

10.4 The Specialist

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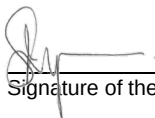
I ILSE SNYMAN, as the appointed specialist hereby declare/affirm the correctness of the information provided as part of the application, and that I:

- in terms of the general requirement to be independent (tick which is applicable):

x	other than fair remuneration for work performed/to be performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity; or
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	am not independent, but another EAP that is independent and meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
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- have expertise in conducting specialist work as required, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- will ensure compliance with the EIA Regulations 2014;
- 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 application;
- will take into account, to the extent possible, the matters listed in regulation 18 of the regulations when preparing the application and any report, plan or document relating to the application;
- will disclose to the proponent or applicant, registered interested and affected parties 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 or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- declare that all the particulars furnished by me in this form are true and correct;
- am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).



Signature of the specialist

SOIL ADVISORY SERVICES (PTY) LTD

Name of company

21-07-2025

Date



10.5 The Review Specialist

I, as the appointed review specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- am independent, and other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the activity or application and that there are no circumstances that may compromise my objectivity;
- am fully aware of and meet all of the requirements of Regulation 13, and that failure to comply with any the requirements may result in disqualification;
- have reviewed/will review all the work undertaken by the specialist;
- have disclosed/will disclose, to the applicant, the EAP, other specialist (if any), the Department and interested and affected parties, all material information that have or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of regulation 48 of the 2014 NEMA EIA Regulations.

Signature of the review specialist

Name of company

Date



Soil, Land Capability and
Agricultural Potential
Assessment for the
proposed Waste Water
Treatment Plant &
expansion of Diesel
Storage at McCain's
Delmas Operation,
Mpumalanga province

For: WSP Africa

JUN 2025

Document no. SAS20241101-1-MCC-SLCAP

Executive summary

McCain is proposing to develop a wastewater treatment plant and expand the diesel storage area at their Delmas operation in the Mpumalanga province. WSP Group Africa (Pty) Ltd (WSP) was appointed to conduct the environmental authorisation (EA) application process for the proposed facility in terms of the National Environmental Management Act (NEMA) and the 2014 Environmental Impact Assessment (EIA) Regulations, as amended. A specialist soil, land capability and agricultural potential assessment for the proposed facility, in support of the environmental authorisation (EA) application process, was consequently conducted in March 2025.

The objective of the specialist study was as follows:

- Provide a detailed description of baseline soil characteristics and land capability (Section 7).
- Undertake a soil, land capability and agricultural potential impact assessment (Section 8).
- Identify and map sensitive areas based on the above-mentioned information (Section 7).
- Evaluate the potential impacts associated with the proposed project activities (Section 8.2)
- Provide recommendations to mitigate the potential impacts on soil, land capability and agricultural potential associated with the proposed project (Sections 8.3 and 8.4).

A soil survey was conducted on 20 March 2025 of the proposed footprint of the WWTP, where five observation points were evaluated during the survey and the land uses/activities, soil features, recorded, and the soil forms determined. A set of 4 representative soil samples were submitted for laboratory analysis of specific soil properties required for soil classification purposes and also for determining the soil fertility status. Note: The footprint designated for the new diesel storage tank and clarifier is located within the existing operational area and was thus not surveyed. The potential impacts on soil due to the new diesel storage tank were however considered in detail in Section 8.

From a soil assessment perspective, the proposed footprint of the WWTP can be divided into two portions, namely, the fill-material area (western portion) and the uncovered, Hutton soils (eastern portion). The fill-material was characterised as part of the geotechnical investigation of the site, and was confirmed to contain mainly excavated soil and rocks from the construction activities at the McCain Delmas operation (north of the proposed WWTP footprint). The soils along the eastern portion of the project site are characterised by reddish brown, friable, sandy loam topsoil, gradually transitioning into the friable, medium sandy loam apedal B horizon. Inherently these soils have a high land capability (i.e., very few limitations to dryland cropping). However, given the relatively small extent of this high land capability land, commercial dryland cropping would not be economically feasible. The overall soil agricultural potential of the site was thus rated as medium to low. The historical images of the proposed WWTP footprint do not show distinct land uses related to commercial cropping. The land could however historically have been used for grazing, or smaller scale crop production (though not visible from historic imagery), given the high land capability of the uncovered portion of the site.

The key anticipated impacts on the soil, land capability and land use due to the proposed project activities mainly affect soil quality, soil quantity, land use, and land capability. The significance of the potential impacts on the soil and agricultural potential are moderate due to the nature of the project activities. However, with the implementation of appropriate mitigation measures the significance of the impacts can be reduced. The mitigation measures are focussed on preventing and controlling the potential impacts on the soil. The recommended soil monitoring programme includes regular site inspections on the proposed WWTP and new diesel tank footprints, and appropriately managing accidental waste, chemical and diesel spills in areas where soils are exposed.

Table of Contents

1.	Introduction	1
2.	Project background	1
3.	Regulatory considerations	4
4.	Environmental setting	4
4.1.	Regional soil information.....	4
4.2.	Geology	4
4.3.	Water resources and wetlands	4
4.4.	Agricultural sensitivity classification	4
5.	Specialist study objectives.....	7
6.	Methodology	7
6.1.	Desktop study.....	7
6.2.	Field survey, soil sampling and analysis	7
6.3.	Data analysis, baseline reporting and impact assessment.....	8
7.	Soil, Land Capability, Land Use and Agricultural Potential	8
7.1.	Soil survey	8
7.2.	Soil fertility status.....	12
7.3.	Land capability	13
7.4.	Soil agricultural potential	15
7.5.	Land use	17
8.	Impact assessment	20
8.1.	Methodology.....	20
8.2.	Potential impacts.....	22
8.3.	Significance rating	23
8.3.1.	Construction phase	25
8.3.2.	Operational phase	25
8.3.3.	Decommissioning and closure phase.....	25
8.4.	Mitigation Measures	26
8.4.1.	Recommended mitigation measures	26
8.4.2.	Recommended monitoring and evaluation programme	26
9.	Study assumptions & limitations	27
10.	Conclusions.....	28
11.	References	28

FIGURES

Figure 1.	Location of the proposed project.....	2
Figure 2.	Preliminary site layout.....	3

Figure 3. Land type of study area	5
Figure 4. Agricultural Sensitivity for project site	6
Figure 5. Darker topsoil and red subsoil of Hutton soil (left), stony soil surface of soils surrounding study area	9
Figure 6. Soil mixed with stones in fill-material area and rocks in fill-material area of site.....	9
Figure 7. Locations of soil observation points.....	10
Figure 8. Soil map for project site	11
Figure 9. Soil texture triangle indicating topsoil (red) and subsoil (blue) texture classification	12
Figure 10. Land capability map.....	14
Figure 11. Soil agricultural potential of project site.....	16
Figure 12. Historical images from 1944 (left) and 1996 (right) of the project site.	17
Figure 13. Current land use conditions at project site.....	18
Figure 14. Neighbouring commercial cultivated fields (left), and vegetation within fill material area (right).....	18
Figure 15. National Land Cover map of project site	19
Figure 16. Mitigation Sequence/Hierarchy.....	22

TABLES

Table 1. Soil and Land Use survey observations	8
Table 2. Soil fertility of representative soil profiles.....	12
Table 3. Land capability classification for project area.....	13
Table 4. Criteria used for soil agricultural potential rating	15
Table 5. Impact Assessment Criterion and Scoring System	20
Table 6. Anticipated activities relevant to potential impacts on soil and agriculture	22
Table 7. Impact significance rating.....	24
Table 8. Recommended monitoring and evaluation programme.....	27

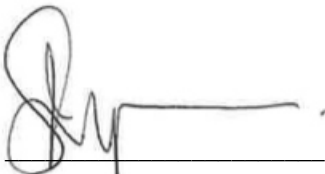
APPENDICES

Appendix A. Laboratory certificates.....	30
Appendix B: CV of specialist	31

Declaration of Independence

I, **Ilse Snyman**, in my capacity as a professional scientist, hereby declare that I -

- Act as an independent consultant.
- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998).
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- As a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member; and
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional judgement.



Ilse Snyman (PrSciNat)

Soil Scientist

SACNASP Reg. No. 400282/14

26 June 2025

Date

1. Introduction

McCain is proposing to develop a wastewater treatment plant and expand the diesel storage area at their Delmas operation in the Mpumalanga province. WSP Group Africa (Pty) Ltd (WSP) was appointed to conduct the environmental authorisation (EA) application process for the proposed facility in terms of the National Environmental Management Act (NEMA) and the 2014 Environmental Impact Assessment (EIA) Regulations, as amended. A specialist soil, land capability and agricultural potential assessment for the proposed facility, in support of the environmental authorisation (EA) application process, was consequently conducted in March 2025.

This report document details the methodology, results, and overall findings of the specialist study.

2. Project background

The following project description has been provided to Soil Advisory Services by WSP:

Proposed wastewater treatment plant:

McCain Delmas proposes to develop a new wastewater treatment plant (WWTP) to treat effluent that is generated from the manufacturing process. The plant will have a maximum treatment flowrate of 3 400 m³/day and will be located in the northwestern corner of the site, on McCain-owned property. The effluent will be treated to meet the quality requirements that would be suitable for discharge to municipal sewer or for plant use (potable water quality). Waste activated sludge (WAS) from the treatment plant will be temporarily stored in hoppers on site and ultimately disposed offsite.

The plant will include an anaerobic digestion process for chemical oxygen demand (COD) containing wastes on site, such as fryer waste, slivers, and other materials that are collected in the main wastewater screen and oily-water screen. The anaerobic digester will convert the COD into biogas, which can be used to either generate power or displace natural gas in the processing plant's boilers. The digester feed flow will be approximately 385 m³/day, with a total digestion volume of 9 074 m³.

The development footprint for the facility will be approximately 9 000 m² and will include the following key infrastructure components:

- Primary Clarifier
- Equalisation Tank
- Upflow Anaerobic Sludge Blanket (UASB) Feedtank & Pumps
- UASB Sludge
- Activated Sludge
- Waste Water Process Building
- Secondary Clarifier
- Biogas Digester
- Biogas & Power Building
- Flare

Proposed diesel tank:

McCain Delmas cumulatively stores 43.782 m³ of diesel in various tanks on site and proposes to install an additional 79 m³ diesel storage tank next to a current 30 m³ diesel storage tank. The proposed diesel storage tank will be a self-bunded (double wall) containerised tank, with the same design as the current 30 m³ diesel storage tank.

The proposed infrastructure layout is shown in Figure 2.

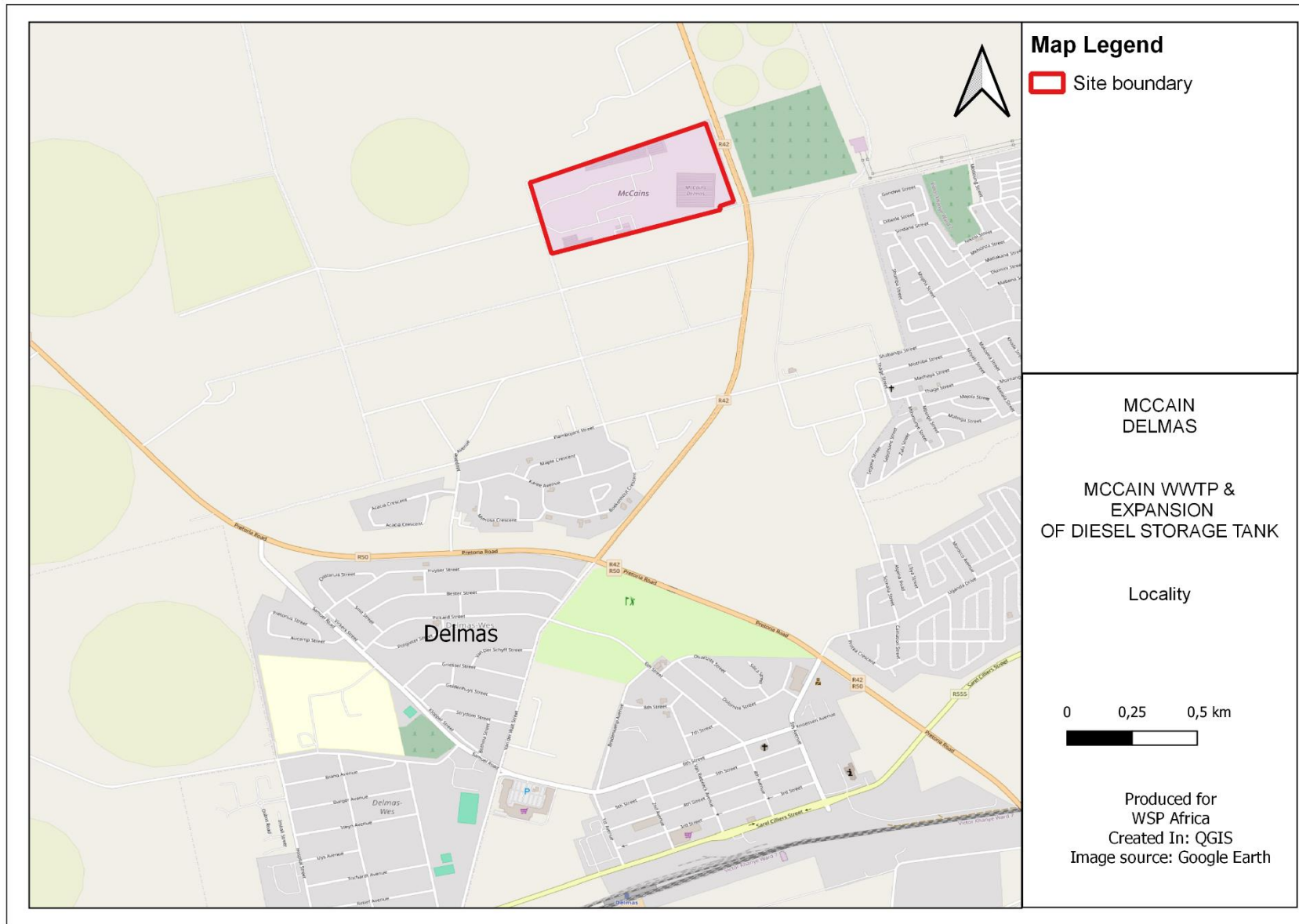


Figure 1. Location of the proposed project

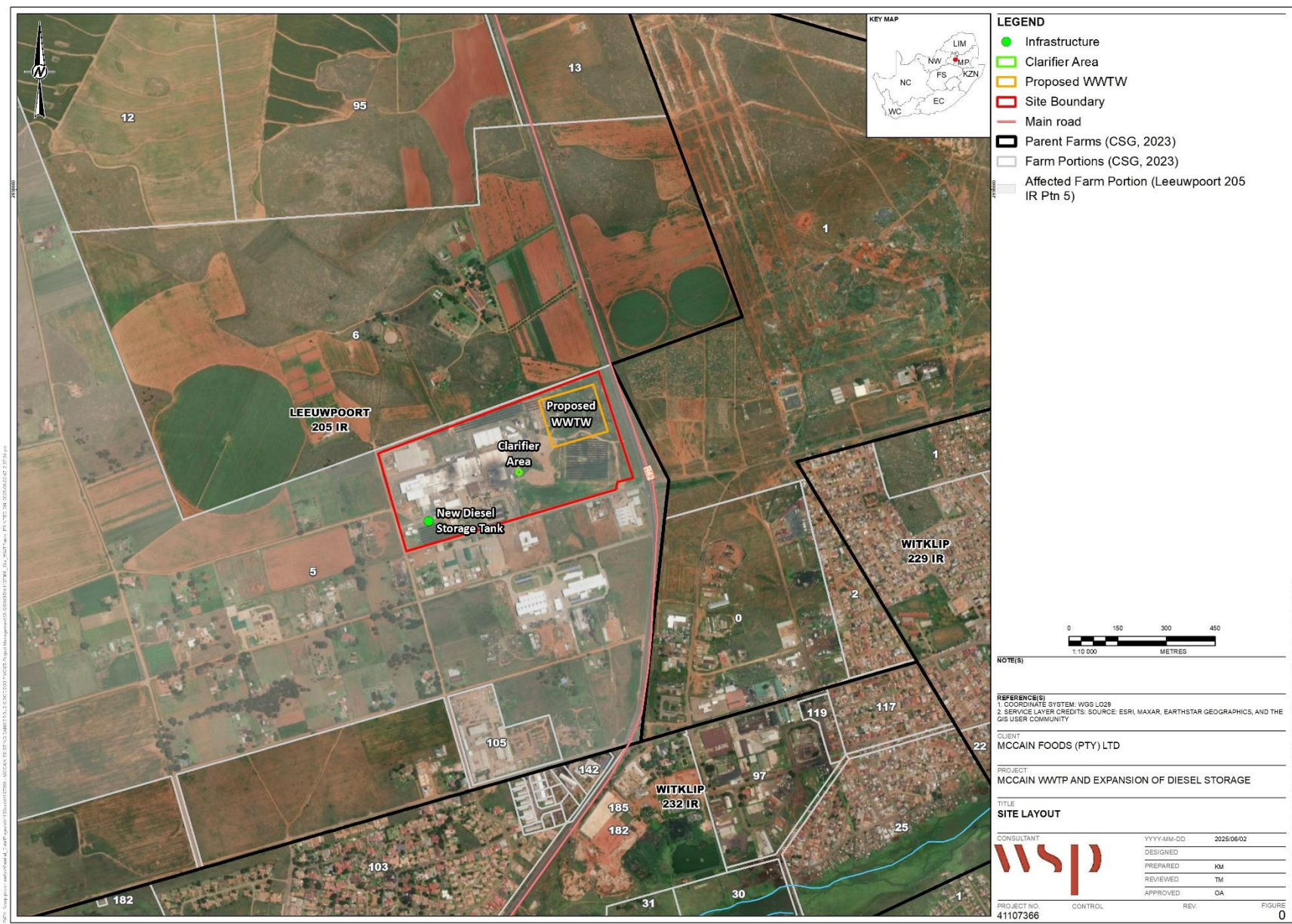


Figure 2. Preliminary site layout

3. Regulatory considerations

The South African Environmental Legislation that needs to be considered for the proposed project with regards to management of soil are as follows:

- The law on Conservation of Agricultural Resources (Act 43 of 1983) states that the degradation of the agricultural potential of soil is illegal.
- The Conservation of Agriculture Resources Act 43 of 1983 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 Bill of Rights states that environmental rights exist primarily to ensure good health and well-being, and secondarily to protect the environment through reasonable legislation, ensuring the prevention of the degradation of resources.
- The National Environmental Management Act (No. 107 of 1998), which prescribes three principles, namely the precautionary principle, the “polluter pays” principle and the preventive principle; soils and land capability are protected under the National Environmental Management Act 107 of 1998, the Environment Conservation Act 73 of 1989, the Mineral and Petroleum Resources Development Act (MPRDA) of 2002 and the Conservation of Agricultural Resources Act 43 of 1983.

4. Environmental setting

4.1. Regional soil information

A reconnaissance survey at a scale of 1:250 000 was conducted in South Africa in the early 1970s in order to compile inventories of the natural resources of South Africa in terms of soil, climate and terrain. The survey reflects the dominant soils in each land type by percentage. The land type information is not a substitute for a detailed soil map but gives a very good indication of where certain soil patterns are located. The land type memoirs and associated maps of 2528 Pretoria and 2628 East Rand (Land Type Survey Staff, 1976 - 2006) indicate that the project site lies within the Ba 2 land type (Figure 3).

Land type unit Ba represents a plinthic catena where the upland duplex and marginal soils are rare and dystrophic and/or mesotrophic red soils are widespread. The soil forms expected in the land type unit Ba 2 have medium to fine sandy clay loam to sandy loam topsoil textural classes. Soil forms expected within this land type unit is Hutton, Avalon, Longlands, Glencoe, Wasbank, Rensburg, Bonheim, Willowbrook, Escourt and pans. The majority of soils of this land type unit is found in the crest and midslope positions.

4.2. Geology

The geology represented by land type unit Ba 2 is shale and sandstone of the Ecca Group, Karoo Sequence; dolerite; granite and gneiss.

4.3. Water resources and wetlands

The project site is not located within 500 m of a watercourse or wetland system. Thus, any potential impacts on watercourses or wetland systems due to the possible changes in soil conditions arising from the project activities were not considered as part of the overall soil assessment.

4.4. Agricultural sensitivity classification

The land intended for the WWTP and its associated infrastructure was screened using the Department of Forestry, Fisheries and the Environment (DFFE) environmental screening tool. The screening results indicate that the proposed project site is located on land that has high sensitivity for agricultural resources as shown in Figure 4 (DFFE, 2022). The national land capability of the project site classifies the land as having a moderate-high land capability.

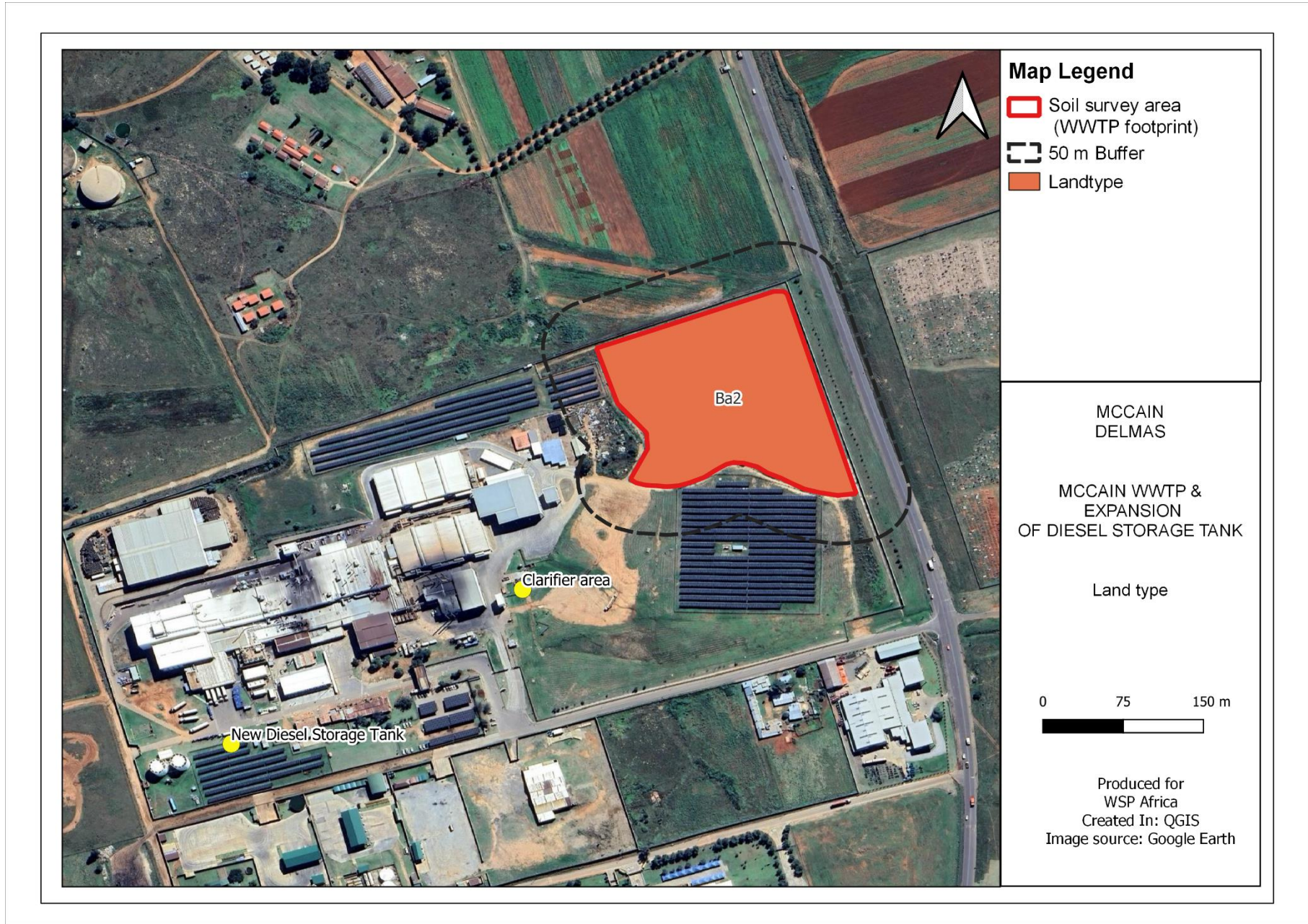


Figure 3. Land type of study area

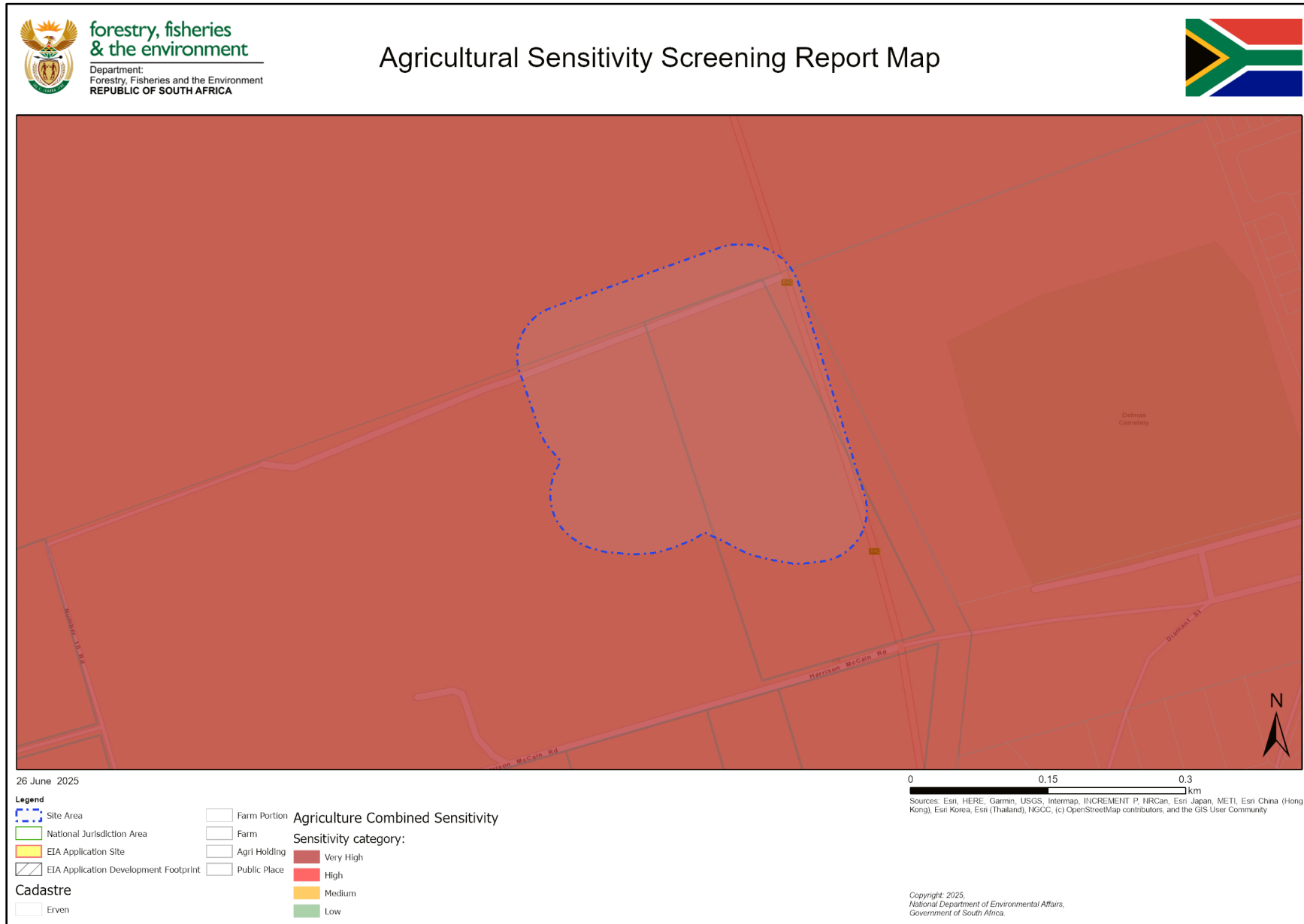


Figure 4. Agricultural Sensitivity for project site (include 50 m buffer)

5. Specialist study objectives

The objectives of the specialist study are as follows:

- Provide a detailed description of baseline soil characteristics and land capability.
- Identify and map sensitive areas based on the above-mentioned information.
- Evaluate the potential impacts associated with the proposed project activities.
- Undertake a soil, land capability and agricultural potential impact assessment.
- Provide recommendations to mitigate the potential impacts on soil, land capability and agricultural potential associated with the proposed project.

6. Methodology

6.1. Desktop study

For the assessment, a desktop study and soil survey were conducted. The desktop study included an evaluation of the available satellite imagery, land type, topographic, land cover, and geological maps of the study area. This background information, along with the site contours and geological map of the area were used to prepare the soil survey field plan.

6.2. Field survey, soil sampling and analysis

The soil survey was conducted on 20 March 2025, where five observation points were evaluated during the survey. At each observation point, the soil was augered to a depth of 120 cm (unless an impenetrable layer was encountered restricting sampling depth) using a bucket auger. The relevant and distinct soil and landscape features were recorded at each observation point. These included characteristics such as soil colour, texture, soil depth, stoniness, drainage class, parent material, signs of erosion, vegetation cover, micro-topography, aspect and fauna.

For the classification, the soil characteristics were used to classify the soils according to the Soil Classification System for South Africa (Soil Classification Working Group, 2018). The procedure used in the identification of the soil types using the Soil Classification System involved the following:

1. Demarcating the master horizons present in the profile;
2. Identifying diagnostic horizons or materials;
3. Establishing the soil form using the Key in the Classification Book;
4. Identifying family criteria;
5. Establishing the soil family; and
6. Determining the texture class of the A horizon, which was then added to the code of the soil family.

During the soil survey, the land uses/activities were also recorded, and the overall site features photographed.

The soil samples were only collected from distinctively different representative profiles comprising of A and B horizons and were submitted for laboratory analysis to Eco Analytica laboratory, at the Northwest University in Potchefstroom. The analysis was conducted according to methods set out in the Handbook of Standard Testing for Advisory purposes (Soil Science Society of South Africa, 1990). Soil samples were analysed for the following parameters:

- Three (3) fraction particle size (sand, silt and clay) analysis;
- Ammonium acetate (at pH 7) extractable cations (Ca, Mg, K and Na);
- Walkley- Black Organic Carbon (for topsoil samples only);
- Bray-1 Phosphorus; and
- pH and EC.

6.3. Data analysis, baseline reporting and impact assessment

Based on the findings of the field survey, and aerial imagery obtained for the project area, the soil and land capability maps were generated for the project area. The agricultural potential and sensitivity were evaluated by considering the land capability and potential production costs associated with the agricultural land use.

The significance of impacts was assessed by using a risk rating system as provided to Soil Advisory Services by WSP.

Note: The footprint designated for the new diesel storage tank and clarifier is located within the existing operational area and was thus not surveyed. The potential impacts on soils due to the development of the new diesel storage tank footprint were considered in Section 8. Impacts associated with the clarifier area were included as part of the overall WWTP activities in Section 8.

7. Soil, Land Capability, Land Use and Agricultural Potential

7.1. Soil survey

A set of five (5) observation points were inspected during the soil survey, to confirm the soil forms, land use and land capability. The locations of the evaluated points and the reconnaissance soil form map is shown in Figure 7 and Figure 8 respectively.

During the soil survey it was noted that the majority of the proposed wastewater treatment plant footprint is largely covered by fill material, presumably mostly soil and rock material originating from the previous construction activities at the McCain Delmas operation. This area was previously delineated at part of the geotechnical investigation for the site. A portion of the study area closer to the eastern boundary is not covered with fill material. Two soil observation points were inspected at this area. The soil forms along the eastern boundary of the study area are mainly of the Hutton soil form, which are characterised by reddish brown, friable, sandy loam topsoil, gradually transitioning into the friable, medium sandy loam apedal B horizon. The soil features and overall site conditions and land use are shown in Figure 5 and Figure 6, and listed per observation point in Table 1.

Table 1. Soil and Land Use survey observations

Observation point	Soil form	High-level soil description	Land use
MD-AH1, MD-AH2 & MD-AH4	Witbank 1100	Reddish brown soil mixed with stones and rocks of varying sizes	Stockpile of soil and rock (fill material) / part of McCain Delmas property
MD-AH3 & MD-AH5	Hutton 1100	Reddish brown, friable, sandy loam orthic A horizon, overlying red, friable, sandy loam apedal B horizon	Open land / part of McCain Delmas property



Figure 5. Darker topsoil and red subsoil of Hutton soil (left), stony soil surface of soils surrounding study area



Figure 6. Soil mixed with stones in fill-material area and rocks in fill-material area of site

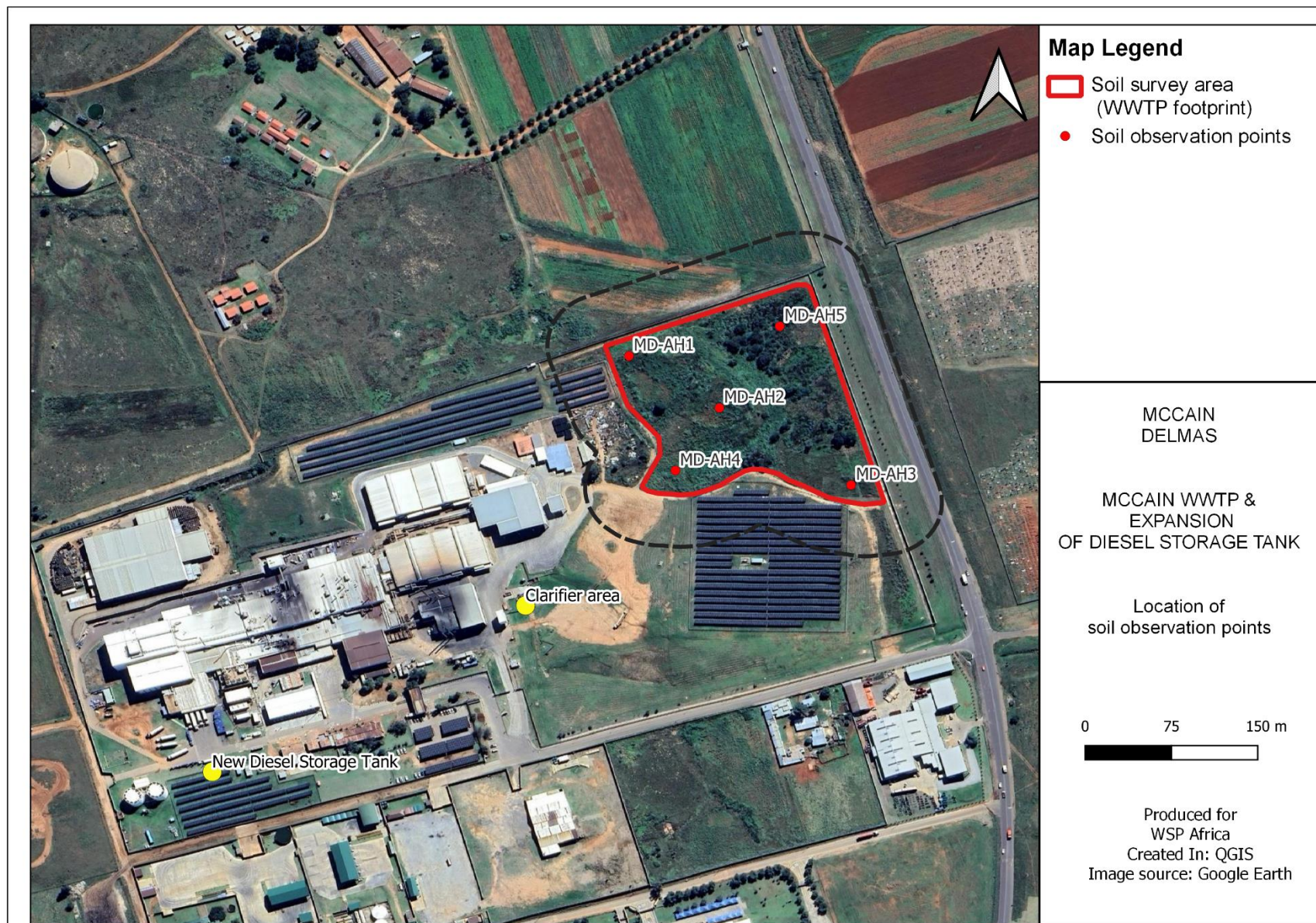


Figure 7. Locations of soil observation points

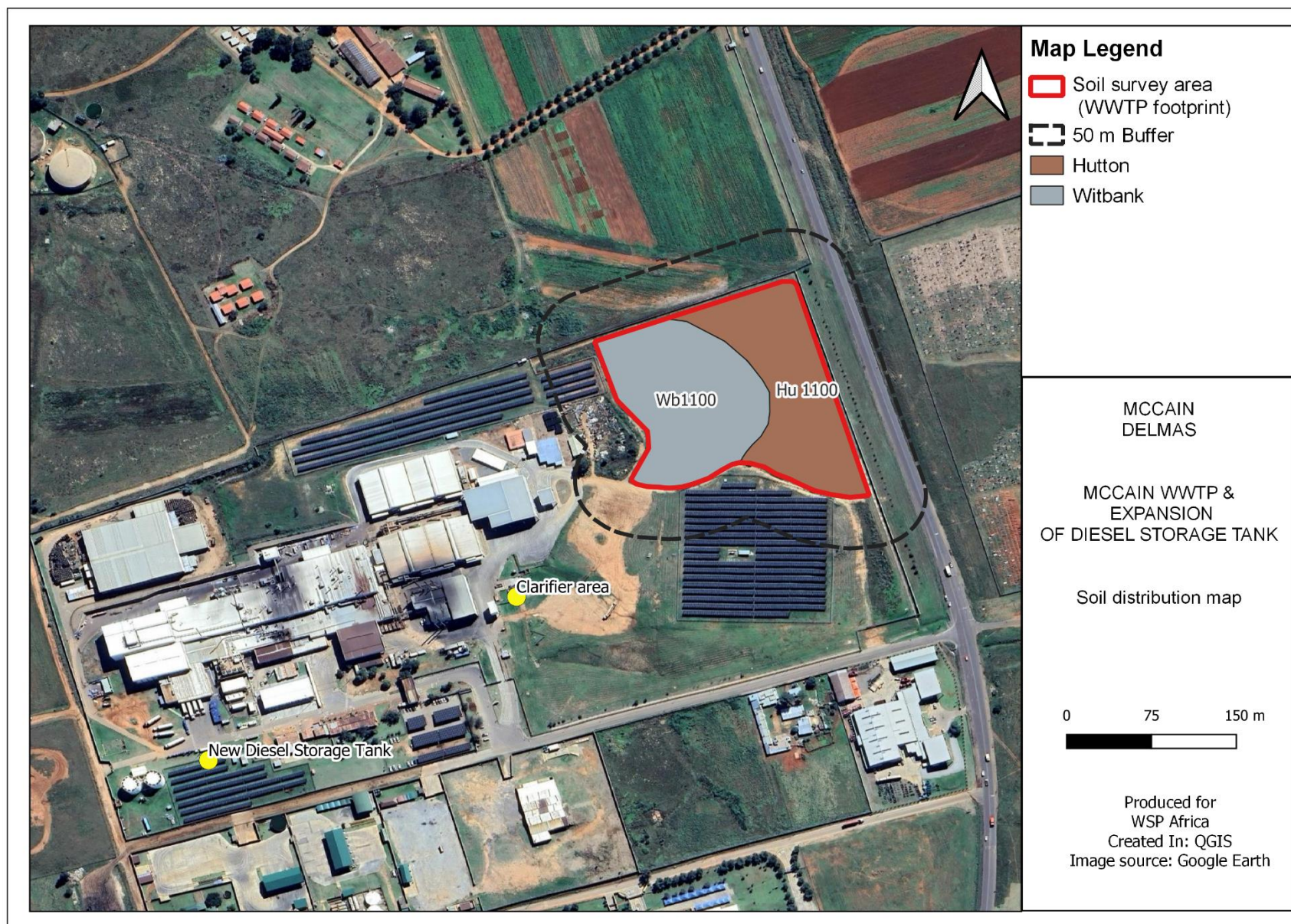


Figure 8. Soil map for project site

7.2. Soil fertility status

The laboratory results (Table 2) were interpreted using soil fertility guidelines in the Fertilizer Society of South Africa's Fertilizer Handbook (Fertilizer Society of South Africa, 2007). The soil characteristics can be summarised as follows:

- Soils are medium sandy loam in texture (Figure 9).
- In terms of soil reaction, the soils are generally very slightly acidic with pH ranging from 5.06 – 6.06, and are non-saline (EC ranging from 13 – 28 mS/m). Note: Growth of salt sensitive crops will be affected by an EC > 200 mS/m.
- The calcium, magnesium and potassium status, and cation exchange capacity of the soils are low. Apart from sample MD-AH5.1 that has very high phosphorus levels, all other samples' P levels are low.
- The topsoil soil organic carbon levels range from 0.5 – 0.7 %

Table 2. Soil fertility of representative soil profiles

Sample ID	Ca	Mg	K	Na	P	pH(H ₂ O)	EC	Organic C	CEC
Units	(mg/kg)						(mS/m)	%OC	cmol(+)/kg
MD-AH3.1	169.5	43.5	132.4	7.5	11.8	6.06	27	0.50	2.17
MD-AH3.2	67.9	49.3	7.8	7.3	3.4	5.09	15		1.56
MD-AH5.1	155.2	57.4	14.3	9.1	201.3	5.06	13	0.77	2.69
MD-AH5.2	199.9	41.8	55.8	9.7	12.9	5.30	28		2.50

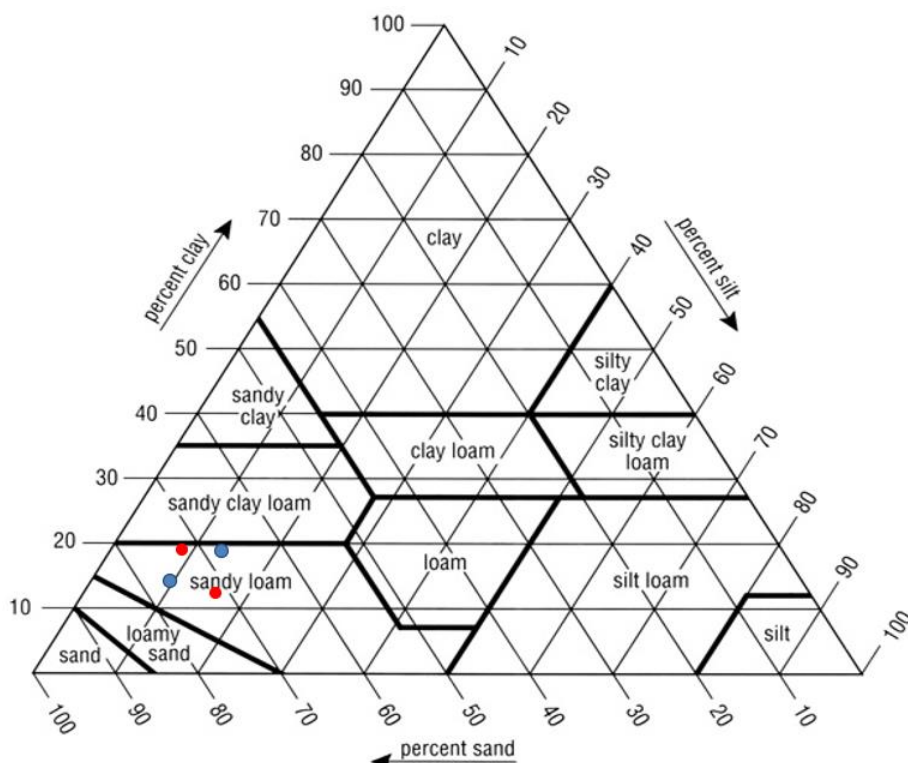


Figure 9. Soil texture triangle indicating topsoil (red) and subsoil (blue) texture classification

7.3. Land capability

The Land Capability Evaluation report (2016) defines land capability as “the most intensive long-term use of land for purposes of rainfed farming determined by the interaction of climate, soil and terrain.” The classification of land capability is a land evaluation system that groups and ranks soils based on their potential for agricultural uses. The system was originally published by the U.S Soil Conservation Service under the authorship of Klingelbiel and Montgomery (1961). In South Africa, broadly speaking, a similar methodology is applied. The land capability classes, as described by Scotney (1987), and updated by Schoeman (2000), have been used to describe the land capability of the proposed project site.

The national land capability map indicates that the capability of the land for the proposed project is moderate to high. Having conducted the soil survey of the study area, the following have been observed:

- More than half of the study area is currently covered with fill material, and thus cannot be used for dryland cropping.
- The remaining portion of the study area is approximately 1.5 ha. Inherently, the Hutton soils found in the study area have a high land capability (Class I). But given that this is a relatively small portion of land, commercial dryland cropping on this portion would not be economically feasible.

Based on these observations, the soil characteristics and the above land capability definitions, the land capability of the project area can be classified as generally not suited for cultivation (Table 3).

The land capability map for the project site is shown in Figure 10.

Table 3. Land capability classification for project area

Soil form	Map Unit	Soil texture	Terrain Factors		Soil Factors			Soil Capability Class	Climatic Factors	Land Capability Classes
			Erosion hazard (E)	Flood hazard (F)	Effective depth (D)	Internal drainage (W)	Mechanical Limitations (M)			
Hutton	Hu 1100	SaCILm - SaLm	E1	F1	D1	W1	MB0	S1	C1	I

The general description of land with a Class I capability is as follows (Schoeman, et al., 2000):

- Land in Class I has few limitations that restrict its use.
 - It may be used safely and profitably for cultivated crops.
 - The soils are nearly level and deep.
 - They hold water well and are generally well drained.
 - They are easily worked, and are either fairly well supplied with plant nutrients or are highly responsive to inputs of fertilizer.
 - When used for crops, the soils need ordinary management practices to maintain productivity.
 - The climate is favourable for growing many of the common field crops.
- Note: “Highly responsive to inputs of fertilizer” is taken to imply that strongly acid soils in need of liming are excluded from Class I.

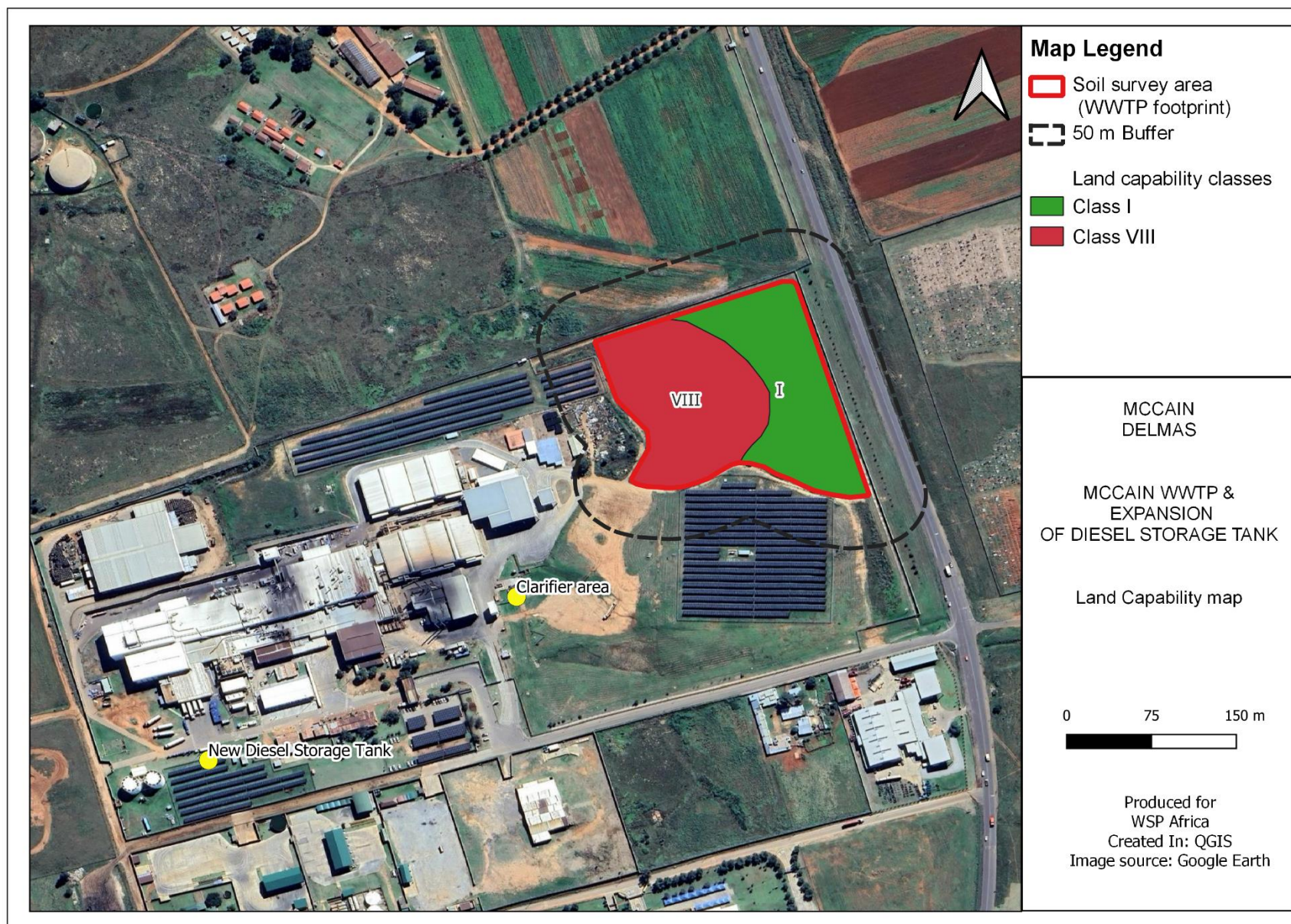


Figure 10. Land capability map

7.4. Soil agricultural potential

The Land Capability Evaluation report (2016) also defines agricultural potential, as

- (a) *is a measure of potential productivity per unit area and unit time achieved with specified management inputs; and*
 (b) *for a given crop or veld type and level of management, is largely determined by the interaction of climate, soil and terrain.*

Soil agricultural potential is an interpretation of the land capability classification system in terms of its suitability / potential for agricultural use. Numerous soil agricultural potential assessments conducted in South Africa, evaluate the agricultural potential with reference to the land capability classification, and thus for this assessment of the soil's agricultural potential, a similar approach is followed. The criteria (Table 4) used for the soil agricultural potential rating, includes an assumption of potential production and capital costs linked to the use of the land for agricultural production. Singer (2006), concluded the following expected production and capital input costs relative to land capability as “ *lands of higher land capability classification, have higher productivity, with lower productivity costs*”.

Table 4. Criteria used for soil agricultural potential rating

Soil agricultural potential rating	Description of criteria
High	High land capability (Class I-III), low productivity costs for rain-fed cropping
Medium	Moderate land capability (Class IV- VI), moderate productivity costs for rain-fed cropping
Low / marginal	Low land capability (Class VII-VIII), high productivity costs for rain-fed cropping

As mentioned in Section 7.2, only a small portion of the study area has high land capability. The suitability / potential for agricultural use of this portion of the study area is thus limited given the small extent. For small-scale maize production to be viable a minimum land parcel extent of 5 ha is recommended. The remaining high land capability land is far below this (i.e., ~1.5 ha remaining). Thus, the study area can be considered to have medium to low agricultural potential.

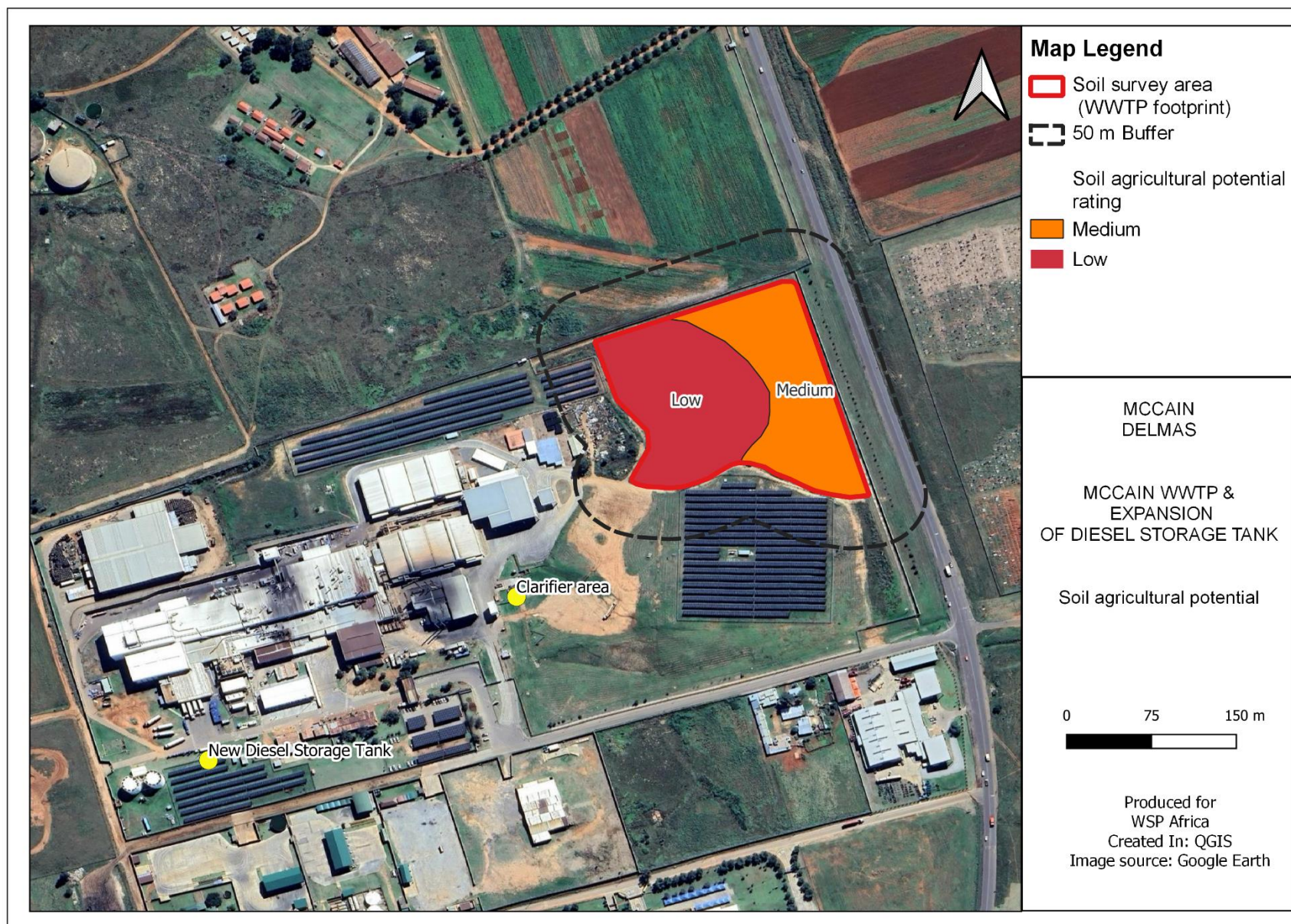


Figure 11. Soil agricultural potential of project site

7.5. Land use

The national land cover map (Figure 15) designates the majority of the proposed project area as “Natural grassland”, bordering an “Industrial” class on the west of the site. The areas identified for the new diesel storage tank and the clarifier area both occur within the “Industrial” land cover class.

During the recent site visit, it was noted that the footprint of the WWTP is largely grassed, with a few large trees occurring within the eastern portion of the study area. The fill material area is overgrown with grasses and weeds, which is understood to be managed during the upcoming dry season. No signs of cropping are visible from the available historical imagery within the proposed project area (Figure 12). The current land use activities are shown in Figure 13 and Figure 14.



Figure 12. Historical images from 1944 (left) and 1996 (right) of the project site.



Figure 13. Current land use conditions at project site



Figure 14. Neighbouring commercial cultivated fields (left), and vegetation within fill material area (right)

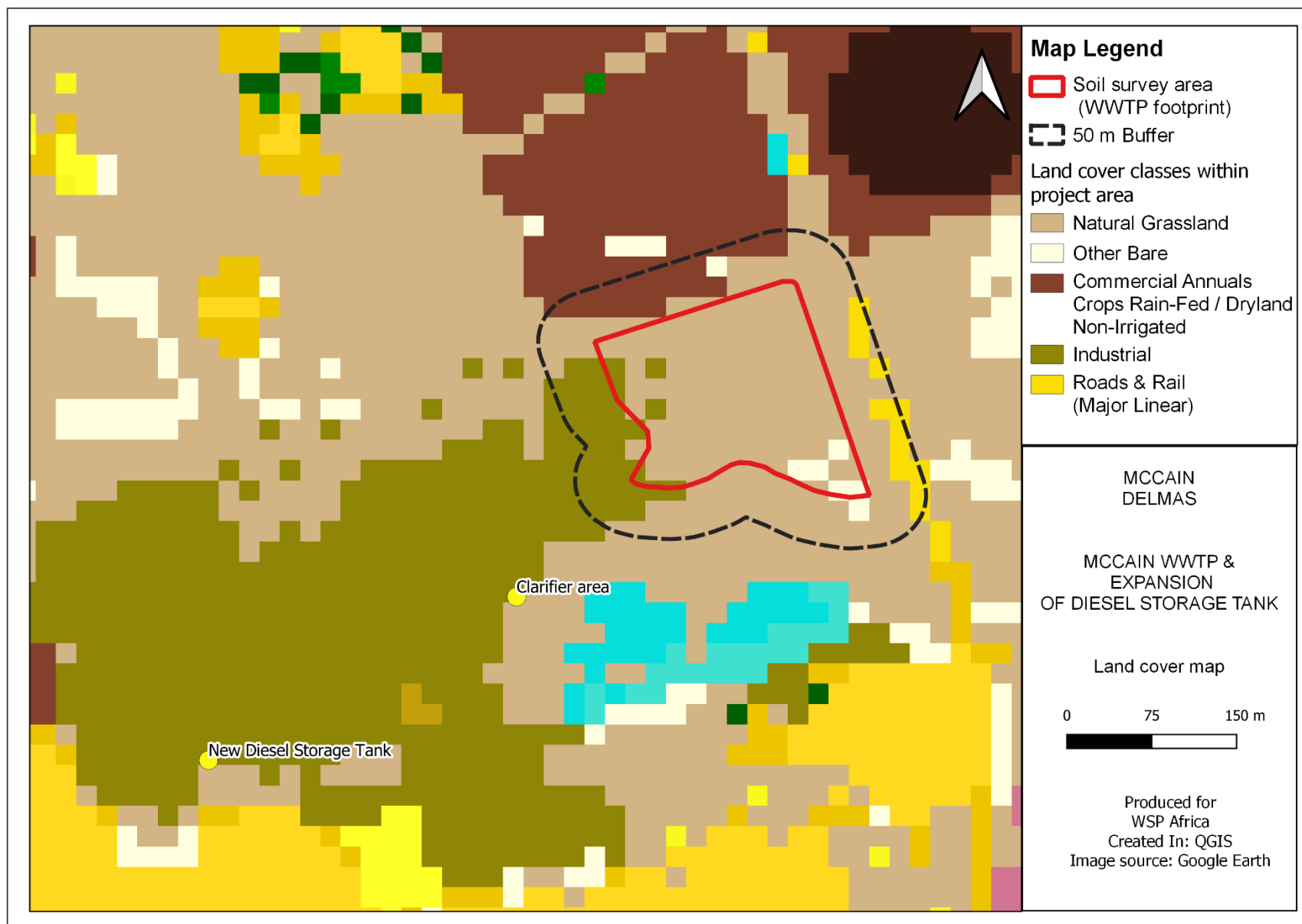


Figure 15. National Land Cover map of project site

8. Impact assessment

8.1. Methodology

The following methodology used to conduct the impact assessment on the soil, land capability, agricultural potential and land use was provided to Soil Advisory Services by WSP.

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed Project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct¹, indirect², secondary³ as well as cumulative⁴ impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria⁵ presented in Table 5.

Table 5. Impact Assessment Criterion and Scoring System

Criteria	Score 1	Score 2	Score 3	Score 4	Score 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite

¹ Impacts that arise directly from activities that form an integral part of the Project.

² Impacts that arise indirectly from activities not explicitly forming part of the Project.

³ Secondary or induced impacts caused by a change in the Project environment.

⁴ Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

⁵ The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
Impact Significance Rating					
Total Score	4 to 15	16 to 30	31 to 60	61 to 80	81 to 100
Environmental Significance Rating (Negative (-))	Very low	Low	Moderate	High	Very High
Environmental Significance Rating (Positive (+))	Very low	Low	Moderate	High	Very High

Impact Mitigation

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in Figure 16.

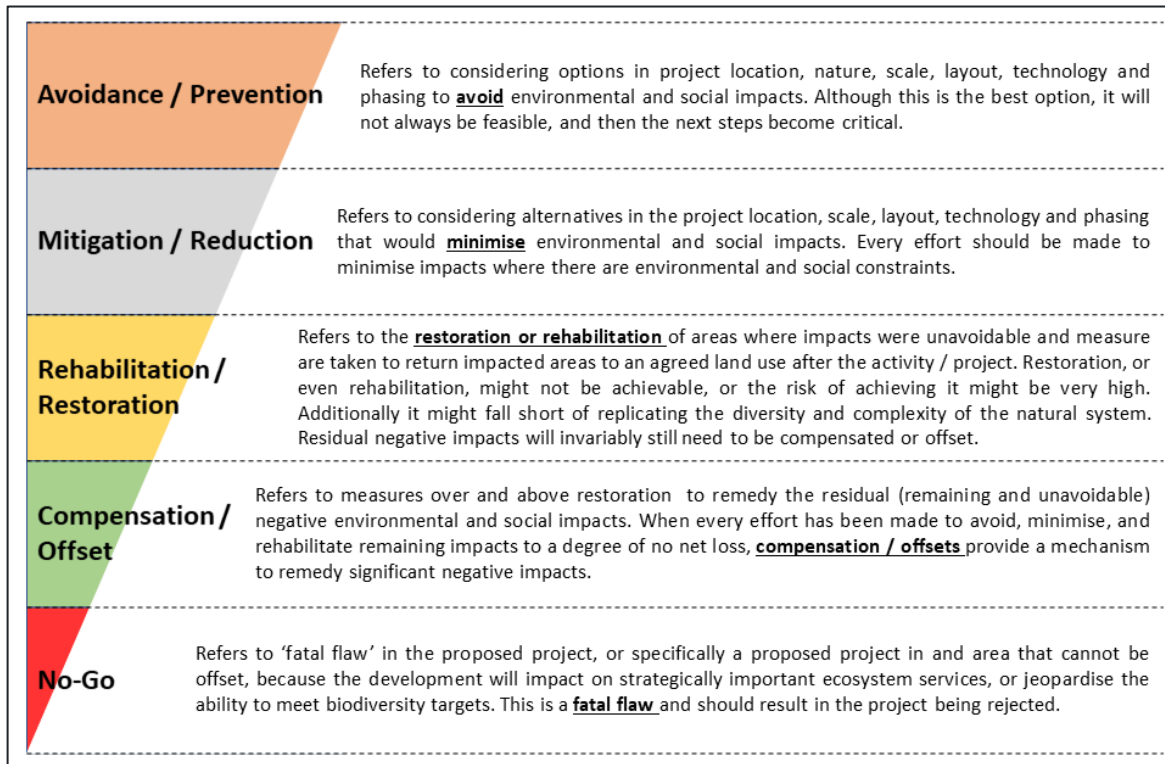


Figure 16. Mitigation Sequence/Hierarchy

The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible however, this is not always feasible. If this is not attainable, the impacts can be allowed however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

8.2. Potential impacts

A set of project activities related to the waste water treatment plant (including the clarifier area) and the new diesel storage tank was evaluated in terms of the potential impact thereof on the soil, land capability, soil agricultural potential and land use. The key activities include: vegetation removal; construction of infrastructure; waste handling, handling and storage of diesel. Table 6 lists a few of the potential impacts on soil and agriculture anticipated due to these project activities.

Table 6. Anticipated activities relevant to potential impacts on soil and agriculture

Anticipated actions	General potential anticipated impacts on soil and agriculture
CONSTRUCTION PHASE	
Clearing vegetation and soil disturbance during the construction of infrastructure.	<ul style="list-style-type: none"> Decrease in cultivatable land with agricultural capabilities. Alteration of existing land use in regions undergoing infrastructure development. Erosion-induced soil degradation.

Anticipated actions	General potential anticipated impacts on soil and agriculture
	<ul style="list-style-type: none"> ▪ Depletion of soil nutrients due to the removal of vegetation and topsoil. ▪ Reduction in soil organic matter content during the removal of vegetation.
Construction of WWTP	<ul style="list-style-type: none"> ▪ Soil burial or soil covering due to the presence of various project structures. ▪ Compaction of the soil in regions where heavy machinery will be used for constructing the project infrastructure, and related utilities. ▪ Increased runoff (leading to erosion) in compacted zones and alteration of natural infiltration processes. ▪ Soil pollution resulting from spills of hydrocarbons and chemicals, including soil sterilization due to cement contaminants at built/ covered areas.
Construction of new 79 m ³ diesel storage tank (next to existing 30 m ³ tank)	<ul style="list-style-type: none"> ▪ Potential localised hydrocarbon spillages and off-site migration of contamination if spill is not contained.
OPERATIONAL PHASE	
Treatment of waste water	<ul style="list-style-type: none"> ▪ Soil contamination resulting from spills of chemicals in locations outside the designated areas / open/uncovered soil areas. ▪ Incorrect disposal of hazardous waste / chemicals at WWTP.
Diesel tank filling, refilling and leakages	<ul style="list-style-type: none"> ▪ If spillages / leaks occur outside bunded area/ or if concrete foundation is cracked / degraded, risk of potential soil and groundwater contamination.
DECOMMISSIONING & CLOSURE PHASE	
Decommissioning of WWTP	<ul style="list-style-type: none"> ▪ Soil contamination resulting from spills of chemicals in locations outside the designated areas / open/uncovered soil areas.
Diesel tank removal	<ul style="list-style-type: none"> ▪ Soil contamination resulting from accidental spills of diesel on degraded / cracked concrete. ▪ Potential migration of hydrocarbons to groundwater from accidental spills during tank removal process.

The key potential impacts identified relevant to the soil, land capability, soil agricultural potential and land use include the following:

- Soil degradation (Soil quality)
- Soil loss (Soil quantity)
- Soil contamination (Soil quality)
- Land use change
- Loss in soil agricultural potential and land capability

8.3. Significance rating

The significance of the above-mentioned potential impacts was assessed and are presented in Table 7.

Table 7. Impact significance rating

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Land Capability, soil quality and health	Decrease in cultivatable land with agricultural capabilities. Alteration or disruption of existing land utilization in regions undergoing infrastructure development. Erosion-induced soil degradation. Depletion of soil nutrients due to the removal of vegetation and topsoil. Reduction in soil organic matter content during the removal of vegetation.	Construction		Limit the extent of soil disturbance to the approved project infrastructural units. Ensure that erosion control measures are implemented to minimise potential soil loss, sediment transport to downgradient wetland area. Avoid / limit disturbance and construction traffic on adjacent land, to reduce potential soil compaction. If areas accidentally become disturbed, ensure that these areas are vegetated as soon as possible to minimise the potential for soil erosion. Ensure that soil disturbance activities occur during the dry season, to limit to severity of potential soil erosion.	4	1	5	4	4	56	P3	3	1	3	4	3	33	P3
Significance						P3 - Moderate							P3 - Moderate						
Impact 2:	Land use (soil availability), Soil quality	Soil burial or soil covering due to the presence various project structures. Compaction of the soil in regions where heavy machinery will be used for constructing the project infrastructure, and related utilities. Increased runoff (leading to erosion) in compacted zones and alteration of natural infiltration processes. Soil contamination resulting from spills of chemicals, including soil sterilization due to cement contaminants at built/ covered areas. Soil contamination from accidental spills of diesel during filling / handling of diesel.	Construction		Ensure that soil covering (paving, and infrastructure) is limited to approved areas. Regarding accidental spills of chemicals and hydrocarbons, ensure that a spill response plan is in place. Ensure that potential spillage areas have appropriate berms / bunding to prevent possible spills from spreading. Ensure that personnel are trained in handling accidental spills. Inspect condition of newly constructed containment (bunding) infrastructure prior to installation of new tank. Ensure that a leakage detection system is installed / or similar system to alert operations in the event of a leak. Regularly inspect tank and bunding for spillages / leaks.	4	2	3	5	4	56	P3	3	1	3	2	2	18	P2
Significance						P3 - Moderate							P2 - Low						
Impact 3:	Soil quality	Soil contamination resulting from spills of hydrocarbons and chemicals, including soil sterilization due to cement contaminants at built/ covered areas. Soil contamination from accidental spills of diesel during refilling / handling of diesel.	Operation		Ensure that a spill response plan (including spill kits) is in place. Ensure that potential spillage areas have appropriate berms / bunding to prevent possible spills from spreading. Ensure that personnel are trained in handling accidental spills. Regularly inspect tank and bunding for spillages / leaks. Ensure that tanks have a leak detection system in place.	4	2	3	5	3	42	P3	3	1	3	2	2	18	P2
Significance						P3 - Moderate							P2 - Low						
Impact 3:	Soil quality	Soil contamination from accidental spills of chemicals from WWTP during demolishing of plant. Soil contamination from accidental spills of diesel during emptying and disposal of diesel tank.	Decommissioning		Ensure that a spill response plan is in place. Ensure that potential spillage areas have appropriate berms / bunding to prevent possible spills from spreading. Ensure that personnel are trained in handling accidental spills. Ensure appropriate disposal of hydrocarbon residue in emptied tanks , and correct disposal of tanks during decommissioning (i.e., appoint suitable hazardous waste handling contractors to depose of waste appropriately).	4	3	3	5	4	60	P3	3	1	3	3	3	30	P2
Significance						P3 - Moderate							P2 - Low						

NOTE: The above impact rating was done based on the understood site conditions and the methodology presented in Section 8.1.

8.3.1. Construction phase

The main activities impacting the soil, land capability, soil agricultural potential and land use during the construction phase relate to the site preparation such as vegetation removal and construction of infrastructural units of the facility. The action of vegetation removal and grubbing, also removes the portion of the topsoil that generally has the highest soil organic matter levels, and soil microbial diversity. The potential for soil erosion also increases with the soil disturbances that will occur during the construction phase. Additional impacts on the soils anticipated during the construction phase are soil compaction, soil burial/ covering by project infrastructure, as well as potential soil contamination from on-site potential oil leaks from earth moving machinery and trucks.

The new diesel storage tank will be constructed within the current operation area, next to the existing 30 m³ diesel storage tank. The required containment infrastructure will be constructed, and new tank installed and filled. The potential impact on soil from accidental spillages of diesel during this phase was considered. If the concrete in the vicinity of the footprint of the new tank is degraded or cracked, accidental spills may impact the soil, with a potential risk of hydrocarbon migration to groundwater.

The significance of these impacts is moderate due to the nature of the activity, and the potential extent thereof. However, with the implementation of appropriate mitigation measures, the significance of the impacts can be reduced to a low significance.

8.3.2. Operational phase

During the operational phase, the WWTP will operate as described in Section 2 of the report. The potential for soil contamination from accidental spillages of hazardous waste handled and chemicals used at the WWTP, as well as incorrect disposal of hazardous chemicals was considered for the operational phase. The significance of this impact was rated as moderate, but can be low if accidental spills of waste material are appropriately handled by the environmental management team.

Regarding the new diesel storage tank, the operational activities which could potentially result in soil impacts, are related to the refilling, and pumping of diesel during routine operations. The potential impact on soil from accidental spillages of diesel or leakages of the diesel tank were considered. The condition of the concrete and containment infrastructure around the diesel tank are critical in ensuring that accidental spills or leaks from the diesel storage tanks do not severely impact the soil (beneath the concrete) and result in migration of contaminants to groundwater. Given that the tank will be within an existing covered (compacted and concreted foundation) surface, and within a bunded area, the potential impact on soil was considered moderate before mitigation, and low with implementation of mitigation.

8.3.3. Decommissioning and closure phase

It is understood that the WWTP and new diesel storage tank will be decommissioned at the time when the overall McCain Delmas operation is decommissioned, since both the WWTP and diesel storage tanks are required for supporting manufacturing processes.

It is likely that once the infrastructure is removed from the site, the necessary environmental site assessments will be conducted, including establishing the soil quality status. During the decommissioning, the soil is most vulnerable to potential chemical and / waste spillage events. The significance of this impact was rated as moderate, but can be low if accidental spills of waste material, hydrocarbons or chemicals are appropriately handled by the environmental management team during the decommissioning of the plant and diesel storage tanks.

8.4. Mitigation Measures

8.4.1. Recommended mitigation measures

WWTP Footprint

- Limit the extent of soil disturbance to the approved project infrastructural units.
- Avoid / limit disturbance and construction traffic on adjacent land, to reduce potential soil compaction. If areas accidentally become disturbed, ensure that these areas are vegetated as soon as possible to minimise the potential for soil erosion.
- Ensure that an erosion management plan is in place.
- Ensure that soil disturbance activities occur during the dry season, to limit to severity of potential soil erosion.
- Ensure that the procedure for land clearance and vegetation removal is adhered to.
- Ensure that soil covering (paving, and infrastructure) is limited to approved areas.
- Ensure that a spill response plan is in place. Ensure that potential spillage areas have appropriate berms / bunding to prevent possible spills from spreading. Ensure that personnel are trained in handling accidental spills.
- Ensure that regular site inspections around designated waste and chemical storage areas are conducted to ensure that potential spillages are cleared to minimise the longer term impact of accidental spills.
- Include site inspection along the perimeter of the project site as part of overall environmental team's inspection tasks.

New diesel storage tank footprint

- Ensure that a spill response plan is in place. Ensure that potential spillage areas have appropriate berms / bunding to prevent possible spills from spreading. Ensure that personnel are trained in handling accidental spills.
- Ensure that regular site inspections around designated diesel storage and refilling areas are conducted to ensure that potential spillages are cleared to minimise the longer term impact of accidental spills.
- Inspect condition of concrete of the footprint of the new diesel storage tank, to ensure that concrete is not degraded or cracked prior to installation of new tank.
- Inspect condition of newly constructed containment (bunding) infrastructure prior to installation of new tank.
- Ensure that a leakage detection system is installed / or similar system to alert operations in the event of a leak.

8.4.2. Recommended monitoring and evaluation programme

The following monitoring programme provides guidance on the potential impacts that require monitoring, the functional requirements for monitoring, and the frequency of monitoring. The overall responsibility of the implementation of the recommended monitoring programme is the McCain Delmas environmental manager.

Table 8. Recommended monitoring and evaluation programme

Source Activity	Impacts Requiring Monitoring Programmes	Functional Requirements for Monitoring	Roles and Responsibilities <i>(For the execution of the monitoring programmes)</i>	Monitoring and Reporting Frequency and Time Periods for Implementing Impact Management Actions
Land clearance and vegetation removal	Soil loss / Erosion	Inspect disturbed / cleared areas for signs of erosion. Inspect adjacent land / perimeter of site to ensure no disturbance or soil erosion due to project activities occur.	Environmental Manager / ECO to inspect areas for signs of erosion.	Weekly erosion inspection during active construction - and more frequently during heavy rainfall periods.
Construction of infrastructure	Soil quality degradation Soil loss / Erosion	Inspect construction footprints and adjacent land / perimeter of site for signs of hydrocarbon or cement or construction waste spillages.	Environmental Manager	Weekly during active construction.
Handling of waste / chemicals / diesel	Soil quality degradation	Inspect chemical / waste / diesel storage areas for signs of spillages	Environmental Manager	Bi-weekly during operation.
Accidental waste / chemical / diesel spillages	Soil quality degradation	After spill is contained and cleared according to spill plan, undertake soil quality screening assessment to establish contamination status. Assessment only required in event of spillage on open / exposed soil areas.	Appoint Soil specialist to assess contamination status and risk	As required

9. Study assumptions & limitations

The following assumptions and limitations were considered in the preparation of this report:

- Relevant information relating to the project such as general site arrangement maps and historic reports was made available to Soil Advisory Services by WSP and was used in the information review and the overall assessment.
- The methodologies and procedures applied in this study are generally followed in the broader soil science and environmental impact assessment community.
- Relevant maps indicate a 50 m buffer extent for the survey areas.
- The presented findings and recommendations in this report are based on the author's current understanding of the project and the level of information available at the time of the assessment and can be adjusted if additional information becomes available.

10. Conclusions

The objective of the specialist study was as follows:

- Provide a detailed description of baseline soil characteristics and land capability (Section 7).
- Undertake a soil, land capability and agricultural potential impact assessment (Section 8).
- Identify and map sensitive areas based on the above-mentioned information (Section 7).
- Evaluate the potential impacts associated with the proposed project activities (Section 8.2)
- Provide recommendations to mitigate the potential impacts on soil, land capability and agricultural potential associated with the proposed project (Sections 8.3 and 8.4).

From a soil assessment perspective, the proposed footprint of the WWTP can be divided into two portions, namely, the fill-material area (western portion) and the uncovered, Hutton soils (eastern portion). The fill-material was characterised as part of the geotechnical investigation of the site, and was confirmed to contain mainly excavated soil and rocks from the construction activities at the McCain Delmas operation (north of the proposed WWTP footprint). The soils along the eastern portion of the project site are characterised by reddish brown, friable, sandy loam topsoil, gradually transitioning into the friable, medium sandy loam apedal B horizon. Inherently these soils have a high land capability (i.e., very few limitations to dryland cropping). However, given the relatively small extent of this high land capability land, commercial dryland cropping would not be economically feasible. The overall soil agricultural potential of the site was thus rated as medium to low. The historical images of the proposed WWTP footprint do not show distinct land uses related to commercial cropping. The land could however historically have been used for grazing, or smaller scale crop production (though not visible from historic imagery), given the high land capability of the uncovered portion of the site.

The key anticipated impacts on the soil, land capability and land use due to the project activities mainly affect soil quality, soil quantity, land use, and land capability. The significance of the potential impacts on the soil and agricultural potential are moderate due to the nature of the project activities. However, with the implementation of appropriate mitigation measures the significance of the impacts can be reduced. The mitigation measures are focussed on preventing and controlling the potential impacts on the soil. The recommended soil monitoring programme includes regular site inspections on the proposed WWTP and new diesel tank footprints, and appropriately managing accidental waste, chemical and diesel spills in areas where soils are exposed.

11. References

- DFFE. (2022). *National Web based Environmental Screening Tool*. Pretoria: Department of Forestry, Fisheries and the Environment. Retrieved from <https://screening.environment.gov.za/screeningtool/#/pages/welcome>
- Fertilizer Society of South Africa. (2007). *Fertilizer Handbook*. Pretoria.
- ISCW. (2007). *Manual of Standards for Soil Surveys*. Pretoria: Institute for Soil Climare and Water.
- Klingebiel, A. A., & Montgomery, P. H. (1961). *Land-capability classification*. Soil Conservation Service, U.S. Dept. of Agriculture. Retrieved from <https://handle.nal.usda.gov/10113/CAT10310193>
- Land Type Survey Staff. (1976 - 2006). *Land type Survey Database*. Pretoria: ARC-ISCW.
- Schoeman, J. L., van der Walt, M., Monnik, K. A., Thackrah, A., Malherbe, J., & Le Roux, R. E. (2000). *Development and application of a Land Capability Classification System for South Africa*. ARC-ISCW, Pretoria.

- Scotney, D. M., Ellis, F., Taylor, K. P., Nott, R. W., van Niekerk, B. J., Verster, E., & Wood, P. C. (1987). *A system of soil and land capability classification for agriculture in the TBVC states*. Pretoria: Technical Committee for Agriculture and Environmental Affairs.
- Singer, M. (2006). Land Capability Analysis. In R. Lal, *Encyclopaedia of Soil Science*.
- Soil Classification Working Group. (2018). *Soil Classification: A Natural and Anthropogenic System for South Africa*. Pretoria: ARC-Institute for Soil, Climate and Water.

SOIL ADVISORY SERVICES (PTY) LTD.

Appendix A. Laboratory certificates

NORTH-WEST UNIVERSITY

ECO-ANALYTICA

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Tel: 018-285 2733

Center for Water Sciences & -Management

11 Hoffman Str

POTCHEFSTROOM

2531

SOIL ADVISORY SERVICES (McCAIN)

2025/04/03

Nutrient Status

Sample no.	Ca	Mg	K	Na	P	pH(H ₂ O)	EC	Walkley Black
	(mg/kg)						(mS/m)	%C
MD-AH3,1	169.5	43.5	132.4	7.5	11.8	6.06	27	0.50
MD-AH3,2	67.9	49.3	7.8	7.3	3.4	5.09	15	
MD-AH5,1	155.2	57.4	14.3	9.1	201.3	5.06	13	0.77
MD-AH5,2	199.9	41.8	55.8	9.7	12.9	5.30	28	

Exchangeable cations

Sample no.	Ca	Mg	K	Na	CEC	S-value	pH(H ₂ O)	pH(KCl)
	(cmol(+)/kg)							
MD-AH3,1	0.85	0.36	0.34	0.03	2.17	1.58	6.06	5.09
MD-AH3,2	0.34	0.41	0.02	0.03	1.56	0.80	5.09	4.88
MD-AH5,1	0.77	0.47	0.04	0.04	2.69	1.32	5.06	4.09
MD-AH5,2	1.00	0.34	0.14	0.04	2.50	1.53	5.30	4.53

HANDBOOK OF STANDARD SOIL TESTING METHODS FOR ADVISORY PURPOSES

Exchangeable cations: 1 M NH₄-acetate pH=7

Saturated Extraction

CEC: 1 M NH₄-acetate pH=7

2025/04/04 Particle Size Distribution

Sample no.	> 2mm (%)	Sand	Silt	Clay
		(% < 2mm)		
MD-AH3,1	19.2	72.7	8.5	18.8
MD-AH3,2	5.9	76.5	9.4	14.1
MD-AH5,1	6.0	72.0	16.0	12.1
MD-AH5,2	15.7	68.0	13.4	18.6

No responsibility is accepted by North West University for any losses due to the use of this data

Appendix B: CV of specialist

CURRICULUM VITAE

Of

ILSE SNYMAN (née MATHYS)

(SOIL SCIENTIST)

PERSONAL INFORMATION

Full Names:	Ilse Loïs Snyman (née Mathys)
Nationality:	South African
Languages:	English, Afrikaans
Identification number:	8106200060082
Drivers licence	Code B
Marital status:	Married
Current location:	Gauteng Province, South Africa
Employment equity Status:	Coloured, Female
Contact number:	+27722379214
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Linkedin profile:	https://za.linkedin.com/in/ilse-snyman-née-mathys-3ab927a

EDUCATIONAL QUALIFICATIONS

- M. Sc Agriculture (Soil Science), Stellenbosch University- (2008-2011)
 - **Title of dissertation:** Soil health and quality concept in agricultural extension and soil science.
An assessment of topsoil conditions in a long-term vineyard soil management trial in Robertson, South Africa.
(http://scholar.sun.ac.za/bitstream/handle/10019.1/6544/mathys_soil_2011.pdf?sequence=1)
 - B. Sc Agriculture (Soil Science & Agronomy), Stellenbosch University - (2000 - 2005)
 - Matric Certificate, Sarepta Senior Secondary School - (1995 - 1999)
-

KEY QUALIFICATIONS & EXPERIENCES

- MSc Agric in Soil Science.
- Intimate knowledge of the South African soil classification system and several years' experience in land capability classification and land use assessments.
- Mine Rehabilitation Planning and Rehabilitation monitoring
- Hydropedological Assessments
- Phase I & II – Contaminated Land Assessments
- Source-Pathway-Receptor Assessments
- Remediation Planning

- Unsaturated flow modelling (HYDRUS-1D) capability
- Erosion modelling capability
- Agronomic technical support for commercial and emerging grain farmers.
- Waste Classifications and Assessments
- Waste exclusion from the definition of waste applications
- Delivered conference contributions in 2019 at the FAO's Erosion Symposium, 2012 and 2014 at the Combined Congress of the Soil Science Society of South Africa, South African Society of Crop Production, South African Weed Society, and South African Society of Horticultural Science.

Summary of course work covered in MSc Agric degree:

- Specialized Pedology and Soil Genesis , Specialized Soil Physics and Water Management, Specialized Soil Chemistry and Fertilization, Soil Biology

Summary of Disciplines covered in Final year of BSc Agric degree:

- Soil Chemistry, Soil Physics, Soil and Water Management, Soil Genesis, Soil Pedology, Greenhouse Production, Hydroponics Greenhouse Production, Ecology and management of natural veld, Pasture Management, Sustainable production for temperate crops

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

- Soil Science Society of South Africa
- Land and Rehabilitation Society of Southern Africa (Council Member – present)
- SACNASP- Professional Natural Scientist, in the field of Soil Science

EMPLOYMENT EXPERIENCE

Director & Soil Scientist, Soil Advisory Services, - (November 2020 - present) Tasks include:

- Soil surveys and Environmental Impact Assessment (EIA) for various Greenfields and Brownfields projects.
- Hydropedological assessments and monitoring to support water use license applications in South Africa
- Contamination assessments for various mining and manufacture clients. Duties include compilation of environmental sampling plan for field staff, data analysis and reporting.
- Waste classification and assessment for mining clients.
- Soil fertility, health and soil quality assessments, including soil health monitoring.
- Unsaturated flow modelling for cover design for mine waste facilities.
- Erosion sensitivity modelling for baseline conditions and for landform designs.

Soil Scientist, Golder Associates Africa, - (April 2015 – October 2020) Tasks included:

- Soil surveys and Environmental Impact Assessment (EIA) for various Greenfields and Brownfields projects in South Africa, Mozambique, Democratic Republic of Congo, Zambia, Ghana, Liberia and Chad.
- Source-Pathway-Receptor study for a copper mine in Zambia on request of Mining Financer. Task included providing input into the SPR in terms of the impact on soils due to the current and historic mining activities. Confidential Mining Client.

- Source-Pathway-Receptor study for a copper mine in DRC. Managing project and specialist input into the SPR in terms of the impact on soils due to the current and historic mining activities. Confidential Mining Client.
- Contamination assessments in South Africa, Zambia, DRC and Ghana for various mining clients. Duties included compilation of environmental sampling plan for field staff, data analysis and reporting. Client: Confidential Mining Clients
- Contamination and liability assessment for a decommissioned mining refinery. Duties included reporting and report presentation to client. Confidential Mining Company in Ghana
- Source-Pathway-Receptor study for a copper refinery in Zambia. Client: Confidential Mining Company in Zambia.
- Waste classification and assessment for mining, smelters, and manufacture clients in South Africa.
- Unsaturated flow modelling for cover design for mine waste facilities (various).
- Erosion sensitivity modelling for baseline conditions and for landform designs (various)
- Soil and waste rock erodibility assessment.

Mine Closure & Rehabilitation Consultant, Golder Associates Africa, - (July 2014 – April 2015)

Tasks included:

- Provide support for planning and execution of rehabilitation in the mining and industrial sectors.
- Devise and combine multiple concepts and considerations into integrated rehabilitation and eminent closure plans.
- Conceptualize and formulate rehabilitation and closure objectives, measures, associated packaging of solutions, as well as the actions for implementation.
- Assist in the completion of rehabilitation programmes to implementation phase.
- Assisting with rehabilitation and closure planning projects and interacting with multiple consulting disciplines to deliver innovative and integrated rehabilitation and closure plans to clients

Soil Scientist, Terrasoil Science, - (January 2014 – June 2014) Tasks include:

- Wetland Delineation report reviewing
- Research and literature review
- Website content management

Soil Science and Basic Chemistry Lecturer-Elsenburg Agricultural College, Western Cape Department of Agriculture- (May 2009 – July 2013) Tasks included:

- Presentation of Course
- Updating course material
- Presentation of Practical sessions
- Develop practical guidelines for Course
- Drafting of test and examinations for Course
- Moderating scripts for High Certificate and B Agric Courses

Soil Scientist – Strategic Environmental Focus (April 2008 – May 2009)Tasks included:

- Provision of specialist opinion
- Archival research and literature review
- Detailed baseline survey (including site visits)
- Consultation, recommendations
- Analysis and reporting

- Team liaison and communication
- Mapping
- Assessment of impacts and their significance
- Marketing
- Project management.
- Financial and time management (timesheets and quotations).
- Professional and personal development.

Agronomy Consultant Lecturer-Elsenburg Agricultural College, Western Cape Department of Agriculture- (February – March 2008) Tasks included:

- Presentation of High Certificate Agronomy Course
- Drafting test papers for High Certificate Agronomy Course
- Moderating scripts for High Certificate and B Agric Agronomy Course

Young Professional Programme-Research Student- Plant Production Institute, Western Cape Department of Agriculture- (October 2007 – March 2008) Tasks included:

- Literature review on the subject of soil quality in agronomy.

Agronomist- SENWES LTD (January 2006- August 2007) Tasks included:

- Identifying Emerging vegetable production farmers with the potential to become successful commercial farmers
- Advisory and consultation to emerging farmers on Agricultural crop production aspects
- Agricultural production planning- Agricultural economic feasibility studies
- Demonstrations and experimental Trials which will benefit Developing Agriculture
- Writing of popular articles for company magazine and Developing Agriculture media (Nu Farmer)
- Organizing Farmers days and presenting information relevant to agricultural industry
- Participated in grain (maize) crops yield estimation project for SENWES service area (North West, Free State, Southern Gauteng)
- Soil moisture and soil classification survey for SENWES service area (North West, Free State, Southern Gauteng)
- Participated in GMO-free maize survey
- Project proposals and project execution
- Liaise with various stakeholders in Developing Agriculture

PUBLICATIONS

- Mathys, I.L. and Rozanov, A. (2012). Soil health (quality) assessment of topsoil conditions in a long-term vineyard surface management trial in Robertson, South Africa. Combined Congress of Soil Science Society of South Africa (SSSSA), SAWSS and SASCP 2012. Potchefstroom, South Africa. January 16-19. 2012. (<http://www.combinedcongress.org.za/abstracts.aspx>)
- Mathys, I.L., Clarke, C.E., and Hardie, A.G. (2014). Evaluation of field and laboratory amorphous Al diagnostic tests for humic topsoils. Combined Congress of Soil Science Society of South Africa (SSSSA), HSSSA, SAWSS and SASCP 2014. Grahamstown, South Africa. January 20-23. 2014. (http://www.combinedcongress.org.za/pdf/CC2014_INDEX.pdf)

- Snyman, I.L., Herselman, J.E. & Skinner, T. (2019). Assessment of soil erosion by R/USLE – A case study of the applications of RUSLE in the mining industry. The Global Symposium on Soil Erosion (GSER19), from 15-17 May 2019, at the UN Food and Agriculture Organization (FAO) Headquarters in Rome, Italy
- Snyman, I.L., Herselman, J.E. & Skinner, T. (2020). Applications of R/USLE in baseline soil studies for environment impact assessments. Golder Associates Technical Excellence Conference, from 19 -22 February 2020, in Vancouver Canada
- Snyman, I.L., & Kgasago, H. (2023). Assessment and monitoring of the soil health of mine rehabilitated land at Voorspoed mine – A case study of the applications of the soil health concept in the mining industry. Land Rehabilitation Society of Southern Africa 10th Annual Conference, from 12-13 September 2023, in Cullinan, South Africa

EMPLOYMENT REFERENCES

Carl Steyn	(Golder Associates, July 2014 – Oct 2020) <u>Contact details:</u> 072 648 6058
Elize Herselman	(Golder Associates, July 2014 – Oct 2020) <u>Contact details</u> 082 782 2225 elize@herselmanconsult.co.za
Johan van der Waals	(Terrasoil Science, January 2014-June 2014) <u>Contact details:</u> 08 257 01297 johan@terrasoil.co.za
Aatika Shema	(Elsenburg Agricultural College, Western Cape Department of Agriculture- May 2009 – June 2013) <u>Contact details.</u> 021 808 5455 aatikav@elsenburg.com
Mariana Purnell	(SENWES LTD January 2006- August 2007) <u>Contact details.</u> 082 336 8534 -

ACADEMIC REFERENCES

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Dr. Keith Du Plessis	(ARC- Infruitec- Nietvoorbij- Soil Health Project Manager Feb 2008-2011) Contact details: +27 82 740 7654 Keith.DuPlessis@coega.co.za