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Agricultural Compliance Statement for the Proposed Hyperion Thermal Power Dual Fuel Facility

Submitted by TerraAfrica Consult cc

Mariné Pienaar

11 January 2021

Declaration of the Specialist

Details of practitioner

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Declaration of Independence

I, Mariné Pienaar, hereby declare that TerraAfrica Consult, an independent consulting firm, has no interest or personal gains in this project whatsoever, except receiving fair payment for rendering an independent professional service.

I further declare that I was responsible for collecting data and compiling this report. All assumptions, assessments and recommendations are made in good faith and are considered to be correct to the best of my knowledge and the information available at this stage.

TerraAfrica Consult cc represented by M Pienaar
11 January 2021

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1. Introduction

Terra-Africa Consult cc was appointed by Savannah Environmental (Pty) Ltd to conduct the Agricultural Compliance Assessment to be included in Environmental Impact Assessment report for proposed Hyperion Thermal Power Dual Fuel Facility (from here onwards also referred to as the project). The facility will consist of a dispatchable, dual fuel (liquid or gas) thermal generation plant that will work in combination with the already authorized Hyperion PV Solar Energy Facility (SEF) complex. The power generated by the thermal facility as well as the Hyperion PV complex will connect via an overhead 132 kV power line to a nearby substation.

The development area for this project are located approximately 22km north of Kathu within in the Gamagara Local Municipality which falls within jurisdiction of the John Taolo Gaetsewe District Municipality of the Northern Cape Province. The proposed project will be located north-west of the N14 national route and the Vlermuisleegte river runs parallel to the eastern boundary of the proposed development area (Figure **1**). The proposed infrastructure will be developed on the following properties:

Thermal power dual fuel facility

- Remainder of the Farm Lyndoch 432

Access road route

- Remainder of the Farm Lyndoch 432
- Portion 2 of the Farm Cowley 457
- Portion 1 of the Farm Cowley 457
- Remainder of the Farm Cowley 457

2. Purpose and objectives of the compliance statement

The overarching purpose of the Agricultural Compliance Statement that will be included in the Environmental Impact Assessment Report, is to ensure that the sensitivity of the site from the perspective of agricultural production to the proposed development, is sufficiently considered. Also, that the information provided in this report, enables the Competent Authority to come to a sound conclusion on the impact of the proposed project on the agricultural production potential of the study area and development area.

To meet this objective, site sensitivity verification must be conducted of which the results must meet the following objectives:

- It must confirm or dispute the current land use and the environmental sensitivity as was indicated by the National Environmental Screening Tool. **Please refer to Section 9.3 for confirmation of the screening tool report.**

- It must contain proof in the form of photographs of the current land use and environmental sensitivity pertaining to the study field. **Please refer to Chapter 9 for detail and proof of current land use.**
- All data and conclusions are submitted together with the Environmental Impact Assessment Report (prepared in accordance with the NEMA regulations) for the proposed project. **This report will be submitted as part of the Environmental Assessment being conducted for environmental authorisation by Savannah Environmental.**

According to GN320, the agricultural compliance statement that is submitted must meet the following requirements:

- It must be applicable to the preferred site and the proposed development footprint.
- It has to confirm that the site is of “low” or “medium” sensitivity for agriculture.
- It has to indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site.

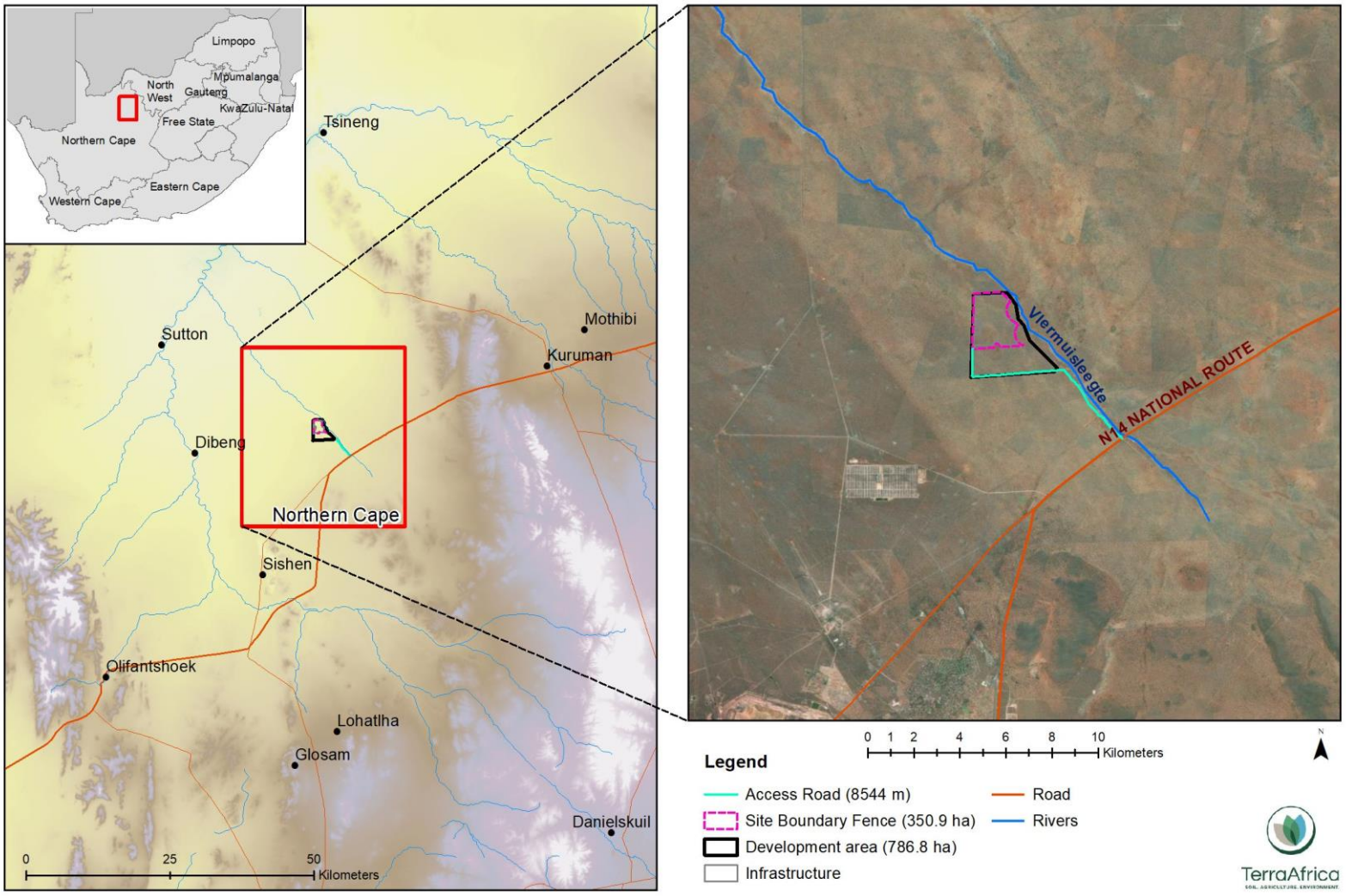


Figure 1: Locality map of the proposed Hyperion Thermal Dual Fuel Facility development area and access road

The following checklist is supplied as per the requirements of GNR 320, detailing where in the report the various requirements have been addressed:

GNR 320 requirements of an Agricultural Compliance Statement (Low to Medium Sensitivity)	Reference in this report
3.1. The compliance statement must be prepared by a soil scientist or agricultural specialist registered with the SACNASP.	Page 2
3.2. The compliance statement must: 3.2.1. be applicable to the preferred site and proposed development footprint;	Page 6
3.2.2. confirm that the site is of "low" or "medium" sensitivity for agriculture; and	Section 9.3
3.2.3. indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site.	Section 12
3.3. The compliance statement must contain, as a minimum, the following information: 3.3.1. contact details and relevant experience as well as the SACNASP registration number of the soil scientist or agricultural specialist preparing the assessment including a curriculum vitae;	Page 2
3.3.2. a signed statement of independence;	Page 2
3.3.3. a map showing the proposed development footprint (including supporting infrastructure) with a 50m buffered development envelope, overlaid on the agricultural sensitivity map generated by the screening tool;	Figure 2
3.3.4. confirmation from the specialist that all reasonable measures have been taken through micro- siting to avoid or minimise fragmentation and disturbance of agricultural activities;	Section 12
3.3.5. a substantiated statement from the soil scientist or agricultural specialist on the acceptability, or not, of the proposed development and a recommendation on the approval, or not, of the proposed development;	Section 12
3.3.6. any conditions to which the statement is subjected;	Section 10
3.3.7. in the case of a linear activity, confirmation from the agricultural specialist or soil scientist, that in their opinion, based on the mitigation and remedial measures proposed, the land can be returned to the current state within two years of completion of the construction phase;	N/A – not a linear activity
3.3.8. where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr; and	Section 10
3.3.9. a description of the assumptions made as well as any uncertainties or gaps in knowledge or data.	Section 7
3.4. A signed copy of the compliance statement must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	This report forms part of the EIA process reports for authorisation

3. Terms of Reference

In addition to the requirements stipulated in GN320, the following Terms of Reference as stipulated by Savannah Environmental (Pty) Ltd applies to the Agricultural Compliance Statement:

- To ensure a thorough assessment, that includes both the desktop assessment of databases and aerial photography as well as a description of previous on-site verification of the agricultural potential of the area and the soil forms present in the development area.
- Identify and assess potential impacts on both agricultural potential as well as soil, resulting from the proposed project.
- Identify and describe potential cumulative soil, agricultural potential and land capability impacts resulting from the proposed development in relation to proposed and existing developments in the surrounding area.
- Recommend mitigation, management and monitoring measures to minimise impacts and/or optimise benefits associated with the proposed project.

4. Agricultural Sensitivity

For the purpose of the assessment, the development area of 786.8ha was considered. The requirements of GN320 stipulates that a 50m buffered development envelope must be assessed with the screening tool. This area includes all the project layout components and allow for a buffered assessment area of 50m and more around the proposed infrastructure. In addition to the development area, the proposed access road alignment was also considered.

These infrastructure components were screened separately by using the National Environmental Screening Tool (www.screening.environment.gov.za). The Agricultural Theme of the screening tool considers a combination of the national land capability raster data as well as the field crop boundaries as compiled by Department of Agricultural, Forestry and Fisheries (DAFF) (DAFF 2017, DAFF 2019).

The screening reports were generated by Savannah Environmental (Pty) Ltd on 11 January 2021 and presented as Figure **2** and Figure **3**. The results provided by the screening tool indicated that both the development area as well as the proposed access road, has Medium to Low agricultural sensitivity.

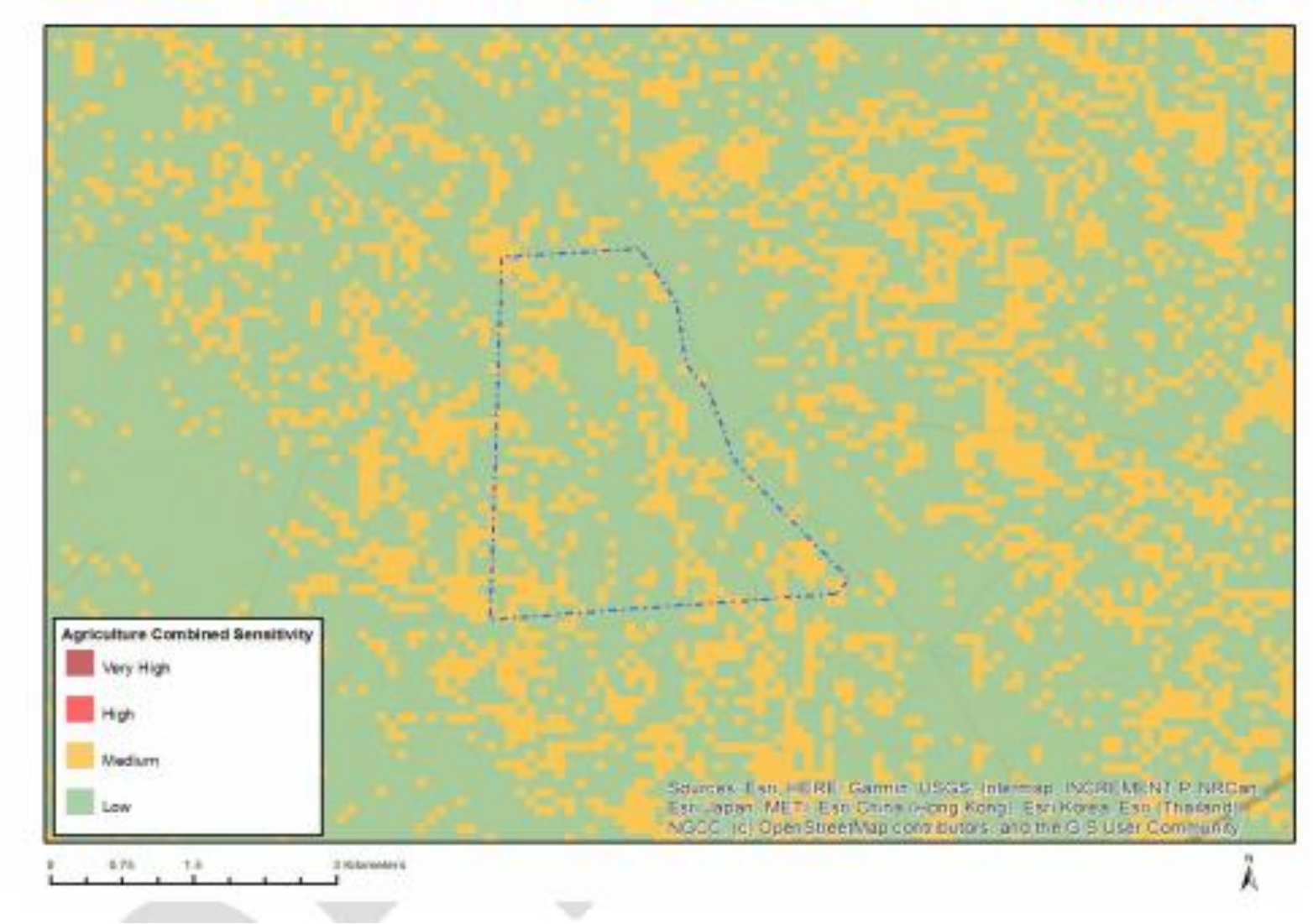


Figure 2 Agricultural Combined Sensitivity of the Hyperion Thermal Dual Fuel Facility development area (generated by Savannah Environmental, 2021)

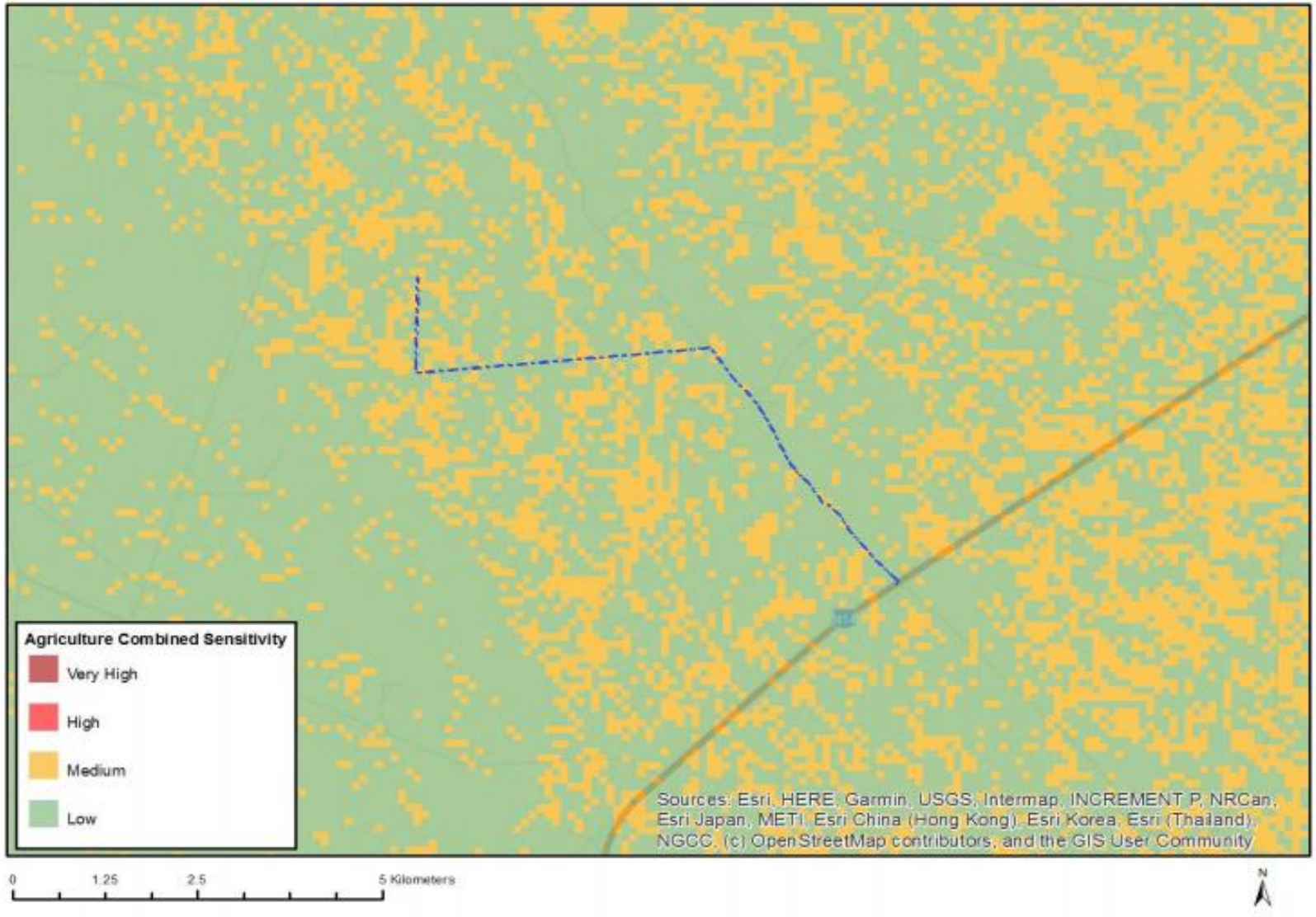


Figure 3 Agricultural Combined Sensitivity of the proposed Access Road route of the Hyperion Thermal Dual Fuel Facility (generated by Savannah Environmental, 2021)

5. Environmental legislation and soil management guidelines applicable to study

The report follows the protocols as stipulated for agricultural assessment in Government Notice 320 of 2020 (GN320). This Notice provides the procedures and minimum criteria for reporting in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (No. 107 of 1998) (from here onwards referred to as NEMA). It replaces the previous requirements of Appendix 6 of the Environmental Impact Assessment Regulations of NEMA.

Since the results of the environmental screening report indicated that the area has Medium to Low sensitivity with regards to the combined agricultural theme, an Agricultural Compliance Statement is required as part of the Environmental Impact Assessment process. In addition to the specific requirements of GN320 for this study, the following South African legislation is also considered applicable to the interpretation of the data and conclusions made with regards to environmental sensitivity and the conservation of soil resources of the project area:

- The Conservation of Agricultural Resources (Act 43 of 1983) states that the degradation of the agricultural potential of soil is illegal. This Act requires the protection of land against soil erosion and the prevention of water logging and salinisation of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed.
- Section 3(a) of the Subdivision of Agricultural Land Act 70 of 1970 states that agricultural land must not be subdivided. Although the Environmental Authorisation application is not for the purpose of a subdivision of agricultural land, it will change the current land use from extensive livestock production to that of infrastructure development for energy generation.
- In addition to this, the National Water Act (Act 36 of 1998) deals with the protection of water resources (i.e. wetlands and rivers) and is considered in the case that hydric soils with wetland land capability is part of the proposed development area.

6. Methodology

The different steps that were followed to gather the information used for the compilation of this report, is outlined below. The methodology is in alignment with the requirements of GN320.

6.1 Desktop analysis of satellite imagery

The most recent aerial photography of the area available from Google Earth was obtained. The satellite imagery was analysed to determine areas of existing impact and land uses within the grid connection corridor as well as the larger landscape. It was also scanned for any areas where crop production and farming infrastructure may be present.

6.2 Site assessment

The development area was already visited on 18 to 20 September 2018 for the soil classification survey that was part of the reports submitted for the environmental authorisation processes of the Hyperion SEF projects. The proposed access road was not part of the survey area visited during September 2018 and available desktop data will be interpreted to discuss the baseline soil and agricultural characterisation of the access road.

During the survey of September 2018, soil profiles were examined to a maximum depth of 1.5m or refuse, using a hand-held auger. Observations were made regarding soil texture, structure, colour and soil depth at each survey point. A cold 10% hydrochloric acid solution was used on site to test for the presence of carbonates in the soil. Ten soil samples (five topsoil and five subsoil) were collected during the site visit and sent to Eco Analytica Laboratory that is part of North West University for analyses. Samples taken to determine baseline soil fertility were analysed for pH (KCl), plant-available phosphorus (Bray1), cation exchange capacity (CEC), exchangeable cations (calcium, magnesium, potassium, sodium), organic carbon (Loss-On-Ignition or LOI) and texture classes (relative fractions of sand, silt and clay).

The soils were described using the South African Soil Classification: A Natural and Anthropogenic System for South Africa (2018) and a Munsell Colour Chart was used to classify soil colour. For soil mapping, the soils were grouped into classes with relatively similar soil characteristics. The soil classification map was then used to classify the Hyperion SEF development area into different land capability classes.

For the soil and land capability classification of the Hyperion Thermal Dual Fuel Facility, the proposed site layout boundaries are superimposed on the data layers that were generated after the site visit of September 2018. The maps generated from the process are illustrated in the baseline description in Section 8.

6.3 Analysis of all other relevant available information

To ensure a comprehensive analysis of the proposed development area, the following data was also analysed:

- The National Land Capability Evaluation Raster Data Layer was obtained from the DAFF to determine the land capability classes of the project assessment zone according to this system. The data was developed using a spatial evaluation modelling approach (DAFF, 2017).
- The long-term grazing capacity for South Africa 2018 was analysed for the area and surrounding area of the project assessment zone. This data set includes incorporation of the RSA grazing capacity map of 1993, the Vegetation type of SA 2006 (as published by Mucina L. & Rutherford M.C.), the Land Types of South Africa data set as well as the KZN Bioresource classification data. The values indicated for the different areas represent long term grazing capacity with the understanding that the veld is in a relatively good condition.
- The Northern Cape Field Boundaries (November 2019) was analysed to determine whether the proposed project assessment zone falls within the boundaries of any crop production areas. The crop production areas may include rainfed annual crops, non-

pivot and pivot irrigated annual crops, horticulture, viticulture, old fields, small holdings and subsistence farming.

- Land type data for the project assessment zone 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 entails the division of land into land types, typical terrain cross sections for the land type and the presentation of dominant soil types for each of the identified terrain units.

6.4 Impact assessment methodology

Following the methodology prescribed by Savannah Environmental (Pty) Ltd., the direct, indirect and cumulative impacts associated with the project have been assessed in terms of the following criteria:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional, and a value between 1 and 5 will be assigned as appropriate (with 1 being low and 5 being high):
- The **duration**, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5;

- The **magnitude**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
- the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
- the **status**, which will be described as either positive, negative or neutral.
- the degree to which the impact can be reversed.
- the degree to which the impact may cause irreplaceable loss of resources.
- the *degree* to which the impact can be *mitigated.*

The **significance** is calculated by combining the criteria in the following formula:

S=(E+D+M)P

S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

7. Study gaps, limitations and assumptions

- The initial soil classification data as well as the photographic evidence collected during the site visit in 2018, is considered sufficient evidence of current soil conditions since the land uses of the proposed Hyperion Thermal Dual Fuel Facility development area has not changed since then.
- It is assumed that there is good correlation between the previous site survey data, available desktop data and the desktop data for the nearby access road and that the access road can be characterised with the desktop data.
- It is further assumed that the infrastructure components will remain as indicated and that the activities for the construction and operation of the infrastructure are limited to that typical for a project of this nature.
- No other uncertainties and gaps have been identified that may affect the conclusions made in this report.

8. Results of desktop analysis

8.1 Land capability

The proposed access road alignment traverses through an area that largely has Low (Class 05) land capability. The north-western side of the alignment falls in an area where Low land capability areas are interspersed with Low-Moderate (Class 06) land capability. The development area of 786.8 ha consists of a similar combination of Low and Low-Moderate land capability classes. The distribution of these land capability classes in and around the project area, is depicted in Figure 4. Both these classes are indicative that the area is suitable for livestock grazing and is considered not suitable for arable agriculture under rainfed conditions.

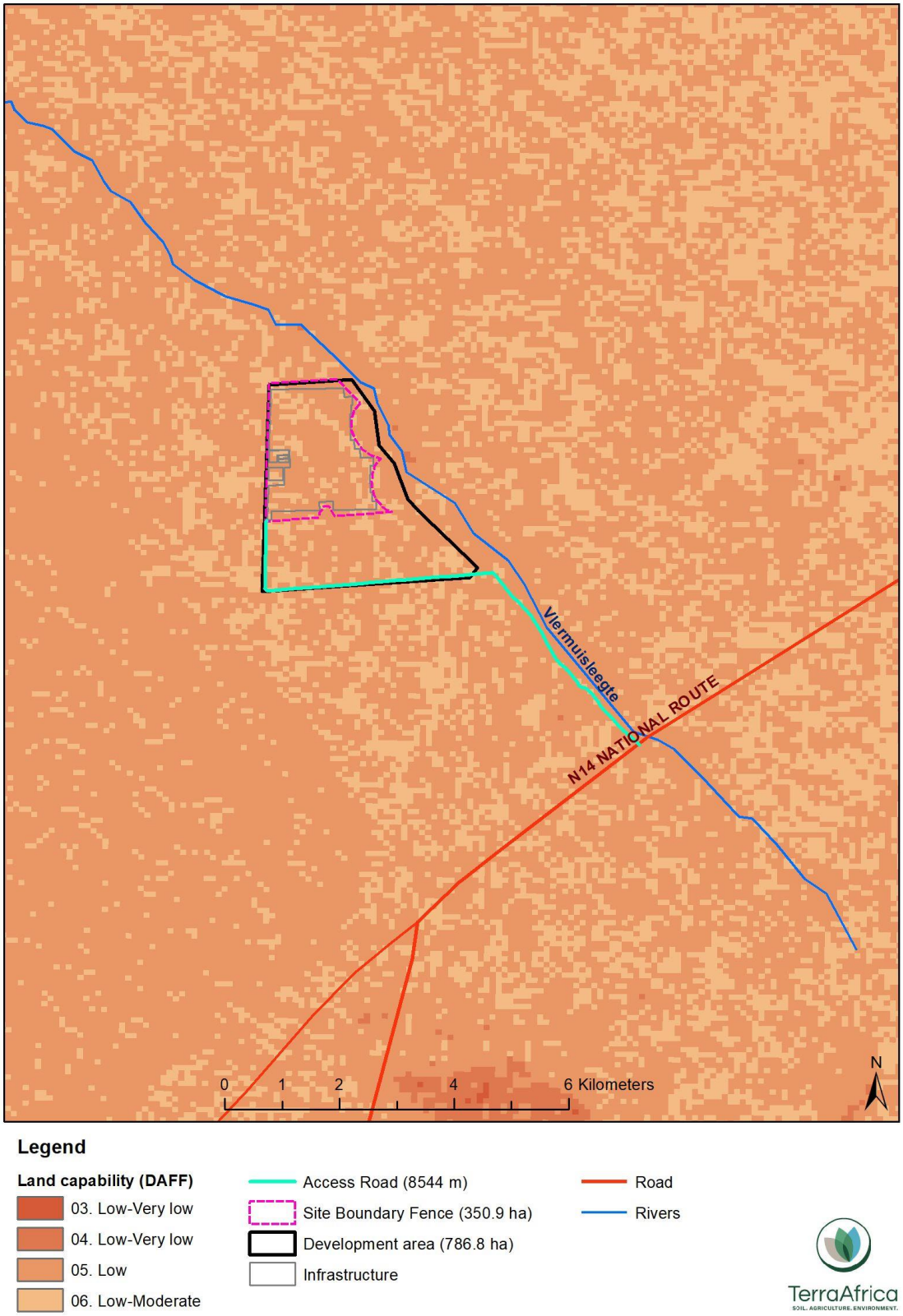


Figure 4 Land capability classification of the Hyperion Thermal Dual Fuel Facility development area and access road (data source: DAFF, 2017)

8.2 Field crop boundaries

There are no field crop boundaries within this area (refer to Figure 5). The nearest crop field boundaries are approximately 15km away to the northeast of the project area and according to this data, consist of old fields. Further away to the northeast, a centre pivot irrigation area is present (approximately 3.5 km south of the R31). Small fields with planted pasture and/or rainfed crop production are located further away to the north, north-east, south-west and west of the proposed development area.

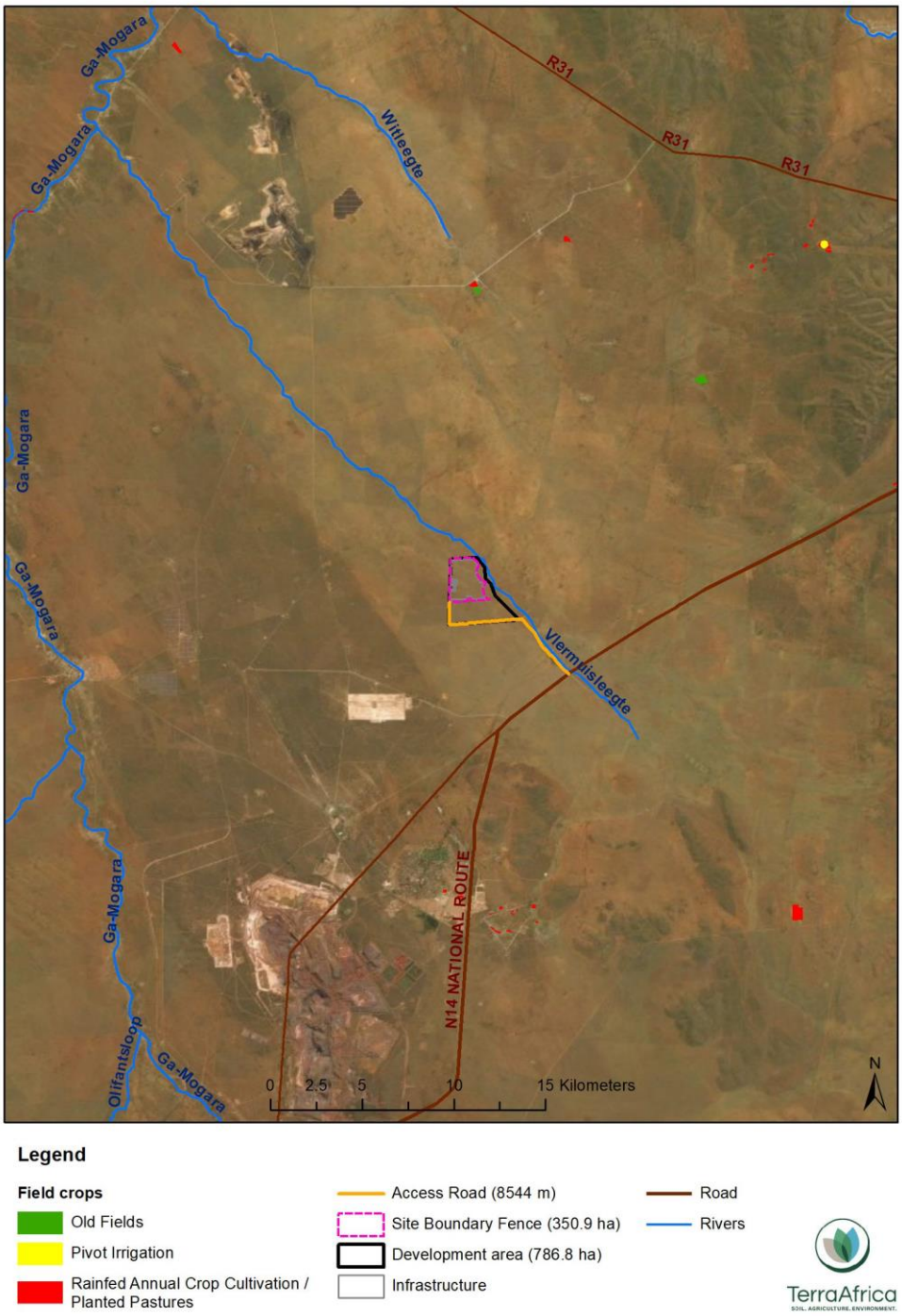


Figure 5 Location of field crop boundaries in the larger area around the proposed Hyperion Thermal Dual Fuel Facility (data source: DAFF, 2019)

8.3 Grazing capacity

The ideal grazing capacity of a specified area is an indication of the long-term production potential of the vegetation layer growing there to maintain an animal with an average weight of 450 kg (defined as 1 Large Stock Unit (LSU)) with an average feed intake of 10 kg dry mass per day over the period of approximately a year. This definition includes the condition that this feed consumption should also prevent the degradation of the soil and the vegetation. The grazing capacity is therefore expressed in a number of hectares per LSU (ha/LSU) (South Africa, 2018).

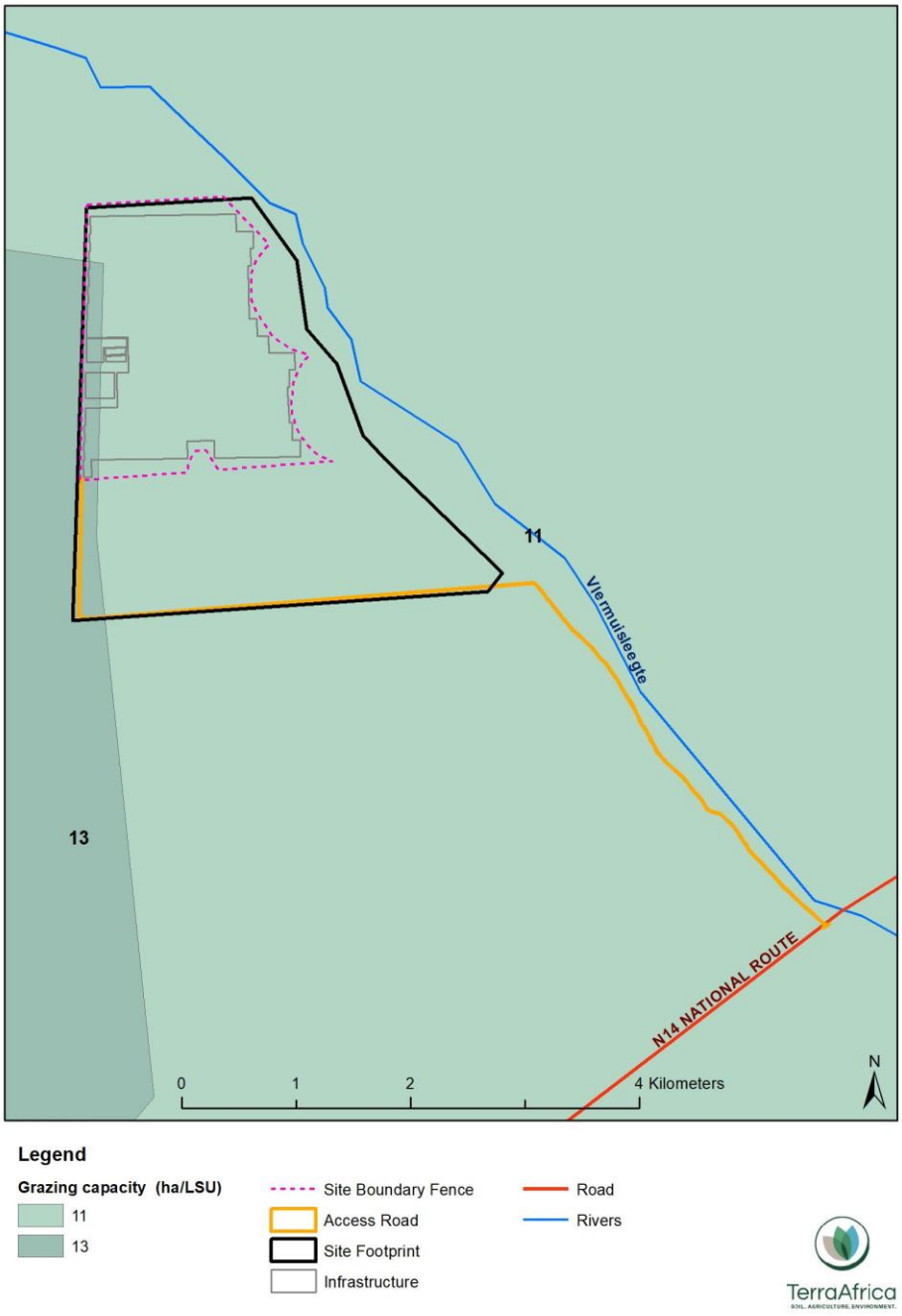


Figure 6 Grazing capacity of the proposed Hyperion Thermal Dual Fuel Facility development area and access road (data source: DAFF, 2018)

Following the metadata layer obtained from DAFF, the grazing capacity of the largest section of the development area, is 11 ha/LSU. (Figure 6). A narrow strip along the western boundary of the development area as well as the most northern part of the access road, have grazing capacity of 13 ha/LSU.

8.4 Land types

The entire development area as well as the access road consist of Land Type Ah9 (refer to **Error! Reference source not found.**).

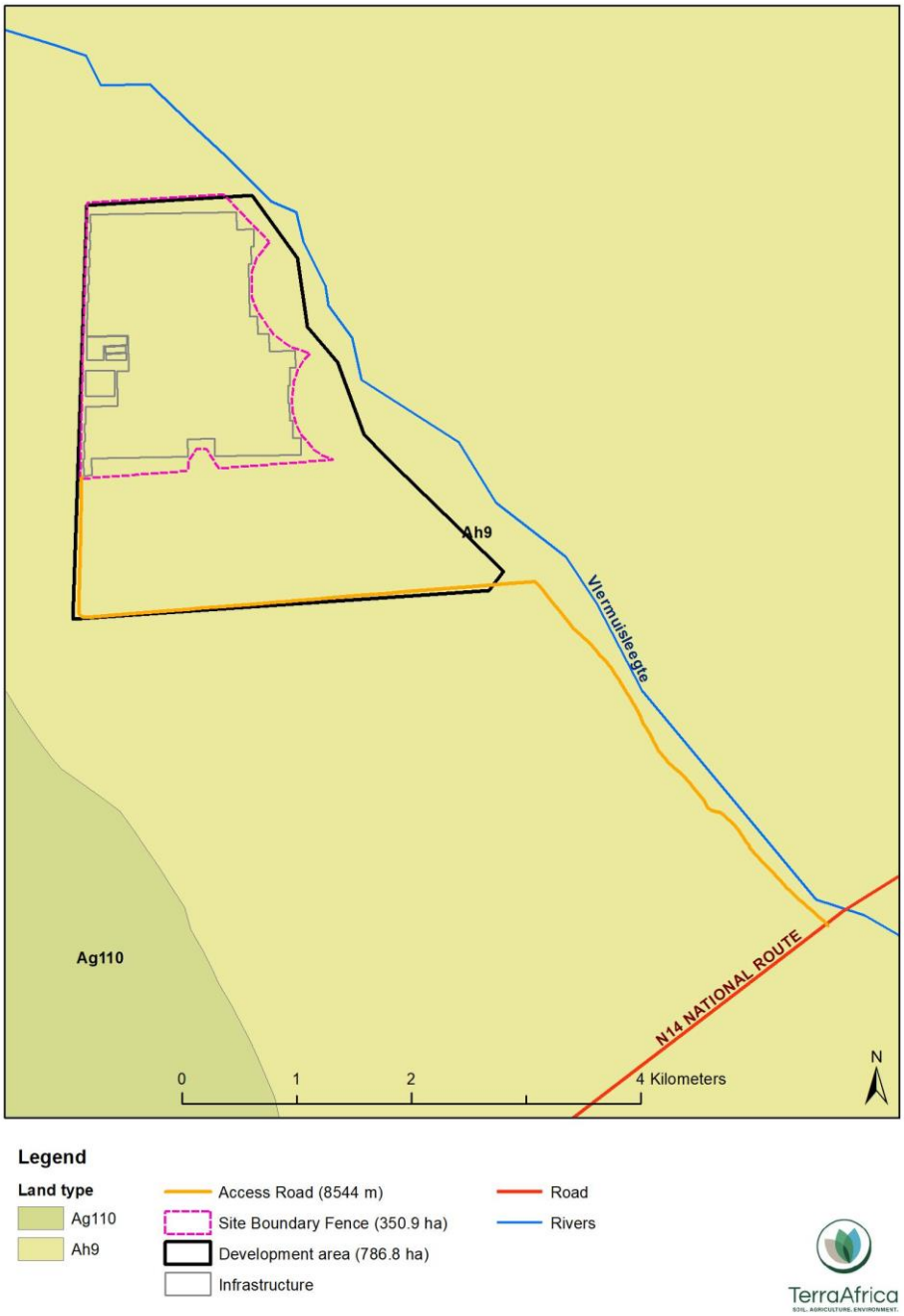


Figure 7 Land type classification of the proposed Hyperion Thermal Dual Fuel Facility development area and access road

Land Type Ah9 consists of only two terrain units where Terrain Unit 4 is the vast flat areas that dominates the landscape and Terrain Unit 5 is the areas of slight depression where endorheic pans can develop (see Figure 8). Therefore, the landscape can be described as flat to very slightly undulating with slopes ranging between 0 and 3%. The soil formed from Aeolian sand of Recent age and the riverbeds in the larger area around the Project area formed on outcrops of Tertiary Kalahari beds (in most cases limestone layers can be seen where it has been exposed through sediment transport by water and wind). The texture of soil in this land type is dominated by sand with the clay fraction estimated as always less than 10%. Deep Hutton and Clovelly soil forms (deeper than 1200 mm) constitutes the largest portion of this land type with very limited possibility for finding shallow, rocky soils of the Mispah and Glenrosa forms over the entire land type area (an estimated 3.5%).

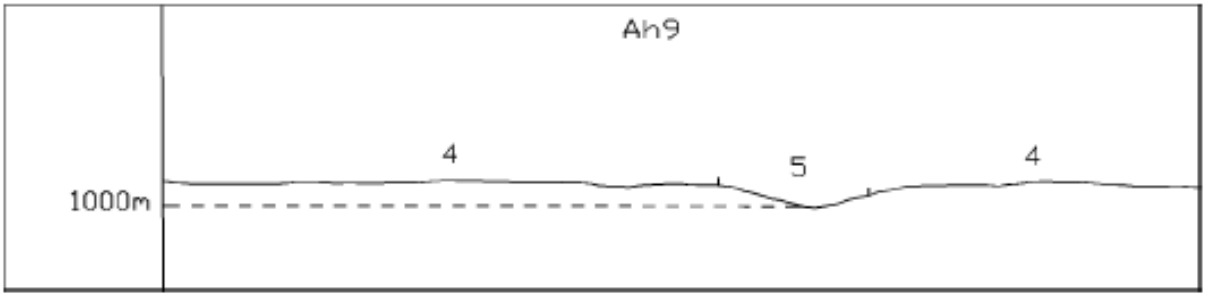


Figure 8 Terrain form sketch of Land Type Ah9

9. Results of previous on-site inspection

9.1 Soil properties

The entire study area consists of sandy, well-drained soils of the Hutton and Ermelo forms. Both these soil forms consist of an orthic A horizon overlying a thick B1 apedal horizon. The only difference between the Hutton and Ermelo forms, is the colour of the B1 horizon. While the Hutton form has uniform red colours, the Ermelo form is yellow-brown. The range of red and yellow-brown colours that is used to differentiate between the two soil forms, is defined by the Soil Classification Working Group (2018).

The soil texture is dominated by the sand fraction and all the samples analysed have a sand fraction between 92.7% and 96.0%. The high sand fraction makes soil susceptible to soil erosion by wind and water. The very low clay content indicates that the soil has very limited buffering capacity against pollutants that may be brought into contact with the soil surface as a result of construction and operational activities.

The soil pH values range between 5.39 and 6.47 and the organic carbon content is low to very low (between 0.16% and 0.36%). The electrical conductivity values are sufficiently low (and indicate that soil salinity is not currently an issue) ranging between 5 mS/m and 21 mS/m except for the subsoil sample (Sample no 2) which indicates higher soil salinity levels at 231 mS/m. However, this is an outlier value that may be attributed to historical agricultural activities. Calcium concentrations dominate the cation exchange complex, followed by potassium, and then sodium. Magnesium concentrations are present at the lowest concentration of the four major cations that were determined.

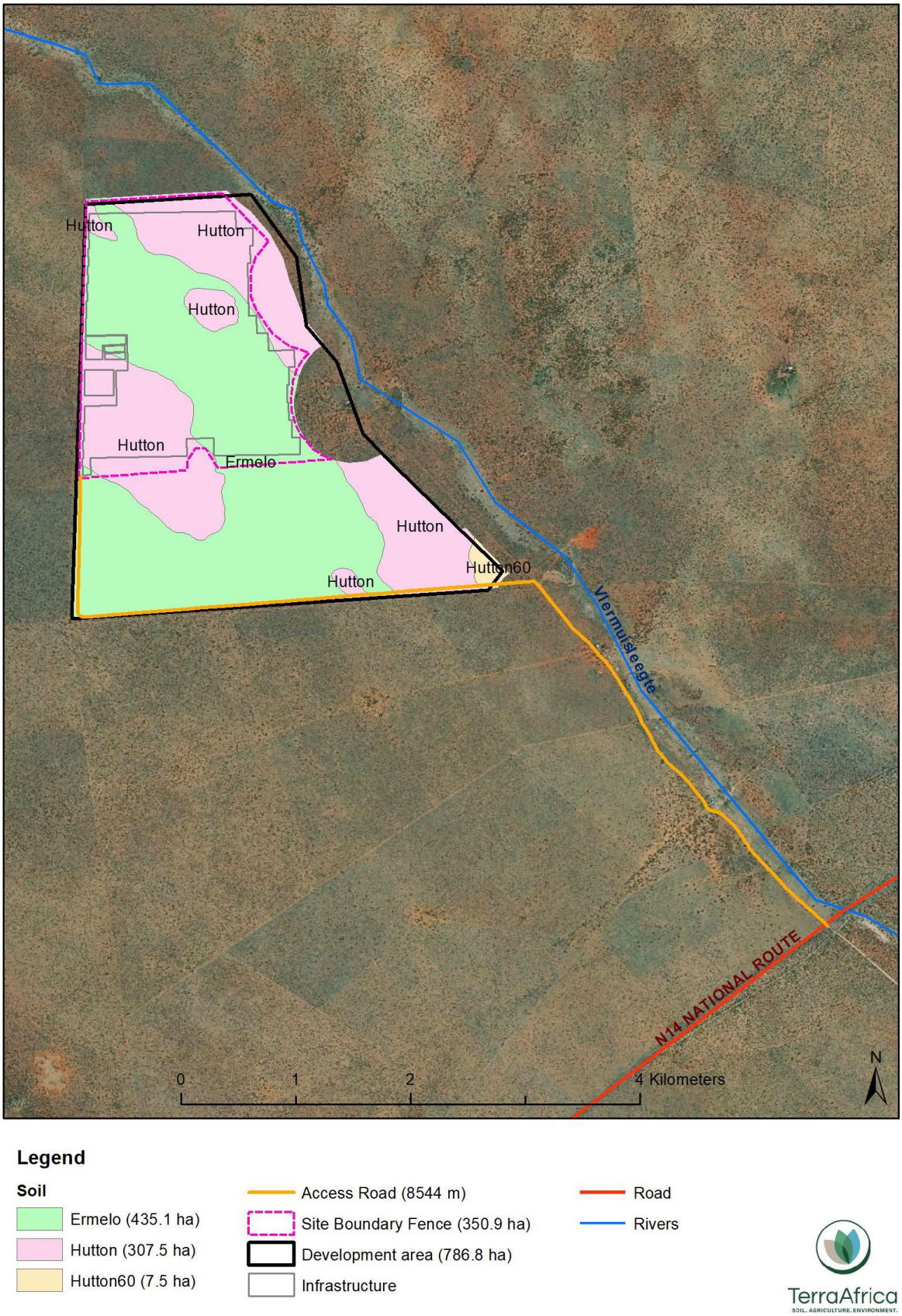


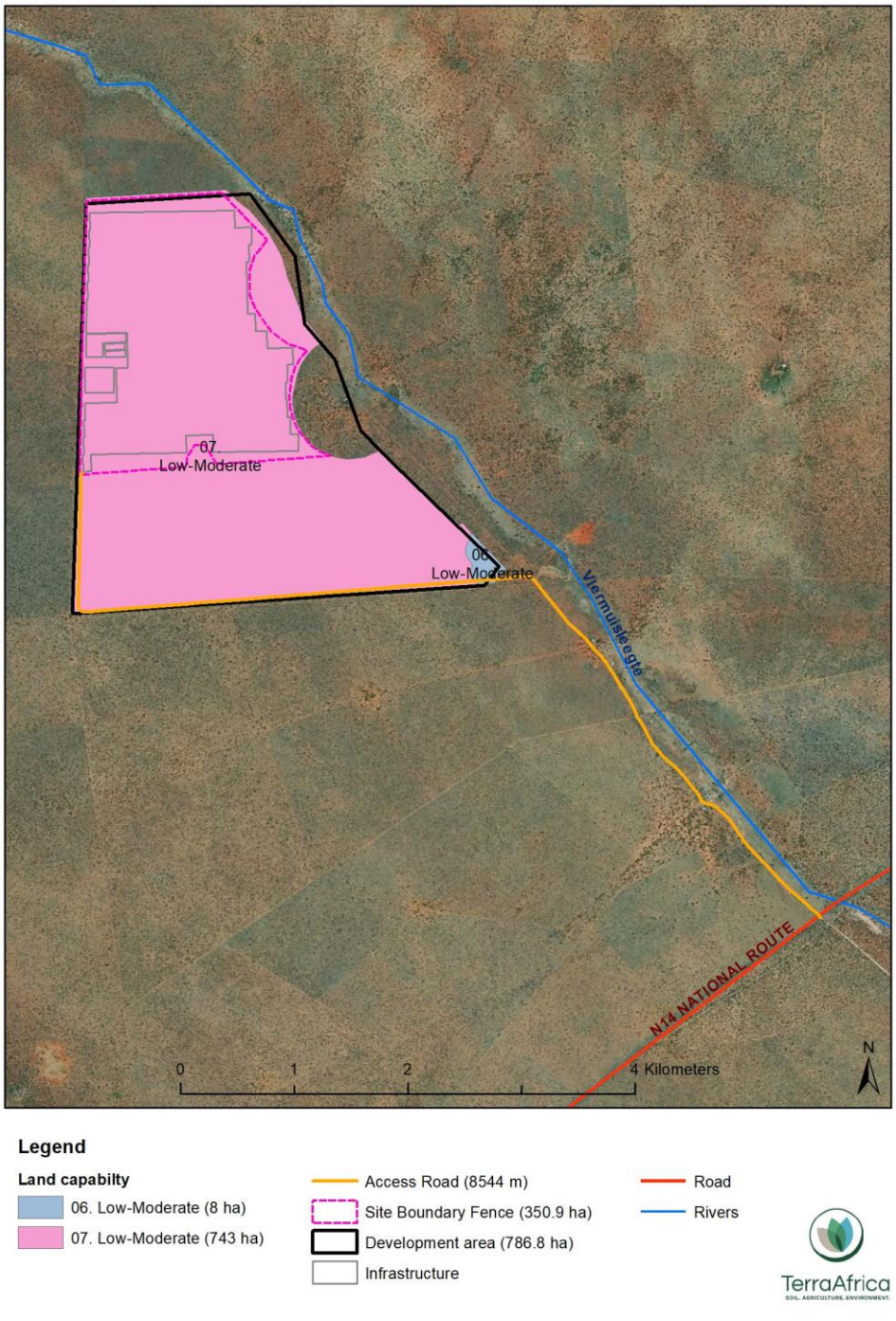
Figure 9 Soil map of the Hyperion Thermal Dual Fuel Facility development area

Figure 10 Photographic evidence of the red colours of the Hutton profiles on site

Figure 11 Photographic evidence of the yellow-brown soil of the Ermelo soil form present within the development area

9.2 Land use and agricultural activities

Although the soil physical and chemical properties do not pose limitations to crop production, the climate of the development area is semi-arid to arid and erratic rainfall patterns increase the risk of crop failure. According to Climate-data.org (2021), the Kathu area has average annual rainfall of 395mm with the month of March on average the month with the highest monthly rainfall (74mm per month). The area is not considered suitable for rainfed crop production.



Following the previous land capability classification, the Hyperion Thermal Dual Fuel Facility and development area and northern part of the access road consist of land with Low-Moderate (Class 07) land capability. The area with shallower soil of the Vaalbos form falls outside the proposed boundary fence, however, this area has Low-Moderate (Class 06) land capability. Both these land capability classes are suitable for livestock farming.

The current land use on all the land parcels assessed, is a combination of natural veld that support local biodiversity and cattle farming. The vegetation of the study area consists of a mixture of veld grass and shrubs and trees of the Vachellia and Grewia genera amongst others. (Figure 12).

Since the proposed infrastructure within the development area will be fenced off, it will no longer be available for livestock grazing. The area that will be fenced off and excluded from livestock farming is around 350.9ha. Similarly, the access road will be stripped of vegetation in preparation of the road surface and will no longer be suitable for livestock grazing. The access road will approximately be 8544m long and be no wider than 15m. Following the average grazing capacity of the area (11 ha/LSU), the development of the Hyperion Thermal Dual Fuel Facility will affect grazing veld that can feed 32 head of cattle.

Although it is uncertain whether the access road will be fenced off, the access road area will approximately remove grazing veld of 1 head of cattle (around 12.8 ha to be affected).

Figure 12 Photographic evidence of the natural vegetation (*Vachellia sp*.) of the Hyperion Thermal Dual Fuel Facility

9.3 Sensitivity analysis

Following the consideration of all the desktop and gathered baseline data above, **the area is considered to have Low to Medium Agricultural Sensitivity** to the proposed development. Although the deep soil profiles and soil chemical composition have the ability to support crop production, the arid climate and occurrence of drought spells from time to time, makes these areas not suitable for rainfed agriculture. Since no irrigation infrastructure such as centre pivots or drip irrigation as well as dams are present within the development area, irrigated agricultural is currently not practiced in the area.

From a soil quality conservation perspective, the area is considered to have **Medium Sensitivity** to the proposed development. The sandy texture of the soil indicate that soil will be sensitive to soil erosion in the absence of vegetation cover and the low buffering capacity and high water infiltration rate of these soils increase the risk of soil contamination spread, should it occur.

The anticipated impacts of the proposed project on the soil properties and land productivity, are discussed in Section 10 below.

10. Impact assessment

10.1 Project description

The proposed Hyperion thermal generation plant will include the following infrastructure:

- Gas turbines or Reciprocating Engines
- Access road (tarred and not wider than 15m)
- Truck entrance and parking facility
- Regasification plant
- Dry cooling system
- Fuel off-loading facility
- Fuel storage facility
- Water demineralisation plant
- O&M building, fencing, warehouses and workshops

The power generated will connect to an authorised substation via an overhead 132kV power line. However, the power line is not part of this Environmental Authorisation process and impacts of the activities associated with power line construction is excluded from the discussion below.

10.2 Impact significance rating

The most significant impacts of the proposed Hyperion Thermal Dual Fuel Facility project on soil and agricultural productivity, will occur during the construction phase when the vegetation

is removed and the soil surface is prepared for road building and infrastructure commissioning. During the operational phase, the risk remains that soil will be polluted by the waste generated during the operational phase or in the case of a spill incident. During the decommissioning phase, soil will be prone to erosion when the infrastructure is removed from the soil surface. Below follows a rating of the significance of each of the impacts.

10.2.1. Construction phase

Impact: Soil erosion

Nature: All areas where vegetation is removed from the soil surface in preparation for the infrastructure construction, will result in exposed soil surfaces that will be prone to erosion. Both wind and water erosion are a risk and even though the project area is in the arid climate, the intensity of single rainstorm may result in soil particles being transported away.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A
Mitigation: • Land clearance must only be undertaken immediately prior to construction activities and only within the development footprint; • Unnecessary land clearance must be avoided; • Level any remaining soil removed from excavation pits that remained on the surface instead of allowing small stockpiles of soil to remain on the surface. • Where possible, conduct the construction activities outside of the rainy season.		
Residual Impacts: The residual impact from the construction and operation of the proposed Hyperion Dual Thermal Facility on the susceptibility to erosion is considered low.		
Cumulative Impacts: Any additional infrastructure development in support of the Hyperion SEF complex and the Hyperion Dual Thermal Facility, will result in additional areas where exposed to soil erosion through wind and water movement.		

Impact: Soil compaction

Nature: The clearing and levelling of land for both the thermal plant infrastructure as well as the access road, will result in soil compaction. In the area where the access road will be constructed, topsoil will be removed and the remaining soil material will be deliberately compacted to ensure a stable road surface.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No

Can impacts be mitigated?	Yes	N/A
Mitigation: • Vehicles and equipment must travel within demarcated areas and not outside of the construction footprint; • Unnecessary land clearance must be avoided; • Where possible, conduct the construction activities outside of the rainy season; and • Vehicles and equipment must park in designated parking areas.		
Residual Impacts: The residual impact from the construction and operation of the proposed Hyperion Thermal Dual Fuel Facility on soil compaction is considered low.		
Cumulative Impacts: Any additional infrastructure development in support of the Hyperion SEF complex and the Hyperion Dual Thermal Facility, will result in additional areas exposed to soil compaction.		

Impact: Soil pollution

During the construction phase, construction workers will access the land for the preparation of the terrain and the construction of the thermal plant and access road. Both potential spills and leaks from construction vehicles and equipment as well as waste generation on site, can result in soil pollution.

Nature: The following construction activities can result in the chemical pollution of the soil: 1. Petroleum hydrocarbon (present in oil and diesel) spills by machinery and vehicles during earthworks and the removal of vegetation as part of site preparation. 2. Spills from vehicles transporting workers, equipment, and construction material to and from the construction site. 3. The accidental spills from temporary chemical toilets used by construction workers. 4. The generation of domestic waste by construction workers. 5. Spills from fuel storage tanks during construction. 6. Pollution from concrete mixing. 7. Pollution from road-building materials. 8. Any construction material remaining within the construction area once construction is completed. 9. Containment breaches related to the battery units and any inadvertent chemical exposure therefrom.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Low (4)	Improbable (2)
Significance	**Medium (36)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A
Mitigation: • Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills; • Any waste generated during construction, must be stored into designated containers and removed from the site by the construction teams. • Any left-over construction materials must be removed from site		
Residual Impacts: The residual impact from the construction and operation of the proposed project will be low to negligible.		
Cumulative Impacts:		

Any additional infrastructure that will be constructed to strengthen and support the operation of the Hyperion SEF complex and the Hyperion Dual Thermal Facility and where waste is not removed to designated waste sites, will increase the cumulative impacts associated with soil pollution in the area.

10.2.2. Operational phase

Impact: Soil erosion

During the operational phase, staff and maintenance personnel will access the Hyperion Thermal Dual Fuel Facility daily. This phase will have no additional impact on the livestock farming potential of the area. The following impacts on soil is expected for this phase:

Nature: The areas where vegetation was cleared, will remain at risk of soil erosion, especially during a rainfall event when runoff from the cleared surfaces will increase the risk of soil erosion in the areas directly surrounding the Hyperion thermal plant and access road.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (30)**	**Low (16)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A
Mitigation: • The area around the Hyperion thermal plant as well as the access road must regularly be monitored to detect early signs of soil erosion on-set. • If soil erosion is detected, the area must be stabilised by the use of geo-textiles and facilitated re-vegetation.		
Residual Impacts: The residual impact from the operation of the proposed Hyperion Thermal Dual Fuel Facility on the susceptibility to erosion is considered low.		
Cumulative Impacts: Any additional infrastructure that will be constructed to strengthen and support the operation of Hyperion SEF complex and the Hyperion Dual Thermal Facility, will result in additional areas where exposed to soil erosion through wind and water movement.		

Impact: Soil pollution

Nature: During the operational phase, potential spills and leaks from maintenance vehicles and equipment as well as waste generation on site, can result in soil pollution. Also, any failure of the fuel storage containers or equipment can be a source of soil pollution.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Low (4)	Improbable (2)
Significance	**Medium (36)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low

Irreplaceable loss of resources?	Yes	No
Can impacts be mitigated?	Yes	N/A
Mitigation: • Maintenance must be undertaken regularly on all vehicles and maintenance machinery to prevent hydrocarbon spills; • No domestic and other waste must be left at the site and must be transported with the maintenance vehicles to an authorised waste dumping area. •		
Residual Impacts: The residual impact from the operation of the proposed project will be low to negligible.		
Cumulative Impacts: The operation of any additional infrastructure to strengthen and support the operation of the Hyperion Thermal Dual Fuel Facility and where waste is not removed to designated waste sites, will increase the cumulative impacts associated with soil pollution in the area.		

10.2.3. Decommissioning phase

The decommissioning phase will have the same impacts as the construction phase i.e. soil erosion, soil compaction and soil pollution. It is anticipated that especially the risk of soil erosion will remain until the vegetation growth has re-established in the area where the Hyperion thermal plant was decommissioned.

11. Cumulative Impacts

"Cumulative Impact", in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities[1].

The role of the cumulative assessment is to test if such impacts are relevant to the proposed project in the proposed location (i.e. whether the addition of the proposed project in the area will increase the impact). This section should address whether the construction of the proposed development will result in:

- Unacceptable risk
- Unacceptable loss
- Complete or whole-scale changes to the environment or sense of place
- Unacceptable increase in impact

The cumulative impacts of the proposed project have been discussed in Section 10 above.

[1] Unless otherwise stated, all definitions are from the EIA Regulations 2014 (GNR 326).

Table 1 Assessment of cumulative impact of decrease in areas available for livestock farming

Nature: Decrease in areas with suitable land capability for cattle farming.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Short duration - 2-5 years (2)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Highly likely (4)	Highly likely (4)
Significance	**Low (28)**	Medium (40)
Status (positive/negative)	Negative	Negative
Reversibility	High	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Confidence in findings: High.		
Mitigation: The only mitigation measure for this impact is to keep the footprints of all renewable energy facilities as small as possible and to manage the soil quality by avoiding far-reaching soil degradation such as erosion.		

Table 2 Assessment of cumulative impact of areas susceptible to soil erosion

Nature: Increase in areas susceptible to soil erosion		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Regional (2)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Medium (30)**	**Medium (33)**
Status (positive/negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Confidence in findings: High.		
Mitigation: Each of the projects should adhere to the highest standards for soil erosion prevention and management as defined in Section 10.2.2 above.		

Table 3 Assessment of cumulative impact of increased risk of soil pollution

Nature: Increase in areas susceptible to soil pollution

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Local (1)	Regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Medium (30)**
Status (positive/negative)	Negative	Negative
Reversibility	Low	Low
Loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	No
Confidence in findings: High.		
Mitigation: Each of the projects should adhere to the highest standards for soil pollution prevention and management as defined in Section 10.2.3 above.		

12. Mitigation and management measures

The objective of the mitigation and management measures presented below are to reduce the risk of soil degradation that will in turn result in affect the ability of soils in within the project site to support the natural vegetation and provide ecosystem services.

Prevention and management of soil erosion:

Project component/s	• Construction of infrastructure • Construction of the access road
Potential Impact	Soil particles can be removed from the area through wind and water erosion
Activity/risk source	The removal of vegetation in areas where infrastructure will be constructed
Mitigation: Target/Objective	To avoid the onset of soil erosion that can spread into other areas

Mitigation: Action/control	Responsibility	Timeframe
• Limit vegetation clearance to only the areas where the surface infrastructure will be constructed. • Avoid parking of vehicles and equipment outside of designated parking areas. • Plan vegetation clearance activities for dry seasons (late autumn, winter and early spring). • Design and implement a Stormwater Management System where run-off from surfaced areas are expected.	Environmental Control Officer / SHEQ division	During the entire construction, operational and decommissioning phases

• Re-establish vegetation along the access road to reduce the impact of run-off from the road surface.		

Performance Indicator	No visible signs of soil erosion around the project infrastructure
Monitoring	• Regular inspections around the constructed infrastructure to detect early signs of soil erosion developing. • When signs of erosion is detected, the areas must be rehabilitated using a combination of geo-textiles and re-vegetation to prevent the eroded area(s) from expanding.

Prevention and management of soil pollution:

Project component/s	• Construction of infrastructure • Daily activities and maintenance during the operational phase
Potential Impact	Potential fuel and oil spills from vehicles as well as the generation of waste can cause soil pollution.
Activity/risk source	• Petroleum hydrocarbon (present in oil and diesel) spills by machinery and vehicles during earthworks and the removal of vegetation as part of site preparation. • Spills from vehicles transporting workers, equipment, and construction material to and from the construction site. • The accidental spills from temporary chemical toilets used by construction workers. • The generation of domestic waste by construction workers. • Spills from fuel storage tanks during construction. • Pollution from concrete mixing. • Pollution from road-building materials. • Any construction material remaining within the construction area once construction is completed. • Containment breaches related to the battery units and any inadvertent chemical exposure therefrom.
Mitigation: Target/Objective	To avoid soil pollution that can harm the surrounding environment and human health.

Mitigation: Action/control	Responsibility	Timeframe
• Maintenance must be undertaken regularly on all vehicles and construction/maintenance machinery to prevent hydrocarbon spills; • Any waste generated during construction, must be stored into designated containers and removed from the site by the construction teams. • Any left-over construction materials must be removed from site.	Environmental Control Officer / SHEQ division	During the entire construction, operational and decommissioning phases

• Ensure battery transport and installation by accredited staff / contractors. • Compile (and adhere to) a procedure for the safe handling of battery cells during transport and installation.		

Performance Indicator	• No visible signs of waste and spills within the project site. • No accumulation of contaminants in the soils of the project site.
Monitoring	• Regular inspections of vehicles and equipment that enter the project site. • Analysis of soil samples around high-risk areas to determine whether soil contaminants are present. • In the case that soil pollution is detected, immediate remediation must be done.

10. Acceptability statement

Following the data analysis and impact assessment above, the proposed Hyperion Thermal Dual Fuel Facility and access road is considered an acceptable development within the area of the project assessment zone that was assessed for the purpose of compiling the Agricultural Compliance Report.

The project assessment zone consists largely of deep, well-drained and structureless (apedal) soils of the Hutton and Ermelo forms. The soil pH range between slightly acidic and neutral and the plant nutrients are sufficient should the soil have been used for crop production. Although the soil properties may be suitable for crop production, the arid climate and erratic rainfall patterns of the area proposed for the Hyperion Thermal Dual Fuel Facility, reduces the land capability to that of land suitable for livestock farming. In the absence of irrigation water and infrastructure, the area is also not considered suitable for irrigated crop production. The land capability of the site is Low-Moderate and the grazing capacity (according to DAFF, 2018), is around 11ha/LSU.

It is anticipated that the construction and operation of the Hyperion Thermal Dual Fuel Facility will have impacts that range from medium to low. Through the consistent implementation of the recommendation mitigation measures, most of impacts can all be reduced to low. Since the area around the plant will be fenced off, it is not anticipated that the impact on livestock farming can be mitigated as this area together with the access road alignment, will now be excluded from livestock farming.

Considering that the thermal plant infrastructure components will be placed in close proximity to each other, I confirm that all reasonable measures have been taken to avoid or minimize

fragmentation and disturbance of agricultural activities, provided that the mitigation measures provided in this report are implemented.

It is my professional opinion that this application be considered favourably, permitting that the mitigation measures are followed to prevent soil erosion and soil pollution and to minimise impacts on the veld quality of the farm portions that will be affected. The project infrastructure should also remain within the proposed footprint boundaries that will be fenced off and the construction corridor around the access road must be as narrow as possible.

11. Reference list

Crop Estimates Consortium, 2019. *Field crop boundary data layer (NC province)*, 2019. Pretoria. Department of Agriculture, Forestry and Fisheries.

Department of Agriculture, Forestry and Fisheries, 2017. *National land capability evaluation raster data: Land capability data layer*, 2017. Pretoria.

Land Type Survey Staff, 1972 – 2006. *Land Types of South Africa data set*. ARC – Institute for Soil, Climate and Water. Pretoria.

South Africa (Republic), 2018. *Long-term grazing capacity for South Africa*: Data layer. Government Gazette Vol. 638, No. 41870. 31 August 2018. Regulation 10 of the Conservation of Agricultural Resources Act (CARA): Act 43 of 1983. Pretoria. Government Printing Works.

The Soil Classification Working Group, 2018. *Soil Classification – Taxonomic System for South Africa.* Dept. of Agric., Pretoria.

APPENDIX 1 – SOIL ANALYSIS RESULTS

NORTH-WEST UNIVERSITY
ECO-ANALYTICA

Eco Analytica
P.O. Box 19140
NOORDBRUG 2522
Tel: 018-285 2732/3/4

TERRA AFRICA (HYPERION)
30/10/2018 **Nutrient Status**

Sample no.	Ca	Mg	K	Na	P	pH(H_2O)	EC	LOI
	(mg/kg)						(mS/m)	%C
1	544,2	21,6	81,2	51,7	10,4	6,47	21	0,36
2	280,7	83,1	329,4	77,2	10,0	5,78	231	0,16
3	328,1	31,0	97,9	41,9	7,3	6,07	7	0,22
4	405,2	76,3	93,9	58,9	6,1	6,53	8	0,22
5	154,2	10,1	54,9	55,9	6,9	5,64	5	0,18
6	190,9	35,7	71,1	58,4	6,2	5,69	6	0,16
7	166,0	10,5	58,5	57,1	6,2	5,39	5	0,25
8	186,2	35,3	73,5	57,7	5,7	5,74	5	0,26
9	264,5	22,7	77,0	55,3	6,3	6,14	10	0,24
10	187,9	17,3	114,8	43,4	5,3	6,34	9	0,30

30/10/2018 **Particle Size Distribution**

Sample no.	> 2mm (%)	Sand	Silt	Clay
		(% < 2mm)		
1	0,0	96,0	1,6	2,4
2	0,0	95,9	1,6	2,5
3	0,0	95,9	1,6	2,4
4	0,0	93,9	1,6	4,5
5	0,0	94,8	3,5	1,7
6	0,3	94,7	3,6	1,7
7	0,2	94,7	3,6	1,7
8	0,6	92,7	3,6	3,7
9	0,0	94,7	3,6	1,7
10	0,1	94,6	3,7	1,7

HANDBOOK OF STANDARD SOIL TESTING METHODS FOR ADVISORY PURPOSES
Exchangeable cations 1M NH_4-Asetaat pH=7 EC: Saturated Extraction
CEC: 1 M Na-asetaat pH=7 pH H_2O/KCl: 1:2.5 Extraction
Extractable, Exchangeable micro-elements: 0.02M $(NH_4)_2$ EDTA Phosphorus: P-Bray 1 Extraction

This laboratory participates in the following quality control schemes:
International Soil-Analytical Exchange (ISE), Wageningen, Nederland.
No responsibility is accepted by North-West University for any losses due to the use of this data

APPENDIX 2 - CURRICULUM VITAE OF SPECIALIST

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Wolmaransstad,
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EXPERTISE

Soil Quality Assessment

Soil Policy and Guidelines

Agricultural Agro-Ecosystem Assessment

Sustainable Agriculture

Data Consolidation

Land Use Planning

Soil Pollution

Hydropedology

EDUCATION

MASTER'S DEGREE
Environmental Science
University of Witwatersrand
2010 – 2018

BACHELOR'S DEGREE
Agricultural Science
University of Pretoria
2001 – 2004

PROFESSIONAL PROFILE

I contribute specialist knowledge on agriculture and soil management to ensure long-term sustainability of projects in Africa. For the past thirteen years, it has been my calling and I have consulted on more than 200 projects. My clients include environmental and engineering companies, mining houses, and project developers. I enjoy the multi-disciplinary nature of the projects that I work on and I am fascinated by the evolving nature of my field of practice. The next section provide examples of the range of projects completed. A comprehensive project list is available on request.

PROJECT EXPERIENCE

Global Assessment on Soil Pollution

Food and Agricultural Organisation (FAO) of the United Nations (UN)

Author of the regional assessment of Soil in Sub-Saharan Africa. The report is due for release in February 2021. The different sections included:

- Analysis of soil and soil-related policies and guidelines for each of the 48 regional countries
- Description of the major sources of soil pollution in the region
- The extent of soil pollution in the region and as well as the nature and extent of soil monitoring
- Case study discussions of the impacts of soil pollution on human and environmental health in the region
- Recommendations and guidelines for policy development and capacitation to address soil pollution in Sub-Saharan Africa

Data Consolidation and Amendment

Range of projects: Mining Projects, Renewal Energy

These projects included developments where previous agricultural and soil studies are available that are not aligned with the current legal and international best practice requirements such as the IFC Principles. Other projects are expansion projects or changes in the project infrastructure layout. Tasks on such projects include the incorporation of all relevant data, site verification, updated baseline reporting and alignment of management and monitoring measures.

Project examples:

- Northam Platinum's Booysendal Mine, South Africa
- Musonoi Mine, Kolwezi District, Democratic Republic of Congo
- Polihali Reservoir and Associated Infrastructure, Lesotho
- Kaiha 2 Hydropower Project, Liberia
- Aquarius Platinum's Kroondal and Marikana Mines

PROFESSIONAL MEMBERSHIP

South African Council for Natural Scientific Professions (SACNASP)

Soil Science Society of South Africa (SSSSA)

Soil Science Society of America (SSSA)

Network for Industrially Contaminated Land in Africa (NICOLA)

LANGUAGES

English (Fluent)

Afrikaans (Native)

French (Basic)

PRESENTATIONS

There is spinach in my fish pond
TEDx Talk
Available on YouTube

♦

Soil and the Extractive Industries
Session organiser and presenter
Global Soil Week, Berlin (2015)

♦

How to dismantle an atomic bomb
Conference presentation (2014)
Environmental Law Association (SA)

PROJECT EXPERIENCE (Continued)

Agricultural Agro-Ecosystem Assessments

Range of projects: Renewable Energy, Industrial and Residential Developments, Mining, Linear Developments (railways and power lines)

The assessments were conducted as part of the Environmental and Social Impact Assessment processes. The assessment process includes the assessment of soil physical and chemical properties as well as other natural resources that contributes to the land capability of the area.

Project examples:

- Mocuba Solar PV Development, Mozambique
- Italthai Railway between Tete and Quelimane, Mozambique
- Lichtenburg PV Solar Developments, South Africa
- Manica Gold Mine Project, Mozambique
- Khunab Solar PV Developments near Upington, South Africa
- Bomi Hills and Mano River Mines, Liberia
- King City near Sekondi-Takoradi and Appolonia City near Accra, Ghana
- Limpopo-Lipadi Game Reserve, Botswana
- Namoya Gold Mine, Democratic Republic of Congo

Sustainable Agriculture

Range of projects: Policy Development for Financial Institutions, Mine Closure Planning, Agricultural Project and Business Development Planning

Each of the projects completed had a unique scope of works and the methodology was designed to answer the questions. While global indicators of sustainable agriculture are considered, the unique challenges to viable food production in Africa, especially climate change and a lack of infrastructure, in these analyses.

Project examples:

- Measurement of sustainability of agricultural practices of South African farmers – survey design and pilot testing for the LandBank of South Africa
- Analysis of the viability of avocado and mango large-scale farming developments in Angola for McKinsey & Company
- Closure options analysis for the Tshipi Borwa Mine to increase agricultural productivity in the area, consultation to SLR Consulting
- Analysis of risks and opportunities for farm feeds and supplement suppliers of the Southern African livestock and dairy farming industries
- Sustainable agricultural options development for mine closure planning of the Camutue Diamond Mine, Angola

PROFESSIONAL DEVELOPMENT

Contaminated Land Management 101Training Network for Industrially Contaminated Land in Africa
2020

Intensive Agriculture in Arid & Semi-Arid Environments
CINADCO/MASHAV R&D Course, Israel
2015

World Soils and their Assessment Course
ISRIC – World Soil Information Centre, Netherlands
2015

Wetland Rehabilitation Course
University of Pretoria
2010

Course in Advanced Modelling of Water Flow and Solute Transport in the Vadose Zone with Hydrus
University of Kwazulu-Natal
2010

Environmental Law for Environmental Managers
North-West University Centre for Environmental Management
2009

PROJECT EXPERIENCE (Continued)

Soil Quality Assessments

Range of projects: Rehabilitated Land Audits, Mine Closure Applications, Mineral and Ore Processing Facilities, Human Resettlement Plans

The soil quality assessments included physical and chemical analysis of soil quality parameters to determine the success of land rehabilitation towards productive landscapes. The assessments are also used to understand the suitability for areas for Human Resettlement Plans

Project examples:

- Closure Planning for Yoctolux Colliery
- Soil and vegetation monitoring at Kingston Vale Waste Facility
- Exxaro Belfast Resettlement Action Plan Soil Assessment
- Soil Quality Monitoring of Wastewater Irrigated Areas around Matimba Power Station
- Keaton Vanggatfontein Colliery Bi-Annual Soil Quality Monitoring

REFERENCES

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