7-3 Impact assessment related to the loss of the land capability during the Lower Coerney Balancing Dam project construction phase – Post Mitigation

Impact	Post-Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
	1	3	2	3	3	3	2	
Loss of Land Capability	Site: The impact will only affect the site.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Medium term: The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).	Barely reversible: The impact is unlikely to be reversed even with intense mitigation measures.	Significant loss of resources: The impact will result in significant loss of resources.	Medium cumulative impact: The impact would result in minor cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**

7.2.1.1 Mitigation

Intensive mitigation is required given the fact that the pre- mitigation significance rating has been scored as **"High – Negative"** and the post- mitigation significance rating being scored as **"Medium – Negative"** which are *Moderate* cumulative effects in the proposed balancing dam with post mitigation measures. Further mitigation is however detailed in Table 7-8. The following specific measures are intended to secure a low residual risk:

- Avoidance of all high agricultural production land and other actively cultivated areas, where avoidance is not feasible stakeholder engagement should occur to compensate affected landowners;
- Make use of existing roads or upgrades tracks before new roads are constructed. The number and width of internal access routes must be kept to a minimum;
- A stormwater management plan must be implemented for the development. The plan must provide input into the road network and management measures;
- Rehabilitation of the area must be initiated from the onset of the project. Soil stripped from infrastructure placement can be used for rehabilitation efforts; and
- An alien invasive plant species and control programme must be implemented from the onset of the project.

7.2.1 Operational Phase

During the operational phase, limited impacts are foreseen. Only the footprint area will be disturbed due to the flooding of the inundation zone. This will increase the rate of erosion, sediment displacement and siltation within and around the dam. The dam infrastructure maintenance will have to be carried out throughout the life of the project. It is expected that these maintenance practices can be undertaken by means of manual labour. Besides compaction and erosion caused by increased traffic and surface water run-off for the area during the maintenance, few aspects are expected to be associated with this phase.

Table 7-4 Impact assessment related to the loss of the land capability during the Lower Coerney Balancing Dam project Operation phase – Pre-Mitigation

Impact	Pre-Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of Land Capability, Soil erosion and compaction effects	2	3	3	3	3	2	2	
	Local/district: Will affect the local area or district.	Probable: The impact will likely occur (Between a 50% to 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Significant loss of resources: The impact will result in significant loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**

Table 7-5 Impact assessment related to the loss of the land capability during the Lower Coerney Balancing Dam project Operation phase – Post Mitigation

Impact	Post Mitigation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of Land Capability, Soil erosion and compaction effects	1	2	1	1	2	1	1	
	Site: The impact will only affect the site.	Possible: The impact may occur (Between a 25% to 50%	Short term: The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than	Completely reversible: The impact is reversible with	Marginal loss of resource: The impact will result in	Negligible cumulative impact: The impact	Low: Impact affects the quality, use and integrity of the system/component	**Negative Low Impact**

		chance of occurrence).	the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).	implementation of minor mitigation measures.	marginal loss of resources.	would result in negligible to no cumulative effects.	in a way that is barely perceptible.	

7.2.1.1 Mitigation

Limited mitigation is required given the fact that the pre- mitigation significance rating has been scored as **"Medium – Negative"** and the post- mitigation significance rating being scored as **"Low – Negative."** Further mitigation is however detailed in Table 7-8.

7.2.2 Cumulative Impacts

The cumulative impact for the proposed area as well as its surroundings has been considered for this assessment. It is worth noting that large portions of high sensitivity soil resources (as per the DEA screening tool) have been considered for the cumulative I. Therefore, it is the specialist's opinion that the cumulative impact towards soil resources is regarded to be "Medium" due to the associated land potential sensitivity ranging from low to moderate.

Table 7-6 Impacts related to the loss of land capability with the proposed Lower Coerney Balancing Dam project – Project in Isolation.

Impact	Project in Isolation							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of land capability, soil erosion and compaction effects	2	4	3	2	3	2	2	
	Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Significant loss of resources: The impact will result in significant loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**

Table 7-7 Cumulative impacts related to the loss of land capability with the proposed Lower Coerney Balancing Dam project – Cumulative effect

Impact	Cumulative Effect							
	Extent	Probability	Duration	Reversibility	Irreplaceability	Cumulative Effect	Magnitude/ Intensity	**Significance**
Loss of land capability, soil erosion and compaction effects	2	4	3	2	3	2	2	
	Local/district: Will affect the local area or district.	Definite: Impact will certainly occur (Greater than a 75% chance of occurrence).	Long term: The impact and its effects will continue or last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).	Partly reversible: The impact is partly reversible but more intense mitigation measures are required.	Significant loss of resources: The impact will result in significant loss of resources.	Low cumulative impact: The impact would result in insignificant cumulative effects.	Medium: Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).	**Negative Medium Impact**

7.2.2.1 Mitigation

Intensive mitigation is required given the fact that the pre- mitigation significance rating has been scored as **"Medium – Negative"** and the post- mitigation significance rating being scored as *Moderate-Negative* **"Medium – Negative."** Further mitigation is however detailed in Table 7-8.

7.3 Specialist Management Plan

Table 7-8 presents the recommended mitigation measures and the respective timeframes, targets, and performance indicators. The mitigations within this section have been taken into consideration during the impact assessment in cases where the post-mitigation environmental risk is lower than that of the pre-mitigation environmental risk. Additionally, the implementation of these strategies will improve the possibility of restoring degraded soil resources, which are likely to be impacted upon the construction and operational phases, respectively.

Table 7-8 Mitigation measures, including requirements for time frames, roles, and responsibilities.

	Action plan			
Phase	**Management Action**	**Timeframe for implementation**	**Responsible party for implementation**	**Responsible party for monitoring/audit/review**
Construction	Vegetate or cover all stockpiles after stripping/removing soils	During construction phase	Contractor	ECO
	Storage of potential contaminants should be undertaken in bunded areas	During construction phase	Contractor	ECO
	All contractors must have spill kits available and be trained in the correct use thereof.	During construction phase	Contractor	ECO
	All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping".	During construction phase	Environmental Officer (EO)/Contractor	ECO
	No cleaning or servicing of vehicles, machines and equipment may be undertaken in water resources.	During construction phase	Contractor	ECO
	Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems.	During construction phase	Contractor	ECO

Operation	Continuously monitor erosion on site	During the timeframe assigned for the life of the Power line	Operator	dEO
	Monitor compaction on site	During the timeframe assigned for the life of the Power line	Operator	dEO

7.4 Specialist Recommendation

The results indicate ""Medium" post-mitigation significance score ratings for the construction phase and "Low" post-mitigation significance score rating for the operation phase of the proposed Lower Coerney Balancing Dam project. It is therefore clear that the proposed activities are expected to have a low to medium impact on land potential resources. It is recommended stakeholder engagement must be undertaken during the project phases to investigate possible scenarios for appropriate compensation of landowners for high land capability areas where necessary.

8 Conclusion and Impact Statement

The most sensitive soil forms that can be expected within the assessment area are the Hutton and Oakleaf soil forms. The land capability sensitivities (DAFF, 2017) indicate land capabilities with "Low to Moderate" and "Moderate to High" sensitivities.

The available climate can limit crop production significantly. The climatic conditions are associated with low annual rainfall and high evapotranspiration potential demands of the area, which might not be favourable for most cropping practices.

It is worth noting that, additional baseline soil field assessments can give a better and informed understanding of the soil, and land potential classes. It is the specialist's opinion that the proposed Lower Coerney Balancing Dam project (based on the DAFF, 2017) land capability sensitivity will have limited impact on the agricultural production ability of the land. The proposed activities for the Lower Coerney Balancing Dam and associated infrastructure will not result in the segregation of any high production agricultural land. Therefore, the proposed balancing dam project development may be favourably considered.

9 References

Land Type Survey Staff. (1972 - 2006). Land Types of South Africa: Digital Map (1:250 000 Scale) and Soil Inventory Databases. Pretoria: ARC-Institute for Soil, Climate, and Water.

Mucina, L. & Rutherford, M.C. (Eds.). (2006). The vegetation of South Africa, Lesotho and Swaziland. Strelizia 19. South African National Biodiversity Institute, Pretoria South African.

Smith, B. (2006). The Farming Handbook. Netherlands & South Africa: University of KwaZulu-Natal Press & CTA.

Soil Classification Working Group. (1991). Soil Classification A Taxonomic system for South Africa. Pretoria: The Department of Agricultural Development.

Soil Classification Working Group. (2018). Soil Classification A Taxonomic system for South Africa. Pretoria: The Department of Agricultural Development.