LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
ECONOMIC DEVELOPMENT, ENVIRONMENT & TOURISM

BASIC ASSESSMENT REPORT - EIA REGULATIONS, 2014

Basic Assessment report in terms of the Environmental Impact Assessment Regulations, 2014, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

File Reference Number:	
	(For official use only)
NEAS Reference Number:	
Date Received:	
Due date for acknowledgement:	
Due date for acceptance:	
Due date for decision	

Kindly note that:

1. The report must be compiled by an independent Environmental Assessment Practitioner.

2. The report must be typed within the spaces provided in the form. The size of the spaces provided is not necessarily indicative of the amount of information to be provided. The report is in the form of a table that can extend itself as each space is filled with typing.

3. Where applicable **tick** the boxes that are applicable in the report.

4. The use of "not applicable" in the report must be done with circumspection because if it is used in respect of material information that is required by the Department of Economic Development, Environment and Tourism as the competent authority (Department) for assessing the application, it may result in the rejection of the application as provided for in the regulations.

5. An incomplete report may be returned to the applicant for revision.

6. Unless protected by law, all information in the report will become public information on receipt by the department. Any interested and affected party should be provided with the information contained in this report on request, during any stage of the application process.

7. The Act means the National Environmental Management Act (No. 107 of 1998) as amended.

8. Regulations refer to Environmental Impact Assessment (EIA) Regulations of 2014.

9. The Department may require that for specified types of activities in defined situations only parts of this report need to be completed. No faxed or e-mailed reports will be accepted.

10. This application form must be handed in at the offices of the Department of Economic Development, Environment and Tourism:-

Postal Address:	**Physical Address**:
Central Administration Office Environmental Impact Management P. O. Box 55464 **POLOKWANE** 0700	Central Administration Office Environmental Affairs Building 20 Hans Van Rensburg Street / 19 Biccard Street **POLOKWANE** 0699
Queries should be directed to the Central Administration Office: Environmental Impact Management:- **For attention:** Mr E. V. Maluleke **Mobile:** 082 947 7755 **Email:** malulekeev@ledet.gov.za	

View the Department's website at http://www.ledet.gov.za/ for the latest version of the documents.

SECTION A: ACTIVITY INFORMATION

Has a specialist been consulted to assist with the completion of this section?	YES	NO

If YES, please complete the form entitled "Details of specialist and declaration of interest" or appointment of a specialist for each specialist thus appointed:

Any specialist reports must be contained in Appendix D.

1. ACTIVITY DESCRIPTION

Describe the activity, which is being applied for, in detail[1]:

Mang Geoenviro Services has been appointed by Mahlori Development Consulting on behalf of Collins Chabane Local Municipality as an Independent Environmental Assessment Practitioners (EAP) to undertake a Basic Assessment Process for the proposed demarcation of 102 sites on the remainder of the farm Plange 221-LT, in Mtititi, under the jurisdiction of Collins Chabane Local Municipality, Limpopo Province.

The proposed project entails the demarcation of 102 sites for:

- 94 residential use,
- 4 public open space,
- 1 business sites,
- 1 church and
- 1 institutional site.

The proposed development site is 14, 94 hectares.

2. FEASIBLE AND REASONABLE ALTERNATIVES

"alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—

(a) the property on which or location where it is proposed to undertake the activity;

The current preferred location is ideal as it is within the vicinity of an existing educational facilities (Mtititi High School and Phathima Primary School) and a Community Clinic. The site is therefore easily accessible to the surrounding community. This is the only location alternative that will be considered in this Basic Assessment Report.

[1] Please note that this description should not be a verbatim repetition of the listed activity as contained in the relevant Government Notice, but should be a brief description of activities to be undertaken as per the project description.

(b) the type of activity to be undertaken;

The current preferred activity is deemed to be the only feasible activity alternative as this activity will result in improved township which can accommodate more residents and reduce the distance people have to travel to other neighbouring communities, schools and clinic.

(c) the design or layout of the activity;

The layout will not have a high impact on the environment, as long as it complies with criteria listed in this report as well as an EMPr .

(d) the technology to be used in the activity;

The proposed development will be under controlled conditions and it is not expected to have negative effects on the quality of the environment. All the mitigation measures are provided in the Environmental Management Plan

(e) the operational aspects of the activity; and

The operational aspects of the activity relate to the improved community for the Mtititi area. No other alternatives were deemed feasible other than the proposed activity.

(f) the option of not implementing the activity.

It is mandatory to consider the "no-go" option in the EIA process. The "no-go" alternative refers to the current status quo and the risks and impacts associated with it. Some existing activities may carry risks and may be undesirable.

Describe alternatives that are considered in this application. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity could be accomplished in the specific instance taking account of the interest of the applicant in the activity. The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. The determination of whether site or activity (including different processes etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment. After receipt of this report the Department may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

Paragraphs 3 – 13 below should be completed for each alternative.

3. ACTIVITY POSITION

Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees, minutes and seconds. The projection that must be used in all cases is the Hartebeeshoek 94 WGS84 spheroid in a national or local projection.

List alternative sites, if applicable.

Alternative:	**Latitude (S):**			**Longitude (E):**		
Alternative S1[2] (preferred or only site alternative)	23˚	06'	28.42"	30˚	53'	23.99"
Alternative S2 (if any)	°	'	"	°	'	"
Alternative S3 (if any)	°	'	"	°	'	"

In the case of linear activities:

Alternative:	**Latitude (S):**			**Longitude (E):**		
Alternative S1 (preferred or only route alternative)						
• Starting point of the activity	°	'	"	°	'	"
• Middle/Additional point of the activity	°	'	"	°	'	"
• End point of the activity	°	'	"	°	'	"
Alternative S2 (if any)						
• Starting point of the activity	°	'	"	°	'	"
• Middle/Additional point of the activity	°	'	"	°	'	"
• End point of the activity	°	'	"	°	'	"
Alternative S3 (if any)						
• Starting point of the activity	°	'	"	°	'	"
• Middle/Additional point of the activity	°	'	"	°	'	"
• End point of the activity	°	'	"	°	'	"

[2] "Alternative S.." refer to site alternatives.

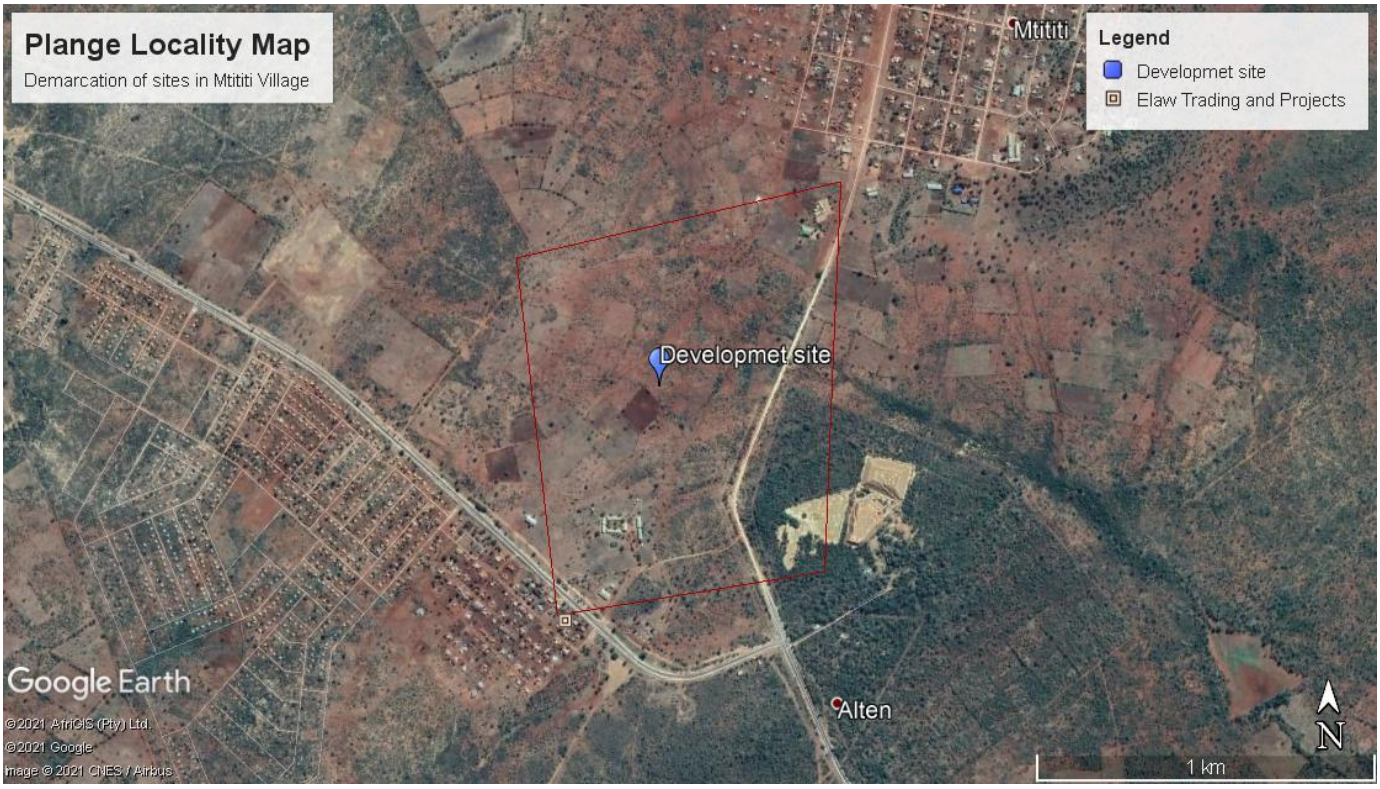


Figure 1: Locality map of the proposed development site

For route alternatives that are longer than 500m, please provide an addendum with co-ordinates taken every 250 meters along the route for each alternative alignment.

4. PHYSICAL SIZE OF THE ACTIVITY

Indicate the physical size of the preferred activity/technology as well as alternative activities/technologies (footprints):

Alternative:	**Size of the activity:**
Alternative A1[3] (preferred activity alternative)	14.94 Hectares
Alternative A2 (if any)	m^2
Alternative A3 (if any)	m^2

or,

<u>for linear activities:</u>

Alternative:	**Length of the activity:**
Alternative A1 (preferred activity alternative)	m
Alternative A2 (if any)	m

[3] "Alternative A.." refer to activity, process, technology or other alternatives.

Alternative A3 (if any)	m

Indicate the size of the alternative sites or servitudes (within which the above footprints will occur):

Alternative:	**Size of the site/servitude:**
Alternative A1 (preferred activity alternative)	m^2
Alternative A2 (if any)	m^2
Alternative A3 (if any)	m^2

5. SITE ACCESS

Does ready access to the site exist?	**YES**	**NO**
If NO, what is the distance over which a new access road will be built	10 m	

Describe the type of access road planned:

The proposed development site will be accessed through the unnamed road in Mtititi village .

Include the position of the access road on the site plan and required map, as well as an indication of the road in relation to the site.

6. SITE OR ROUTE PLAN

A detailed site or route plan(s) must be prepared for each alternative site or alternative activity. It must be attached as Appendix A to this document.

The site or route plans must indicate the following:

6.1 the scale of the plan which must be at least a scale of 1:500;
6.2 the property boundaries and numbers of all the properties within 50 metres of the site;
6.3 the current land use as well as the land use zoning of each of the properties adjoining the site or sites;
6.4 the exact position of each element of the application as well as any other structures on the site;
6.5 the position of services, including electricity supply cables (indicate above or underground), water supply pipelines, boreholes, street lights, sewage pipelines, storm water infrastructure and telecommunication infrastructure;
6.6 all trees and shrubs taller than 1.8 metres;
6.7 walls and fencing including details of the height and construction material;
6.8 servitudes indicating the purpose of the servitude;
6.9 sensitive environmental elements within 100 metres of the site or sites including (but not limited thereto):
- rivers;
- the 1:100 year flood line (where available or where it is required by Department of Water Affairs);

- ridges;
- cultural and historical features;
- areas with indigenous vegetation (even if it is degraded or invested with alien species);

6.10 for gentle slopes the 1 metre contour intervals must be indicated on the plan and whenever the slope of the site exceeds 1:10, the 500mm contours must be indicated on the plan; and

6.11 the positions from where photographs of the site were taken.

7. SITE PHOTOGRAPHS

Colour photographs from the centre of the site must be taken in at least the eight major compass directions with a description of each photograph. Photographs must be attached under Appendix B to this form. It must be supplemented with additional photographs of relevant features on the site, if applicable.

Please refer to Appendix B.

8. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided at a scale of 1:200 as Appendix C for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity.

11. ACTIVITY MOTIVATION

9(a) Socio-economic value of the activity

What is the expected capital value of the activity on completion?	Unknown	
What is the expected yearly income that will be generated by or as a result of the activity?	Unknown	
Will the activity contribute to service infrastructure?	YES	NO
Is the activity a public amenity?	YES	NO
How many new employment opportunities will be created in the development phase of the activity?	unknown	
What is the expected value of the employment opportunities during the development phase?	unknown	
What percentage of this will accrue to previously disadvantaged individuals?	unknown	
How many permanent new employment opportunities will be created during the operational phase of the activity?	unknown	
What is the expected current value of the employment opportunities during the first 10 years?	unknown	
What percentage of this will accrue to previously disadvantaged individuals?	unknown	

9(b) Need and desirability of the activity

Motivate and explain the need and desirability of the activity (including demand for the activity):

NEED:

i.	Was the relevant municipality involved in the application?	YES	NO
ii.	Does the proposed land use fall within the municipal Integrated Development Plan?	YES	NO
iii.	If the answer to questions 1 and / or 2 was NO, please provide further motivation / explanation:		

DESIRABILITY:			
i.	Does the proposed land use / development fit the surrounding area?	YES	NO
ii.	Does the proposed land use / development conform to the relevant structure plans, Spatial development Framework, Land Use Management Scheme, and planning visions for the area?	YES	NO
iii.	Will the benefits of the proposed land use / development outweigh the negative impacts of it?	YES	NO
iv.	If the answer to any of the questions 1-3 was NO, please provide further motivation / explanation:		
v.	Will the proposed land use / development impact on the sense of place?	YES	NO
vi.	Will the proposed land use / development set a precedent?	YES	NO
vii.	Will any person's rights be affected by the proposed land use / development?	YES	NO
viii.	Will the proposed land use / development compromise the "urban edge"?	YES	NO
ix.	If the answer to any of the question 5-8 was YES, please provide further motivation / explanation.		

BENEFITS:			
i.	Will the land use / development have any benefits for society in general?	YES	NO
ii.	Explain: the proposed demarcation of the 101 sites will have direct benefit to the society during construction and operational phase. It will bring the community of Mtititi village new facilities like residential houses, business area, open public space and church.		
iii.	Will the land use / development have any benefits for the local communities where it will be located?	YES	NO

iv.	Explain: According to the 2030 National Development Plan (NDP) Executive Summary (2013), the government must look to invest "in new infrastructure in areas that directly affect the poor, such as education." The NDP (2013) places emphasis on promoting sustainable livelihoods by ensuring "that individuals or families, irrespective of income, can access services such as quality education." This activity will be beneficial to the society and local communities for the following reasons: • Temporary employment opportunities will be created during the construction phase of the development; • New permanent residential areas and employment opportunities will be created during the operational phase; • A wider variety of educational facilities and resources will be available to residents.

10. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations, if applicable:

Title of legislation, policy or guideline:	Administering authority:	Date:
National Environmental Management Act, 1998 (Act No.107 of 1998) Environmental Impact Assessment (EIA) Regulations and associated Listing Notices.	National Department of Environmental Affairs and all Provinces.	2014 as amended
National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004).	DEA, Provinces and Municipalities	2004
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	National Department of Environmental Affairs.	2004
National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)	National Department of Environmental Affairs	2003
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)	National Department of Environmental Affairs and all Provinces.	2008
The National Water Act, 1998 (Act No. 36 of 1998)	National Department of Water and Sanitation	1998
The National Heritage Resources Act, 1999 (Act 25 of 1999) (NHRA)	National Department of Arts and Culture	1999
The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)	National Department of Agriculture, Forestry and Fisheries	1983
The Development Facilitation Act, 1995 (Act 67 of 1995)	National Department of Rural Development and Land Reform	1995
Collins Chabane Spatial Planning, Land Development and Land Use Management By-Law	Collins Chabane Local Municipality	2019

11. WASTE, EFFLUENT, EMISSION AND NOISE MANAGEMENT

11(a) Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?	YES	NO
If yes, what estimated quantity will be produced per month?	The amount of waste will be known and made available during the construction phase.	

How will the construction solid waste be disposed of (describe)?

All solid waste generated during the construction phase will be placed in bulk waste collection area in the construction camp. Litter collection bins will be provided within the construction site not far from each other and will be regularly be disposed. Separation of waste and recycling of paper, glass, cardboards, etc. must be a priority. There will be no burning of waste on site and construction materials that will not be used will be taken out once construction comes to an end.

Where will the construction solid waste be disposed of (describe)?

All construction solid waste will be disposed of at a nearest registered landfill site.

Will the activity produce solid waste during its operational phase?	YES	NO
If yes, what estimated quantity will be produced per month?	10 m^3	

How will the solid waste be disposed of (describe)?

Different kinds of waste will be produced during the operational phase of the school of which none of the waste will be of magnitude concern. The solid waste will consist of general refuse (litter) generated by the pupils and teachers. The local municipality will have to be engaged to provide bulk bins, refuse bags and refuse removal services for the proposed.

Where will the solid waste be disposed if it does not feed into a municipal waste stream (describe)?

All construction solid waste will be disposed of at a nearest registered landfill site.

If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, then the applicant should consult with the department to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the relevant legislation?	YES	NO

If yes, inform the department and request a change to an application for scoping and EIA.

Is the activity that is being applied for a solid waste handling or treatment facility?	YES	NO

If yes, then the applicant should consult with the Department to determine whether it is necessary to change to an application for scoping and EIA.

11(b) Liquid effluent

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?	YES	NO
If yes, what estimated quantity will be produced per month?		m^3
Will the activity produce any effluent that will be treated and/or disposed of on site?	Yes	NO

If yes, the applicant should consult with the Department to determine whether it is necessary to change to an application for scoping and EIA.

Will the activity produce effluent that will be treated and/or disposed of at another facility?	YES	NO

If yes, provide the particulars of the facility:

Facility name:	Not Applicable		
Contact person:	Not Applicable		
Postal address:	Not Applicable		
Postal code:	Not Applicable		
Telephone:	Not Applicable	Cell:	Not Applicable
E-mail:	Not Applicable	Fax:	Not Applicable

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

Not Applicable

11(c) Emissions into the atmosphere

Will the activity release emissions into the atmosphere?	YES	NO
If yes, is it controlled by any legislation of any sphere of government?	YES	NO

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

If no, describe the emissions in terms of type and concentration:

Dust from clearing of the site for demarcation. We therefore suggest that a detailed Air Quality Study would not be necessary.

11(d) Generation of noise

Will the activity generate noise?	YES	NO
If yes, is it controlled by any legislation of any sphere of government?	YES	NO

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

If no, describe the noise in terms of type and level:

General construction noise.

12. WATER USE

Please indicate the source(s) of water that will be used for the activity by ticking the appropriate box(es)

municipal	water board	groundwater	river, stream, dam or lake	other	the activity will not use water

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate
the volume that will be extracted per month:

Litres	
YES	NO

Does the activity require a water use permit from the Department of Water Affairs?

If yes, please submit the necessary application to the Department of Water Affairs and attach proof thereof to this application if it has been submitted.

13. ENERGY EFFICIENCY

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

Design measures will completely be environmentally friendly. The following measures will be considered:

- The architectural design will ensure that there will be a proper natural flow of air into and outside of the building occurs deliberately as ventilation.

Proper insulation of the ceilings is required because as much as 50% of heat losses in a building can be attributed to a lack of ceilings and ceiling insulation, this will significantly reduce heating and cooling expenses.

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

Air Conditioners

- Energy efficient air conditioners must be purchased and used.

Power Supply

- Conservation of energy or the usage of renewal and sustainable energy technology must be a priority. This can be in the form of solar panels that generate and store electricity.

Lighting

- Compact fluorescent light bulbs are recommended as compared to ordinary light bulbs as they also assist for security purpose too.

SECTION B: SITE/AREA/PROPERTY DESCRIPTION

Important notes:

1. For linear activities (pipelines, etc) as well as activities that cover very large sites, it may be necessary to complete this section for each part of the site that has a significantly different environment. In such cases please complete copies of Section C and indicate the area, which is covered by each copy No. on the Site Plan.

Section C Copy No. (e.g. A):

2. Paragraphs 1 - 6 below must be completed for each alternative.

3. Has a specialist been consulted to assist with the completion of this section? YES | NO

If YES, please complete the form entitled "Details of specialist and declaration of interest" for each specialist thus appointed:

All specialist reports must be contained in Appendix D.

Property description/physical address: farm Plange 221-LT

(Farm name, portion etc.) Where a large number of properties are involved (e.g. linear activities), please attach a full list to this application.

In instances where there is more than one town or district involved, please attach a list of towns or districts to this application.

Current land-use zoning: Agricultural

In instances where there is more than one current land-use zoning, please attach a list of current land use zonings that also indicate which portions each use pertains to , to this application.

Is a change of land-use or a consent use application required?	YES	NO
Must a building plan be submitted to the local authority?	YES	NO

Locality map:

An A3 locality map must be attached to the back of this document, as Appendix A. The scale of the locality map must be relevant to the size of the development (at least 1:50 000. For linear activities of more than 25 kilometres, a smaller scale e.g. 1:250 000 can be used. The scale must be indicated on the map.) The map must indicate the following:

- an indication of the project site position as well as the positions of the alternative sites, if any;
- road access from all major roads in the area;
- road names or numbers of all major roads as well as the roads that provide access to the site(s);
- all roads within a 1km radius of the site or alternative sites; and
- a north arrow;
- a legend; and
- locality GPS co-ordinates (Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees, minutes and seconds. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection)

1. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Alternative S1:

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

Alternative S2 (if any):

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

Alternative S3 (if any):

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

2. LOCATION IN LANDSCAPE

Indicate the landform(s) that best describes the site:

2.1 Ridgeline		2.6 Plain	
2.2 Plateau		2.7 Undulating plain / low hills	
2.3 Side slope of hill/mountain		2.8 Dune	
2.4 Closed valley		2.9 Seafront	
2.5 Open valley	X		

3. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

Is the site(s) located on any of the following (tick the appropriate boxes)?

	Alternative S1:		**Alternative S2 (if any):**		**Alternative S3 (if any):**	
Shallow water table (less than 1.5m deep)	YES	NO	YES	NO	YES	NO
Dolomite, sinkhole or doline areas	YES	NO	YES	NO	YES	NO
Seasonally wet soils (often close to water bodies)	YES	NO	YES	NO	YES	NO
Unstable rocky slopes or steep slopes with loose soil	YES	NO	YES	NO	YES	NO
Dispersive soils (soils that dissolve in water)	YES	NO	YES	NO	YES	NO
Soils with high clay content (clay fraction more than 40%)	YES	NO	YES	NO	YES	NO
Any other unstable soil or geological feature	YES	NO	YES	NO	YES	NO

An area sensitive to erosion	YES	NO	YES	NO	YES	NO

If you are unsure about any of the above or if you are concerned that any of the above aspects may be an issue of concern in the application, an appropriate specialist should be appointed to assist in the completion of this section. (Information in respect of the above will often be available as part of the project information or at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by the Council for Geo Science may also be consulted).

4. GROUNDCOVER

Indicate the types of groundcover present on the site:

The location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Natural veld - good condition[E]	Natural veld with scattered aliens[E]	Natural veld with heavy alien infestation[E]	Veld dominated by alien species[E]	Gardens
Sport field	Cultivated land	Paved surface	Building or other structure	Bare soil

If any of the boxes marked with an "[E] "is ticked, please consult an appropriate specialist to assist in the completion of this section if the environmental assessment practitioner doesn't have the necessary expertise.

5. LAND USE CHARACTER OF SURROUNDING AREA

Indicate land uses and/or prominent features that does currently occur within a 500m radius of the site and give description of how this influences the application or may be impacted upon by the application:

5.1 Natural area	x	5.22 School	
5.2 Low density residential		5.23 Tertiary education facility	
5.3 Medium density residential	x	5.24 Church	
5.4 High density residential		5.25 Old age home	
5.5 Medium industrial [AN]		5.26 Museum	
5.6 Office/consulting room		5.27 Historical building	
5.7 Military or police base/station/compound		5.28 Protected Area	
5.8 Spoil heap or slimes dam [A]		5.29 Sewage treatment plant [A]	
5.9 Light industrial		5.30 Train station or shunting yard [N]	
5.10 Heavy industrial [AN]		5.31 Railway line [N]	

5.11 Power station		5.32 Major road (4 lanes or more)	
5.12 Sport facilities		5.33 Airport [N]	
5.13 Golf course		5.34 Harbour	
5.14 Polo fields		5.35 Quarry, sand or borrow pit	
5.15 Filling station [H]		5.36 Hospital/medical centre	
5.16 Landfill or waste treatment site		5.37 River, stream or wetland	
5.17 Plantation		5.38 Nature conservation area	
5.18 Agriculture		5.39 Mountain, koppie or ridge	
5.19 Archaeological site		5.40 Graveyard	
5.20 Quarry, sand or borrow pit		5.41 River, stream or wetland	
5.21 Dam or Reservoir		5.42 Other land uses (describe)	

If any of the boxes marked with an "[N] "are ticked, how will this impact / be impacted upon by the proposed activity?

Not Applicable

If any of the boxes marked with an "[An]" are ticked, how will this impact / be impacted upon by the proposed activity?

If YES, specify and explain:	
If NO, specify:	

If any of the boxes marked with an "[H]" are ticked, how will this impact / be impacted upon by the proposed activity.

If YES, specify and explain:	
If NO, specify:	

6. CULTURAL/HISTORICAL FEATURES

Are there any signs of culturally or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including	YES	NO
Archaeological or palaeontological sites, on or close (within 20m) to the site?	Uncertain	
If YES, explain:		

If uncertain, conduct a specialist investigation by a recognised specialist in the field to establish whether there is such a feature(s) present on or close to the site.

Briefly explain the findings of the specialist:	**Archaeological** According to the archaeological study conducted, there are no cultural heritage sites, features or objects identified on the proposed development site. **Burial Grounds and Graves** No graves were identified on site No further studies / Mitigations are recommended given the fact that within the proposed development site and its surrounding there are no archaeological or place of historical significance to be impacted by the gravel extraction process. From a Heritage perspective, the development should be allowed to continue.

Will any building or structure older than 60 years be affected in any way?	YES	NO
Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?	YES	NO

If yes, please submit or, make sure that the applicant or a specialist submits the necessary application to SAHRA or the relevant provincial heritage agency and attach proof thereof to this application if such application has been made.

SECTION C: PUBLIC PARTICIPATION

1. ADVERTISEMENT

The person conducting a public participation process must take into account any guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of the application which is subjected to public participation by—

(a) fixing a notice board (of a size at least 60cm by 42cm; and must display the required information in lettering and in a format as may be determined by the department) at a place conspicuous to the public at the boundary or on the fence of—

  (i) the site where the activity to which the application relates is or is to be undertaken; and

  (ii) any alternative site mentioned in the application;

(b) giving written notice to—

  (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;

  (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;

  (iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;

  (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;

  (v) the municipality which has jurisdiction in the area;

(vi) any organ of state having jurisdiction in respect of any aspect of the activity; and

(vii) any other party as required by the department;

(c) placing an advertisement in—

(i) one local newspaper; or

(ii) any official *Gazette* that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;

(d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the local municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official *Gazette* referred to in subregulation 54(c)(ii); and

(e) using reasonable alternative methods, as agreed to by the department, in those instances where a person is desiring of but unable to participate in the process due to—

(i) illiteracy;

(ii) disability; or

(iii) any other disadvantage.

2. CONTENT OF ADVERTISEMENTS AND NOTICES

A notice board, advertisement or notices must:

(a) indicate the details of the application which is subjected to public participation; and

(b) state—

(i) that the application has been submitted to the department in terms of these Regulations, as the case may be;

(ii) whether basic assessment or scoping procedures are being applied to the application, in the case of an application for environmental authorisation;

(iii) the nature and location of the activity to which the application relates;

(iv) where further information on the application or activity can be obtained; and

(v) the manner in which and the person to whom representations in respect of the application may be made.

3. PLACEMENT OF ADVERTISEMENTS AND NOTICES

Where the proposed activity may have impacts that extend beyond the municipal area where it is located, a notice must be placed in at least one provincial newspaper or national newspaper, indicating that an application will be submitted to the department in terms of these regulations, the nature and location of the activity, where further information on the proposed activity can be obtained and the manner in which representations in respect of the

application can be made, unless a notice has been placed in any *Gazette* that is published specifically for the purpose of providing notice to the public of applications made in terms of these Regulations.

Advertisements and notices must make provision for all alternatives.

terms of the Guideline Document for Environmental Impact Assessment Regulations promulgated in terms NEMA, Stakeholders and I&AP's were notified as follows:

• Site notices were erected (at prominent points on and around the study area) on the 1st of June 2021.

• Landowners and occupants of land within a 100 meters' radius of the boundary of the property and who may be directly affected by the proposed activity were informed;

• Notices regarding the project were further e-mailed, and letters were hand delivered to a list of interested and affected parties on the 1st of June 2021.

• An advertisement was placed in the Limpopo Mirror Newspaper on the 18th of June 2021;

• A list of all persons, organizations' and organs of state that were also invited to register as interested and affected parties.

4. DETERMINATION OF APPROPRIATE MEASURES

The practitioner must ensure that the public participation is adequate and must determine whether a public meeting or any other additional measure is appropriate or not based on the particular nature of each case. Special attention should be given to the involvement of local community structures such as Ward Committees, ratepayers associations and traditional authorities where appropriate. Please note that public concerns that emerge at a later stage that should have been addressed may cause the department to withdraw any authorisation it may have issued if it becomes apparent that the public participation process was inadequate.

5. COMMENTS AND RESPONSE REPORT

The practitioner must record all comments and respond to each comment of the public before the application is submitted. The comments and responses must be captured in a comments and response report as prescribed in these Regulations and be attached to this application. The comments and response report must be attached under Appendix E.

The comments and response report is attached on Appendix E.

6. AUTHORITY PARTICIPATION

Please note that a complete list of all organs of state and or any other applicable authority with their contact details must be appended to the basic assessment report or scoping report, whichever is applicable.

Authorities are key interested and affected parties in each application and no decision on any application will be made before the relevant local authority is provided with the opportunity to give input.

Name of Authority informed:	Comments received (Yes or No)
Department of Water and Sanitation	
Vhembe District Municipality	
Collins Chabane Local Municipality	
South African Heritage Resources Agency (SAHRA)	
Eskom	

7.CONSULTATION WITH OTHER STAKEHOLDERS

Note that, for linear activities, or where deviation from the public participation requirements may be appropriate, the person conducting the public participation process may deviate from the requirements of that subregulation to the extent and in the manner as may be agreed to by the department.

Proof of any such agreement must be provided, where applicable.

Has any comment been received from stakeholders?	**YES**	**NO**

If "YES", briefly describe the feedback below (also attach copies of any correspondence to and from the stakeholders to this application):

SECTION D: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2014, and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts.

1. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

List the main issues raised by interested and affected parties.

None

Response from the practitioner to the issues raised by the interested and affected parties (A full response must be given in the Comments and Response Report that must be attached to this report as Annexure E):

There are no issues raised so far that must be addressed by the practitioner.

2. IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN, CONSTRUCTION, OPERATIONAL, DECOMMISSIONING AND CLOSURE PHASES AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES

List the potential direct, indirect and cumulative property/activity/design/technology/operational alternative related impacts (as appropriate) that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning and closure phase, including impacts relating to the choice of site/activity/technology alternatives as well as the mitigation measures that may eliminate or reduce the potential impacts listed.

Alternative (preferred alternative) Design/ Planning Phase			
Identified Impacts- Planning Phase			
Impact	Significance rating of impact before mitigation	Proposed mitigation	Significance rating of impact after mitigation
Direct Impacts			
Poor Design- Structural failures	High (Negative)	Ensure compliance with the industry standards	Low (Negative)
Indirect Impacts			
Disregard of legislative requirement	High (Negative)	Ensure compliance with relevant legislation and legal standards	Low (Negative)
Construction Phase			
Identified Impacts- Construction Phase			
Impact	Significance rating of impact before mitigation	Proposed mitigation	Significance rating of impact after mitigation
Direct Impacts			
Loss of vegetation and faunal habitat	Medium (Negative)	Maintain the viability of the indigenous seed bank in excavated soil so that it can be used for subsequent re-vegetation of any disturbed areas. • Prevent impact of construction activities to extend on to neighbouring land demarcated and fenced construction camp; strict control of labourers. • Avoid unnecessary loss of indigenous trees.	Low (Negative)
Increased risk of dust and erosion	Medium (Negative)	All vehicles must be along existing lines	Low (Negative)

from clearing of vegetation and earth moving vehicles		or tracks. • Erosion protection measures must be implemented on the site to reduce erosion and sedimentation of the receiving environment. Measures could include: • Sediment traps • Sandbags • Bunding around soil stockpiles. • Adequate dust control strategies should be applied to minimise dust disposition; they can include periodic spraying of roads with water, cover trucks to prevent dust emission during transportation	
Waste collection services	High	Confirmation from the municipality must be sought to ensure the municipal waste collection service will collect the waste generated by the proposed development/ activity	Low (Negative)
Potential noise impact from the use of construction equipment	Medium (Negative)	Limit construction activities to day time hours. • Construction personnel must wear personal protective equipment where appropriate. • All machineries to be utilised on the site must be fitted with buffers and must be maintained in good working conditions in order to minimize noise. • The contractor shall warn all local community that could be affected by the noise generation from construction activities.	Low (Neutral)

Increase in stormwater runoff resulting from construction activities	Medium (Negative)	To prevent stormwater damage, the increase stormwater runoff resulting from construction activities must be estimated and drainage patterns accessed accordingly. • Temporary cut off drains and berms may be required to capture stormwater and promote infiltration.	Low (Negative)
Potential health injuries to construction personnel as a result of construction work.	Medium (Neutral)	The contractor must ensure that all construction personnel are provided with adequate PPE for use where appropriate.	Low (Negative)
Disturbance of Heritage Resources from construction activities.	Low (Negative)	SAHRA must immediately be alerted in case evident or artefacts, paleontological fossils, additional graves or heritage resources are discovered during the course of development.	Negligible
Socio-economic Impact: Employment creation and skills development opportunities during the construction phase, which is expected to give rise to new jobs. This impact is rated as positive.	Medium (Positive)	Enhance the use of local labour and local skills as far as reasonably possible. • Where the required skills do not occur locally, and where appropriate and applicable, ensure that relevant local individuals are trained. • Ensure that an equitable percentage allocation is provided for local labour employment as well as specify the use of small-to-medium enterprises and training specifications in the Contractors contract. • Ensure that goods and services are sourced from the local and regional	High (Positive)

		economy as far as reasonably possible.	
Air quality impact: Emissions from construction vehicles and generation of dust as a result of earthworks	Medium (Negative)	Ensure that cleared areas and unpaved surfaces are sprayed with water (obtained from an approved source) to minimise dust generation. • Approved soil stabilizers may be utilised to limit dust generation. • Ensure that construction vehicles travelling on unpaved roads do not exceed a speed limit of 40 km/hour. • Adequate dust control strategies should be applied to minimise dust deposition, for example: Periodic spraying of the entrance road and environmentally friendly dust control measures (e.g. mulching and wetting) where and when dust is problematic	Low (Negative)
No-go alternative			
Direct Impacts: • None of the impacts mentioned above will occur. • If the proposed project does not proceed, increased income and economic spin-off activities will not be realised. **Indirect Impacts:** There are no indirect impacts during the construction phase for the No-go Option. **Cumulative Impacts:** There are no cumulative impacts during the construction phase for the No-go Option.			
Operational Phase			
Identified Impacts- Operational Phase			
Impact	Significance rating of impact before mitigation	Proposed mitigation	Significance rating of impact after mitigation
Direct Impacts			
Visual impacts will increase during the operation phase due to development and lighting	High	Lighting and layout to be maintained as per the layout plan to ensure bright street lighting is not permitted	Low
Lack of road	High	Road maintenance must	Low

maintenance will lead to a deterioration in the internal and access roads		be done regularly by the Collins Chabane Local Municipality	
Risk of fire explosion	Medium (Negative)	• Prevent spread of fire to surrounding buildings or vegetation • Adequate firefighting training must be given to staff. • Ensure that relevant signage e.g. no smoking, is displayed in potentially dangerous areas and is abided by.	Low (Negative)
Socio-economic Impact: Skills development opportunities and economic spin off activities will also occur during the operational phase. This impact is rated as positive.	Medium (Positive)	• Enhance the use of local labour and local skills as far as reasonably possible. • Where the required skills do not occur locally, and where appropriate and applicable, ensure that relevant local individuals are trained. • Ensure that goods and services are sourced from the local and regional economy as far as reasonably possible.	High (Positive)
Indirect Impacts			
Impact on the surrounding community in terms of visibility and great environment	Medium (Negative)	• Ensure that surrounding gardens are well maintained. The planting of indigenous vegetation is encouraged. • Use water sparingly in maintaining gardens. • Institute an appropriate building and site maintenance programme.	Low (Negative)
No-go alternative			
Direct Impacts: • None of the impacts mentioned above will occur. • If the proposed project does not proceed, increased income and economic spin-off activities will not be realised.			

Indirect Impacts:
There are no indirect impacts during the construction phase for the No-go Option.
Cumulative Impacts:
There are no cumulative impacts during the construction phase for the No-go Option.

3. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that summarises the impact that the proposed activity and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account, with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

Alternative A (preferred alternative)

From the impact assessment discussed in detail in this report, it is evident that the proposed demarcation of sites is suitable for the site.

It should however be noted that this is only if the demarcation is planned and managed un accordance with the mitigation measures described in this report, the specialist studies (especially the mitigation measures as provided in the ecological, geotechnical and heritage reports) and in the Environmental Management Plan (EMP); furthermore, this project will also create employment opportunity for local residents during construction.

The Socio-Economic Environment

During Construction Phase

The proposed development will have a positive impact on the economy due to temporary employment opportunities more especially to the surrounding community. It will also have a positive impact on the social environment as there will be visible investment from the private sector within rural areas.

During Operational Phase:

The proposed development will have a positive impact on the socio-economic environment during the operational phase due to permanent employment opportunities.

The biophysical environment

During Construction Phase:

The biophysical environment will be affected by construction activities that could result in excessive noise and dust. However, there are mitigation measures put in place to prevent the impacts or minimizing them as explained
on the Environmental Management Programme.

During Operational Phase:

All negative impacts that are likely to occur in this phase are not of significance as there are mitigation measures that are already put in place to control and protect the environment

No-go alternative (compulsory)

The No Go Alternative implies that the site is not suitable for demarcation of 101 sites. This option will come to the party if the proposed development has significant negative impact that cannot be mitigated effectively. The proposed site does not have any environmental constraints.

Other factors that can contribute to this option include opposite interested and affected parties with valid points to go against the proposed development as well as none compliance with legislations required by organs of sate. No objections have been received thus far as we are still to advertise and have the public participation meetings.

Our views as Mang Geo-Enviro Services, independent EAPs are that the proposed area is suitable for a proposed demarcation of 101 sites based on that the area is not sensible to the environment and it is located within the Mtititi Village.

Alternative B

Alternative C

For more alternatives please continue as alternative D, E, etc.

SECTION E. RECOMMENDATION OF PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the environmental assessment practitioner)?	YES	NO

If "NO", indicate the aspects that should be assessed further as part of a Scoping and EIA process before a decision can be made (list the aspects that require further assessment):

If "YES", please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the department in respect of the application:

The EAP recommends that the implementation and strict adherence to the EMPr forms part of the conditions of an Environmental Authorisation for the development. The EAP also recommends that all mitigation measures as described in this Basic Assessment Report and specialist studies report be included as part of the conditions of the authorisations granted for the development. Furthermore, the developer should accept responsibility for appointing service providers that comply with the legislative requirements of the country and who have standing agreements with the necessary authorities where required.

The following measures/ plans must also be required as part of the approval:

• Communication or awareness must be undertaken to the project team to ensure maximum participation and compliance to the EMPr.

• The EMP attached and the mitigation measures related to it must be adhered to at all times and the appointed ECO must ensure that the developer complies with the EMP.

• An ECO must be appointed to monitor compliance with the authorization and develop compliance reports to be submitted to the Department during the construction phase.

• It is recommended that adequate storm water management be incorporated in the design of the proposed development in order to prevent erosion and the associated sedimentation of the surrounding areas. All areas affected by construction which are to remain as open space areas should be rehabilitated upon the completion of the construction phase of the development.

• All of the recommendations in the specialist reports that are included as a part of this application should be implemented & strictly adhered to in order to counteract adverse and cumulative impacts to the biophysical & social environments.

Is an EMPr attached? The EMPr must be attached as Appendix F.	YES	NO

SECTION F: APPENDIXES

The following appendixes must be attached as appropriate:

Appendix A: Site plan(s)

Appendix B: Photographs

Appendix C: Facility illustration(s)

Appendix D: Specialist reports

Appendix E: Comments and responses report

Appendix F: Environmental Management Programme (EMPr)

Appendix G: Other information

SECTION G: DECLARATION BY THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

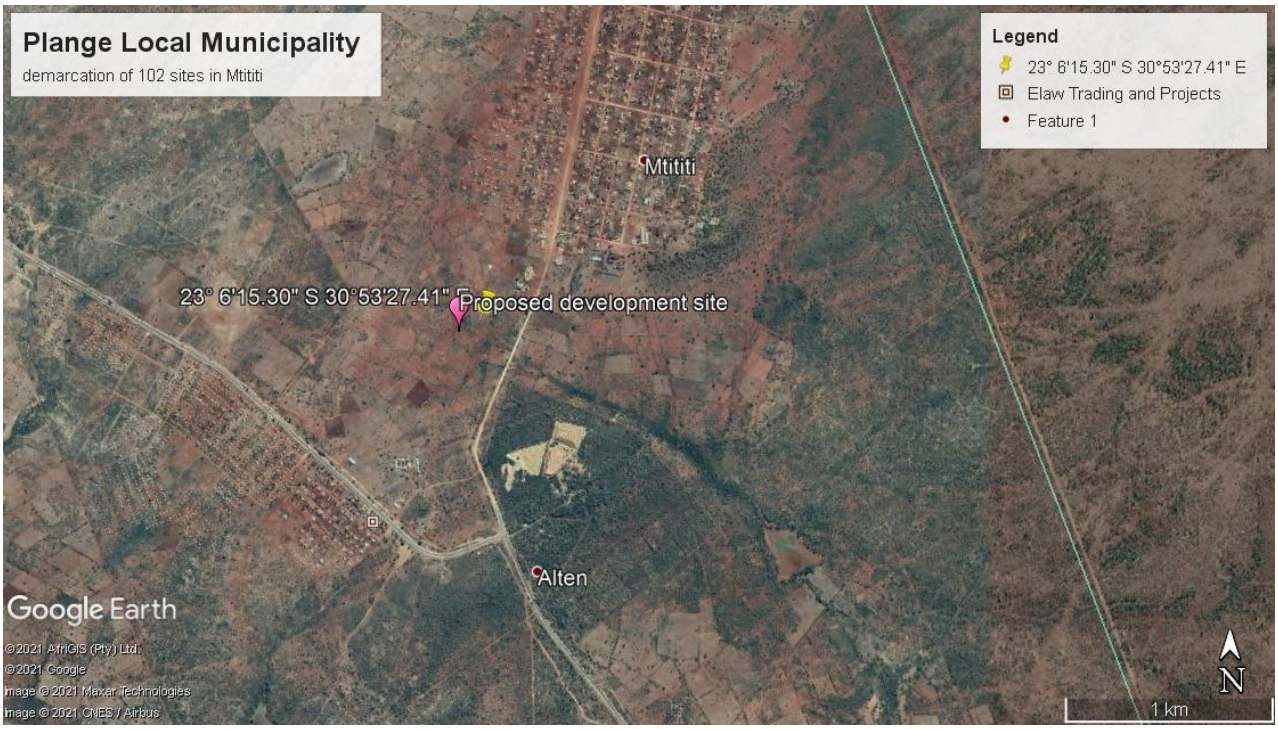
I, _____ declare that I –

(a) act as the independent environmental practitioner in this application;
(b) do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
(c) do not have and will not have a vested interest in the proposed activity proceeding;
(d) have no, and will not engage in, conflicting interests in the undertaking of the activity;
(e) 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 Environmental Impact Assessment Regulations, 2006;
(f) will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
(g) will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the Department in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the Department may be attached to the report without further amendment to the report;
(h) will keep a register of all interested and affected parties that participated in a public participation process; and
(i) will provide the Department with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not.

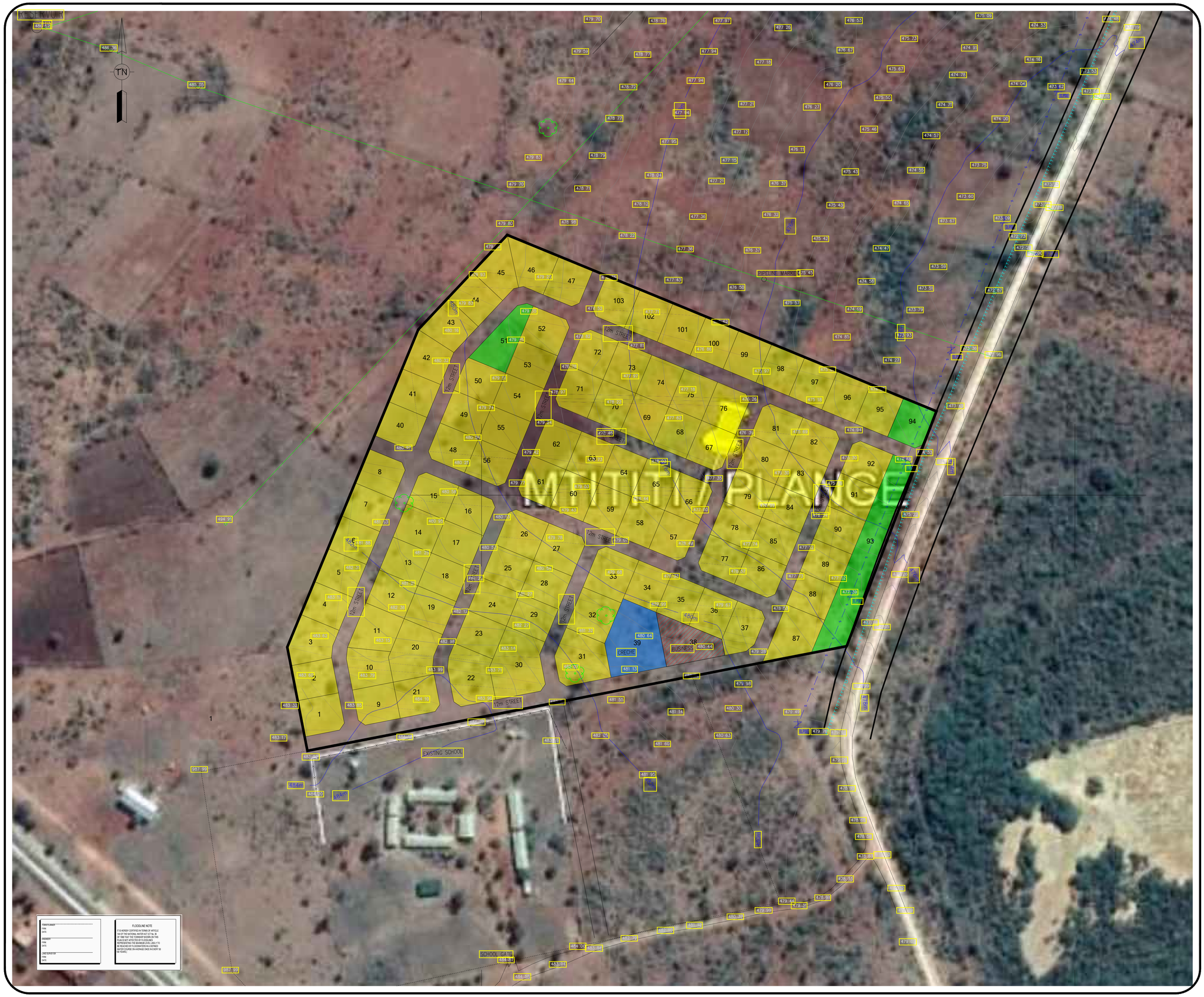
Signature of the Environmental Assessment Practitioner:

Mang Geoenviro Services (Pty) Ltd
Name of company:

14 July 2021
Date:


Plange Local Municipality
demarcation of 102 sites in Mtititi
Legend
23° 6'15.30" S 30°53'27.41" E
Elaw Trading and Projects
Feature 1
Mtititi
23° 6'15.30" S 30°53'27.41" E
Proposed development site
Alten
Google Earth
© 2021 AfriGIS (Pty) Ltd.
© 2021 Google
Image © 2021 Maxar Technologies
Image © 2021 CNES / Airbus
N
1 km

APPENDIX B: LAYOUT PLAN



Project Title:

PROPOSED TOWNSHIP
MTITITI
Situated on:
FARM PLANGE 221 LT
LIMPOPO

LAND USE

ZONING	LAND USE		NO. OF STANDS	AREA Ha.	% OF AREA
RESIDENTIAL 1	RESIDENTIAL		98	10.83	72.6
BUSINESS 1	BUSINESS		1	0.15	1
EDUCATIONAL	CRECHE		1	0.24	2
PUBLIC OPEN SPACE	PUBLIC OPEN SPACE		3	0.61	4
STREETS	*	*	*	3.11	20
TOTAL	*		103	14.9400	100

GENERAL NOTES

1) Cadastral boundaries: ----------
2) All internal roads are 12m wide unless otherwise indicated.
3) All panhandles are 5m wide unless otherwise
4) The contour survey is in accordance with the standard laid down in Reg. 17(a) of Town Planning & Township Ordinance,1960.
5) All dimensions and areas are approximate and subject to final survey by Professional Land Surveyor.
6) All Cadastral dimensions to be confirmedby Proffessional Land Surveyor prior to any detail designs being constructed.
7) Zoning are subject to the applicable Zoning Scheme.
8) Outside Figure

INDEMNITY
MAHLORI DEVELOPMENT CONSULTANTS MAKE NO WARRANT OF ANY KIND, EXPRESSED OR IMPLIED, WITH REGARD TO THE DATA AND SHALL NOT HELD LIABLE IN ANY EVENT FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH OR ARISING OUT OF THE USE OF THIS DATA.

Client: COLLINS CHABANE LOCAL MUNICIPALITY

Dwg. No: MTI/2019	Revision:001
Designed: R.SELEPE	Scale: 1:1 500
Checked: B.MAKASANI	Date: JANUARY 2020

MAHLORI DEVELOPMENT CONSULTANTS

APPENDIX C: PHOTOGRAPHS






APPENDIX D: SPECIALIST REPORTS

PROJECT DETAILS

PROJECT TITLE: BIODIVERSITY STUDY FOR THE EIA APPLICATION FOR THE PROPOSED PLANGE TOWNSHIP DEVELOPMENT ON THE REMAINDER OF THE FARM PLANGE 221-LT IN MTITITI VILLAGE COLLINS CHABANE LOCAL MUNICIPALITY, LIMPOPO PROVINCE

Project Number: Biodiversity 002

Compiled by: Takalani Mudau

Compiled for: Mahlori Development Consultants

Date: 23 February 2020

Takalani Mudau- (Pr. Sci. Nat)

BSc (Hons) Botany – Univen

For Mveledzo Environmental and Safety Solutions Pty Ltd

Table of Contents

DEFINITIONS 3
ABBREVIATIONS 7
1. INTRODUCTION 9
1.1 Background 9
1.2 Project description 10
1.3 Study Approach 10
1.3.1 Site visits 11
1.3.2 Desktop study 11
1.4 Vegetation study 11
1.5 Study area 12
1.6 Biodiversity of the Vhembe District Municipality (VDM) area 14
1.7 Climate 15
1.8 Water resources 16
1.9 Geology 17
1.10 Applicable environmental legislation 18
1.11 Land use activities of the study area 20
2. POTENTIAL ENVIRONMENTAL IMPACTS 21
2.1 Cultural biodiversity resources / products 21
2.2 Habitat destruction and modification 21
2.3 Water quality 22
2.4 Air quality 23
2.5 Noise 24
2.6 Impact Assessment Methodology 25
2.7 Impacts on the vegetation 26
3. RESULTS AND DISCUSSION 28
3.1 Site biodiversity 28
4. CONCLUSION AND RECOMENDATIONS: 36
5. LIST OF REFERENCES 37
6. APPENDIX 38

DEFINITIONS

Environment

The surroundings (biophysical, social and economic) within which humans exist and that are made up of

- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part or combination of (i) and (ii) and the interrelationships among and between them; and,
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.

Environmental Aspects

Elements of an organization's activities, products or services that can interact with the environment.

Environmental Degradation

Refers to pollution, disturbance, resource depletion, loss of biodiversity, and other kinds of environmental damage; usually refers to damage occurring accidentally or intentionally as a result of human activities.

Environmental Impacts

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services.

Environmental Impact Assessment

A systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and Scoping and EIR (NEMA EIA Regulations).

Environmental Impact Report

A report assessing the potential significant impacts as identified during the environmental impact assessment.

Land use

The various ways in which land may be employed or occupied. Planners compile, classify, study and analyse land use data for many purposes, including the identification of trends, the forecasting of space and infrastructure requirements, the provision of adequate land area for necessary types of land use, and the development or revision of comprehensive plans and land use regulations.

Pollution Prevention

Any activity that reduces or eliminates pollutants prior to recycling, treatment, control or disposal.

Public Participation Process

A process of involving the public in order to identify needs, address concerns, in order to contribute to more informed decision making relating to a proposed project, programme or development.

Topography

Topography, a term in geography, refers to the "lay of the land" or the physio-geographic characteristics of land in terms of elevation, slope and orientation.

Vegetation

All of the plants growing in and characterizing a specific area or region; the combination of different plant communities found there.

Waste

Waste is unwanted or undesired material left over after the completion of a process. "Waste" is a human concept: in natural processes there is no waste, only inert end products.

Alternatives

Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site, activity, process or technology, or the no-go alternative.

Cumulative Impacts

Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of the other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Direct impacts

Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of activity). These impacts are usually associated with the construction, operational or maintenance of an activity and are generally obvious and quantifiable.

Mitigate

The implementation of practical measures to reduce adverse impact (DEA).

Environmental Management Plans

This document that provides appropriate mitigation measures designed to minimize or eliminate the significant adverse impacts that may be caused as a result of the proposed project.

Interested and affected parties (I&APs)

Individual, communities or groups, other than the proponent or the authorities, whose interests may be positively or negatively affected by proposal or activity and/or who are concerned with a proposal or activity and its consequences. These may include local communities, investors, business association, trade unions, customers, consumers and environmental interest group. The principle that environmental consultants and stakeholder

engagement practitioners should be independent and unbiased excludes these groups from being considered stakeholders (DEA, 1998).

ABBREVIATIONS

BAR – Basic Assessment Report

BID – Background Information Document

CBD – Central Business District

CA – Competent Authority

CEMP –Construction Environmental Management Plan

CMP -Construction Management Plan

CLO – Community Liaison Officer

DEA – Department of Environmental Affairs

DoH – Department of Health

DWS – Department of Water Affairs and Sanitation

EAP – Environmental Assessment Practitioner

ECO – Environmental Control Officer

EIA – Environmental Impact Assessment

EIAR - Environmental Impact Assessment Report

EIS – Ecological Importance and Sensitivity

EMPr – Environmental Management Programme report

GN – Government Notice

I&AP – Interested and Affected Party

KM – Kilometres

MAP – Mean Annual Precipitation

MM – Millimetres

NEMA – National Environmental Management Act, Act 107 of 1998 as amended

NEMAQA – National Environmental Air Quality Act

NEMWA – National Environmental Management Waste Act

NWA – National Water Act

PM – Project Manager

PPP – Public Participation Process

R – Regulation

SASS – South African Scoring System

SAHRA - South African Heritage Resources Agency

Declaration of Independence

I **Takalani Mudau**, in my capacity as specialist consultant, 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 our profession in accordance with the Code of Conduct of the Council, as well as any other societies to which we are members; and
- Based on information provided to us 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 our professional judgement.

Signature: _____ Date: _____

1. INTRODUCTION

1.1 Background

South Africa has re-affirmed the importance of the national commitment to biodiversity. The National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) has been assented by the President of South Africa and was published in the Government Gazette in June 2004 (Vol. 467; No 26426). The objective of this Act is to provide for, amongst other things: management and conservation of South Africa's biodiversity within the framework of National Environmental Management Act, 1998; the protection of species and ecosystems warrant national protection; and the sustainable use of indigenous biological resources.

Mahlori Development Consultants have been appointed by Collins Chabane Local Municipality, to conduct the EIA for the proposed Plange township development on the remainder of the farm Plange 221-LT in Mtititi village Collins Chabane local Municipality, Limpopo Province. As part of the EIA application process, Biodiversity specialist study must be conducted. Mveledzo Environmental and safety solutions was appointed by Mahlori Development Consultants Services to conduct biodiversity impact studies for the proposed Project. This report contains the results of the biodiversity aspects of the environmental impact assessment. Although several potential impacts on the biodiversity are mentioned in this report, other specialists in their specialist's reports address specifics. This report therefore focuses on the fauna and flora of the study area.

The proposed activity requires an Environmental Impact Assessment (EIA) to be undertaken in compliance with the regulatory requirements of the National Environmental Management Act (Act 107 of 1998) (NEMA) and the Environmental Impact Assessment (EIA) Regulations, 2010, GN R.453, R.544 and R546.

As part of the EIA Process, it is required that specialist studies be conducted before the construction and operational phases.

Mveledzo Environmental and safety Solutions Pty Ltd was appointed by Mahlori Development Consultants, a representative of the applicant, to manage the biodiversity study that will form part of the environmental authorisation process for the proposed development.

This ecological report forms part of the specialist studies that were conducted prior to the commencement of the development. It is important to conduct Biodiversity assessment because in the past planning and development of urban and industrial areas did not include an assessment of the assets of the natural environment. In order to prevent the further destruction of any ecosystem, it is important that planning and co-ordination of human activities and development should include studies of the natural environment, involving soil, water, floral, faunal and cultural or historical aspects. This sspecialist studies and surveys were commissioned to:

- identify flora species
- identify vegetation communities
- identify fauna species (small mammals, reptiles, birds & large mammals) and potential habitats
- identify red data species (fauna & flora) and their habitats
- evaluate the sensitivity of each plant community & red data species habitat
- map vegetation communities & red data species / habitats, and
- identify medicinal, invasive and/or exotic plants that might occur

1.2 Project description

This Plange proposed township is located 27 km from the town of Malamulele in Mtititi Village in the Limpopo province. The proposed Township is proposed to be built on the remainder of the farm Plange 221-LT in Mtititi village, Collins Chabane local Municipality, Limpopo Province. The area is still within a natural state though majority of vegetation are juveniles which shows a regrowth from the event of disturbance but the highly biodiverse. The site is bordered to the south by Mtititi secondary school.

1.3 Study Approach

The study was conducted in two ways which are site visits and desktop study for the proposed site.

1.3.1 Site visits

The site visit was conducted on the 22nd February 2020. The main aim of the site visit was to identify and record all the fauna and flora that are available on the proposed site. All the species that were found onsite were then recorded and identified. The method that was used to record the available species was to transect through all the areas where proposed township is to be situated. The significance of each "actual impact" was then determined and to determine the broad legal requirements of potential impacts and some broad mitigation measures, a broad legal overview has been conducted.

1.3.2 Desktop study

Different sources were visited in order to get the biodiversity of the area and information that was collected from such sources where then verified by the site visit. Although we managed to get the information from different sources the site visit was more informative and giving the clear picture of the biodiversity on site.

1.4 Vegetation study

The aim for this study was to

- Carry out fieldwork to locate and describe the current state of vegetation on the study area, key focus on the impact footprint(s) for site, so that there is a baseline description/status quo against which impacts can be identified and measured.
- Determine the species present and localities within each vegetation types.
- Generate a vegetation map showing the site in relation to any Critical Biodiversity Areas and links to ecological corridors and support areas, vegetation sensitivity, disturbed, transformed and potential "no-go" areas.
- Determine whether the study area falls wholly or partially within the distribution range of species listed as Vulnerable, Endangered or Critically Endangered and Protected.
- Provide site photos that show the current state of the vegetation (i.e. natural, transformed, disturbed etc.) Identify and describe the conservation value and conservation planning frameworks relevant to this site (Regional Planning) for represented vegetation units.
- A detailed list of species of special concern.

- An indication of the irreplaceability value of vegetation types present on site.
- Describe the areas where indigenous vegetation has been transformed.
- Determine alien species present; their distribution within the study area and recommended management actions.
- A description of different micro-habitats, and the species associated with those habitats.
- Note and record the position of unusually large specimens of trees.
- Describe the potential direct, indirect and cumulative negative and positive impacts of the proposed activity on vegetation species during the construction, operation and decommissioning phases of the project.
- Identification of issues and potential direct, indirect and cumulative biodiversity impacts, which are to be considered in combination with any additional relevant issues that may be raised through the public consultation process. These include:
- The cumulative impact of clearing for the operation of the proposed township on floral species of concern both on the farm and in the greater area.
- Disclose any gaps in information or assumptions made.
- Recommendations for mitigatory measures to minimise impacts identified.
- An outline of additional management guidelines.
- Provide monitoring requirements, mitigation measures and recommendations in a table format as input into the Environmental Management Plan (EMP), as well as generic rehabilitation and re-vegetation guidelines.

1.5 Study area

The project is located in Mtititi village 27km from Malamulele town, in the Limpopo Province. The site is contained within the Collins Chabane Local Municipality. The site falls within the Savannah biome (lowveld rugged mopaneveld).

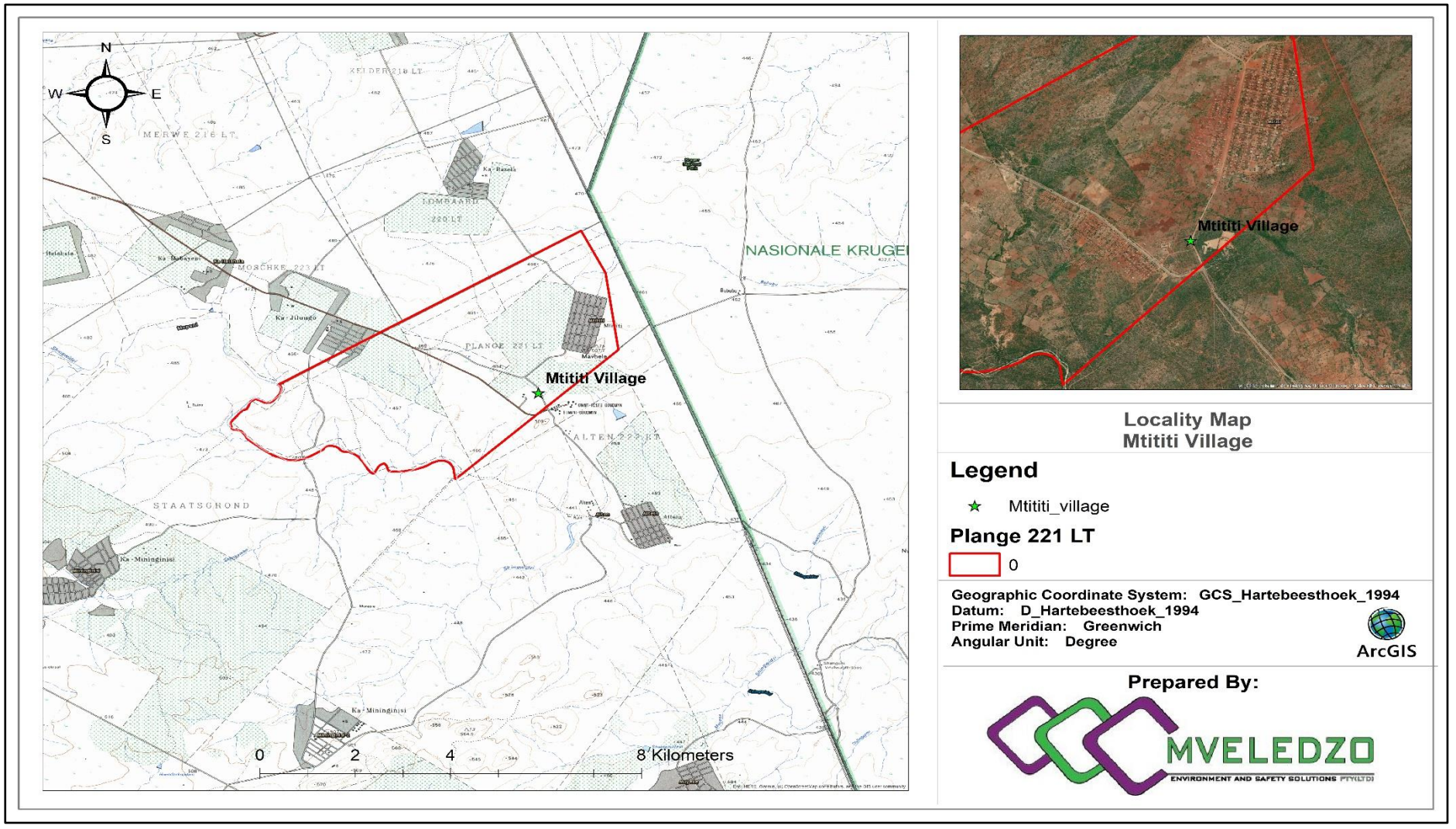


Figure 1: Locality map showing the site for the proposed Plange township,

1.6 Biodiversity of the Vhembe District Municipality (VDM) area

Groupings called Biomes (large-scale biotic communities) have been described for plants and/or animals living together with some degree of permanence, so that large-size patterns in global plant cover can be observed. Biomes broadly correspond with climatic regions, although other environmental controls are sometimes important. Each biome has a characteristic set of plant and animal species as well as a characteristic overall physiognomy (for example a general appearance given by the plant shapes). The general plant characteristics give a characteristic visual signature to the vegetation of the biome. Rutherford and Westfall (1994) map seven biomes of South Africa: Savanna, Thicket, Grassland, Forest, Fynbos, Nama Karoo, Succulent Karoo and Desert. The most recent treatise on the Biomes of South Africa was published in 2006 by Mucina and Rutherford).

The majority of the VDM landscape is characterized by undulating rolling hills with flat plains occurring in the east. The topography of the VDM is also characterized by the Soutpansberg, the northern most mountain range in South Africa. Its altitude ranges from 250 meters above mean sea level to 1748 meters at Lajuma, the highest peak. The Limpopo River System on the northern part of the district is considered to be the life blood of the Northern Vhembe semi-arid area. Limpopo River is the country‘s third most important river which provides sustenance to the predominantly hot and drylands. Vhembe area also boasts the widely known Lake Fundudzi which is steeped in cultural history. There is also the Mutale and Luvuvhu Catchments area with a number of tributaries emanating from the catchments. The Luvuvhu Catchment forms part of the larger Limpopo system, which extends into Mozambique. The Luvuvhu River and some if its tributaries (including the Mutshindudi and Mutale Rivers) rise in the Soutpansberg Mountains and flows for approximately 200 km before it joins the Limpopo River near Pafuri in the KNP. Other main rivers in the VDM are the Sand River, Luvuvhu River, Nzhelele River and the Shisha River.

The Savanna biome covers approximately 98% of the Vhembe District Municipality with the remainder being made up of Forest (1%) and Grassland (0.2%) biomes (CNdV Africa, 2015). Azonal vegetation is found in patches along the Limpopo, Luvuvhu and Shingwidzi Rivers.

Vhembe District Municipality, inclusive of the KNP, has 24 different vegetation types. Two of the 24 vegetation types are classified as Threatened ecosystems, namely Tzaneen Sour Lowveld which is classified as Endangered and the Lowveld Riverine Forest which is classified as Vulnerable in the national list of threatened ecosystems published in terms of the Biodiversity Act (DEA, 2011). It should also be noted that Mapungubwe Forest located on the northern border of the District near MNP is classified as Endangered. Thirteen (13) of the vegetation types occurring within the District are classified as endemic and five (5) as nearendemic. The Soutpansberg Centre of Endemism, the northern most mountain range in South Africa, stretches from east to west covering an area close to 130 Km. The Soutpansberg is truly diverse and home to approximately 2500- 3000 recorded vascular plant taxa, 594 tree taxa, 510 bird species, 116 reptile species and 145 mammal species (The Soutpansberg, 2003). This area also functions as an important biodiversity hotspot, ecological corridor, centre of endemism, Important Bird Area and Strategic Water Source Area. Additionally, the Soutpansberg Mountains houses one of the few natural inland lakes in South Africa, Lake Fundudzi. Several wetlands in this mountain range contain peat which harbours information going back 12 000 years. There is also the Makuleke Wetlands in the north east, an identified RAMSAR wetland, one of only two identified in Limpopo. The mountains also hold the catchments of several important Limpopo Province rivers, including the Sand, Mutamba, Nzhelele, Nwanedzi, Mutale and Luvuvhu. All of these flows north into the province's most important river, the Limpopo.

1.7 Climate

The Mean Annual Precipitation of Mtititi is approximately 601 mm, and Mean Annual Temperature is 16.9 °C. The average rainfall (precipitation) and temperatures of Mtititi

are shown below (Fig. 1).

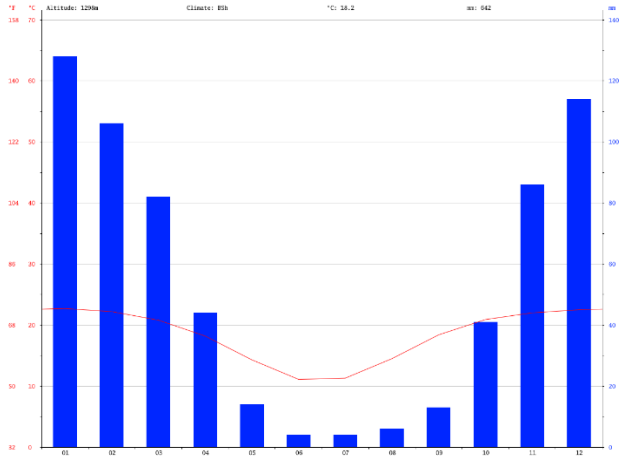


Figure 2: Climatic figures of Mtititi

According to Köppen -Geiger system (Kottek *et al*. 2006), the study area falls within the BSk (Local steppe) climatic region (Fig. 2).

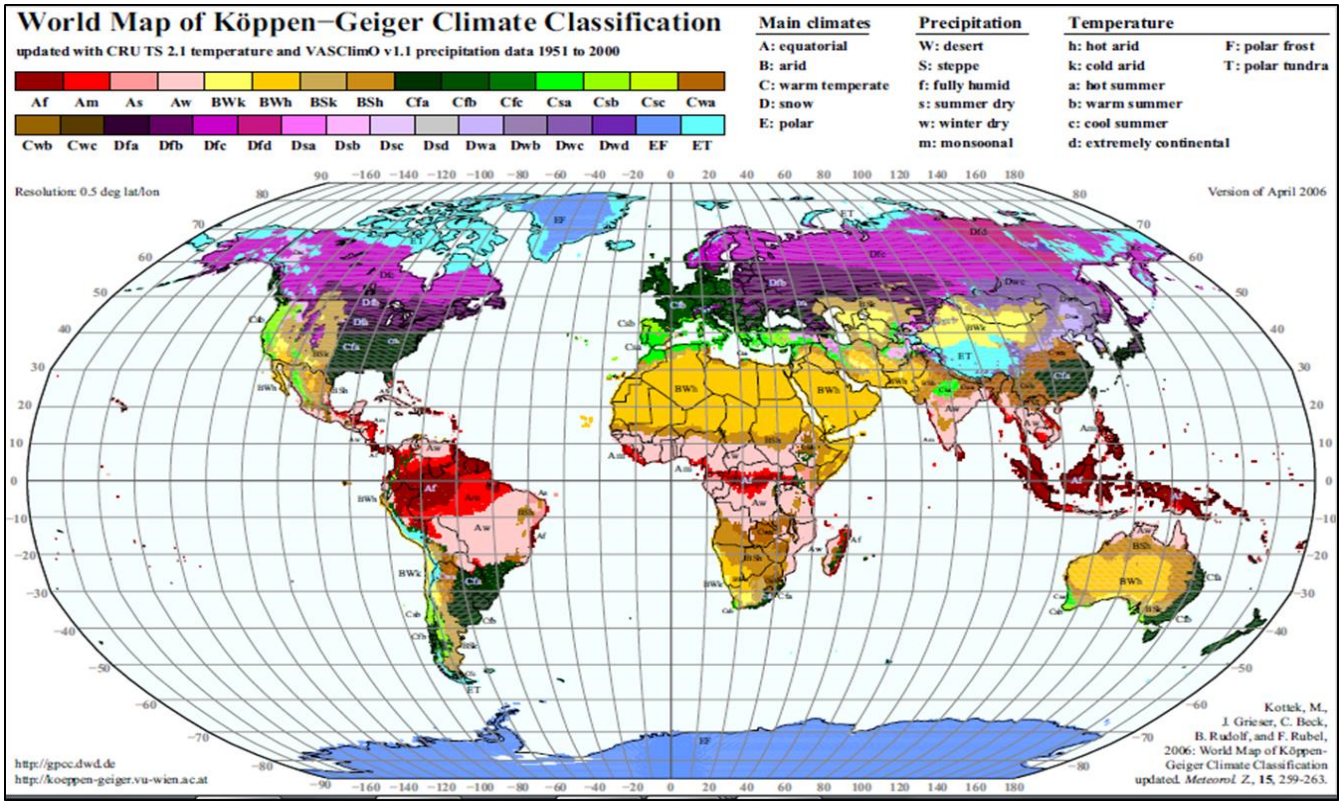


Figure 3:World map of Köppen -Geiger Climate Classification.

1.8 Water resources

The project area falls within the Luvuvhu catchment area.

- Perennial rivers

Perennial rivers are those rivers, which have a constant flow throughout the year. It mainly consists of those rivers which flow throughout the year.

- Wetlands

A wetland is an area of marsh, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed ten metres. See sensitivity map for the type of wetlands found within the project area.

1.9 Geology

Geologically, the study area covers part of the junction between the granite-greenstone terrain of the north-eastern part of the Kaapvaal Craton and the highly metamorphic rocks of the Southern Marginal zone of the Limpopo Mobile Belt (Figure 4.5). Some authors (i.e. Roering et al. 1992) have suggested that the Limpopo Mobile Belt in the northern part of South Africa is the world's earliest example of a Himalayan-type continent-continent collisional orogeny between two large 65 cratons (Kaapvaal- and Zimbabwe Cratons). However, according to Kramers et al., (2006) no consensus regarding the geological process, setting or timing of the Limpopo Mobile Belt have been reached. The resulting Limpopo Mobile Bemol consists of three main crustal zones, namely the Northern Marginal Zone, the Central Zone and the Southern Marginal Zone, which lie parallel to one another in an ENE direction. he geology of the study area is dominated by two lithostratigaphical units in the crystalline complex, namely the Goudplaats-Hout River Gneiss and Groot-Letaba Gneiss. These Palaeoarcheaen (3,600-3,200 million years) gneissic bodies range from homogenous to strongly layered, leucocratic felsic to mafic minerals. The previous subdivision of the strongly migmatised Hout River Gneiss and less well-migmatised Goudplaats Gneiss is no longer regarded as tenable. However, granitoid gneisses occurring between the Murchison (Gavelotte Group) and the Pietersburg-Giyani greenstone belts have been grouped together under the term Groot-Letaba Gneiss (Brandl and Kröner, 1993). These rocks are bounded in

the southeast by the Letaba Shear Zone. Archaean Greenstone Belts. The Rhenosterkoppies (Zandrivierspoort Formation), Pietersburg (Pietersburg Group), (Giyanii Group) and northern part of the Murchison (Gravelotte Group) Greenstone Belts occur in the study area. They are composed largely of extrusive mafic and, to lesser extents, ultramafic and felsic rock. These Greenstone Belts are infolded mainly into grey granitic gneisses which dominate the early Archaean terranes. The NE-trending Pietersburg and Giyani Greenstone Belts extend parallel up to the southern part of the SMZ of the Limpopo Belt. The Murchison Greenstone Belts exists along a major ENE-WSW crustal lineament known as the "Thabazimbi-Murchison Lineament" (TML). Because of the orientation of the TML, the Greenstone Belts and the LMB, many of the geological structures recorded in the study area are parallel with this NE-SW trend. Neoarchaean Intrusions A number of massive, unfoliated granite intrusions occur as batholiths, plutons and stocks in the study area. These granitic intrusions form prominent topographical features that can be seen north of Polokwane. The most distinct of these plutons are Matlala Granite, Moletsi Granite, Mashashane Suite (Granites) and Matok Granite. The Matok Granite was emplaced just north of the HRSZ. The Duivelskloof leucogranite and the Turfloop Granite, which forms elongated northeast-trending batholiths, are the most voluminous granite bodies in the study area. However, the contacts with the surrounding granitoid gneisses of these large batholiths are not well defined. Various other granite intrusives occur throughout the study area including the Schiel Complex located immediately north of the northeast-orientated Kudus River Lineament (Figure 4.6).

1.10 Applicable environmental legislation

LEGISLATION	**SECTIONS**	**RELATES TO**
The Constitution (No 108 of 1996)	Chapter 2	Bill of rights
	Chapter 24	Environmental Rights

National Environmental Management Act (No 107 of 1998, as amended)	Section 2	Defines the strategic environmental management goals and objectives of the government. Applies through-out the republic and to the actions of all organs of state that may significantly affect the environment.
	Section 24	Provides for the prohibition, restriction and control of activities which are likely to have a detrimental effect on the environment.
	Section 28	The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care.
National Environmental Management: Waste Act (No 59 of 2008)		Provides for specific waste management measures and the remediation of contaminated land.
Environmental Conservation Act (No 73 of 1989) and regulations.	Section 19 and 19A	Prevention of littering by employees and sub-contractors during construction and the maintenance phases of the proposed storage dam.
National Environmental Management: Air Quality Act (No 39 of 2004)	Section 34 and 35	Control of dust

Occupational Health and safety Act (No 85 of 1993)	Section 8	General duties of employers to their employees
	Section 9	General duties of employers and self-employed persons to persons other than their employees
National Water Act (No 36 of 1998) and regulations	Section 19	Prevention and remedying the effects of pollution
	Section 20	Control of emergency incidents
Hazardous Substances Act (No 15 of 1973) and regulations		Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances
National Road Traffic Act (No 93 of 1996)		Road Safety
SANS 10103 (Noise Regulations)		The measurement and rating of environmental noise with respect to annoyance and to speech communication with some animals unable to tolerate certain noise levels.

1.11 Land use activities of the study area

The primary land use within the local area is a mixture of mainly residential, open space and livestock farming. Regardless of the human activities influence in the area, dense thicket

dominates the area. It was clear from the site visit and the aerial imagery that the area is still of high biodiversity value since indigenous vegetation still occurs and there is a stream that transverses through the proposed site.

2. POTENTIAL ENVIRONMENTAL IMPACTS

Potential impacts were evaluated against the results of the terrestrial fauna assessment. The relevant impacts were then subjected to a prescribed impact assessment methodology which is described below. Impacts were assessed in terms of the construction and operational phases. The operational phase refers to that phase of the project where the township development has been completed. Due to the nature of this development, the operational phase is assessed as lasting indefinitely and there is no closure or post- closure phases in this scenario. Mitigation measures were only applied to impacts deemed relevant based on the impact analysis. The likelihood and consequence descriptors are presented in Table 9 and Table 10. The significance rating matrix is presented in Table 11

2.1 Cultural biodiversity resources / products

Plants and animals form an integral part of the culture of communities and as such, biodiversity cannot be separated from cultural heritage. For example, Specific trees and bushes serve as grave markers and the positions are known to family members only. Biodiversity resources are used as traditional food sources (e.g. *mashonzha* worm), in traditional healing and spiritual rituals. Conserving cultural heritage therefore also includes conserving the sense of place, associated landscape and biodiversity. This impact should as such be integrated with the cultural and heritage impact study. The area has is still within its natural state< but it has been partially disturbed on the other part but it is already in the state of recovery. The original natural status of the area has been changed with some alien invasive plants establishing themselves in the area and therefore competing with native species for resources.

2.2 Habitat destruction and modification

The operation of the township and erection of infrastructure is likely to impact wildlife and birds via two primary mechanisms: 1) Large areas are often cleared for the township construction, resulting in significant destruction / modification of habitat, and 2) Increased human pressure associated with the township residents may affect animals directly through them being killed when they enter the area, etc. as well as through activities such as poaching. Moreover, many components of the infrastructure associated with the township development, such as powerlines and roads, which will alter normal movement routes. However, the impact will be very minimal in this operation since the will be having less infrastructure and less clearing of vegetation is advised especially with big plant species. The development is also occurring in the close proximity of well-developed area and there are no lot of the fauna species. Human activities can also result in the establishment of populations of invasive species, such as rats and plants used in artificial wetlands for treating effluent.

2.3 Water quality

Townships brings people together to stay in the same area, where there can be littering from general waste, vehicles leaks, hazardous waste do occurs that have the potential to adversely affect scarce water resources in the proposed development area if not properly managed. The type of wastewater emanating from the sewer blockages and hydrocarbons spillages depends largely on the chemical properties of the hydrocarbon materials that come into contact with the water. Chemical pollutants that accumulate in waterways adversely impact aquatic and riparian vegetation. Similar to the impacts of chemical air pollutants, chemical water pollutants can inhibit processes including photosynthesis, water regulation and respiration, which can reduce growth and development of plants. Water impacts that may results from township development activities:

1) Sediment run-off – rainfall can cause significant amounts of run-off especially if the soil is exposed (removed) of vegetation which in turn can results in soil erosions.

2) Leaching of pollutants from the hazardous waste – toxic substances present in hazardous waste not stored properly can be leached in groundwater during rainfall. In addition.
4) Sewage effluent – water used for domestic and sanitary purposes on site can pollute surface or ground water if not treated correctly which affects the growth of plants if water is contaminated.

POTENTIAL IMPACTS

- Washing of general waste that may be littered around the township
- Spillages from vehicles may impact on the ground and surface water
- Hydrocarbon leaks from vehicles
- Sewer blockages can flow to the nearby streams

2.4 Air quality

The significant form of air pollution from the township development is particulate matter (PM) emissions. The diesel trucks, generators and cars may be a source of PM emissions. Impacts from particulate matter (PM) emissions may include low viability of annual species or reduced growth rates during periods when fugitive dust is particularly high. Fugitive dust has the potential to impair respiratory functions of wildlife; however, there are few published studies that address the short or long-term implications of dust pollution on wildlife health. During construction or site establishment, gasoline and diesel fuelled vehicles and equipment will generate gaseous and particulate exhaust emissions, including volatile organic compounds (VOCs), carbon monoxide (CO) and nitrogen oxides (NOx). During the road transportation of fuel, gaseous, particulate exhaust emissions and particulate matter (PM) emissions will also occur along the transport route. This might be fairly localized and limited to areas along the road, but could also, depending on wind speed and direction, impact on larger areas. Pending on the length of the route, the impact will be on a large area.

POTENTIAL IMPACTS:

Particulate matter (PM) emissions through:

- Air pollution from the particulate matters of the vehicles travelling to and from the township development.

Increased PM may reduce radiation interception by plant canopies and may reduce precipitation through a variety of physical effects. It can also change the nutrient balance in coastal waters and large river basins affecting the diversity of ecosystems and contributing to acid rain effects.

2.5 Noise

Numerous environmental factors determine the level of sound at a given point of reception. These factors include: distance from the source of sound to receptor; surrounding terrain; ambient sound level; time of day; wind direction; temperature gradient and relative humidity. There are three major categories of noise sources associated with the township. They are:

- fixed equipment or process operations (generators, pumps, conveyors, electrical equipment);
- Mobile equipment or process operations and
- Transport movements of products, and trucks and cars coming to the developments.
- Residents during the operational phase

It is expected that the noise levels generated on site may exceed the current ambient levels, resulting in a negative impact on animals. Noise may also impact on local residents.

POTENTIAL IMPACTS:

- Increase in ambient noise levels from:
- Fixed equipment or process operations,
- Mobile equipment,
- Transport movements of products, raw material or waste on site, and
- Transport of products off site,

- Residents during operational phase.

Wildlife may be more sensitive to human presence during significant periods of their annual cycles, including the breeding season, therefore this may lead to animals present in the area to migrate to other quite areas, birds included.

2.6 Impact Assessment Methodology

The methods and format of the impact tables used in this chapter are in accordance to the requirements of the 2014 Regulations.

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **probability (P)** *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 **duration (D)**, 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 **extent (E)**, 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 **magnitude (M)**, 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 **significance (S)**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high;
    - the significance rating is calculated by the following formula:

S (significance) = (D + E + M) x (P)

- 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.*

Impacts should be identified for the construction and operational phases of the proposed development. Proposed mitigation measures should be practical and feasible such that they can be realistically implemented by the applicant.

2.7 Impacts on the vegetation

Table 1: Loss of indigenous vegetation due to clearing for construction of buildings, roads and other infrastructure, waste dumps etc.

Nature: The area for the proposed development will be cleared of vegetation, however it is anticipated that only the area to be developed will be stripped off vegetation. This will result in the loss of indigenous species, and the fragmentation of plant communities. The removal of vegetation will also expose soil increasing the risk of erosion.				
	Without mitigation		**With mitigation**	
CONSTRUCTION PHASE				
Probability	Definite	2	Definite	1
Duration	Permanent	2	Permanent	1
Extent	Local	2	Local	1
Magnitude	Low	4	Low	3
Significance	**Low**	**40**	**Low**	**20**
Status (positive or negative)	Positive		Positive	
OPERATIONAL PHASE				
Probability	Definite	2	Highly probable	1
Duration	Permanent	2	Permanent	1

Extent	Local	2	Local	1
Magnitude	Low	4	Low	3
Significance	**Moderate**	**40**	**Low**	**30**
Status (positive or negative)	Positive		Positive	
Reversibility	Low		Low	
Irreplaceable loss of resources?	Low		Low	
Can impacts be mitigated?	To limited extent			
Mitigation: • Limit all developments to the minimum area required, and leave as much as possible natural vegetation intact. • Conserve the areas that will not be developed, particularly the relatively large plant species that is present in the proposed development area • Control al waste dumping and avoid pollution of natural vegetation, • Avoid planting of exotic plant species, and where they have already encroached, they must be controlled as soon as possible by the land owner				
Cumulative impacts: With the surrounding area not their original state and the magnitude of this project is big, the impact won't be moving to the neighbouring farms but will however be localised to the project area.				
Residual Risks: Not currently known.				

Table 2. Loss of indigenous vegetation due to excavation, clearing for construction of buildings, roads and other infrastructure, waste dumps etc.

Nature: Alien invasive plant species has already encroached into disturbed areas that was disturbed by the disturbances that had occurred on the proposed land. It is not expected that extensive area will be disturbed since the township infrastructure is to be only on a portions of the farm, natural vegetation will not be totally destroyed.				
	Without mitigation		**With mitigation**	
CONSTRUCTION PHASE				
Probability	Definite	2	Definite	1
Duration	Permanent	2	Permanent	1
Extent	Local	2	Local	1
Magnitude	Low	4	Low	1
Significance	**Low**	**30**	**Low**	**20**
Status (positive or negative)	Positive		Positive	
OPERATIONAL PHASE				
Probability	Definite	5	Definite	5
Duration	Permanent	5	Permanent	5
Extent	Local	5	Local	5
Magnitude	Low	10	Low	10
Significance	**Low**	**20**	**Low**	**10**

Status (positive or negative)	Positive	Positive
Reversibility	Low	Low
Irreplaceable loss of resources?	Moderate	Moderate
Can impacts be mitigated?	Not regarded as feasible	
Mitigation: • An alien invasive management programme must be incorporated into the Environmental Management Programme; • Ongoing alien plant control must be undertaken; • Areas which have been disturbed will be quickly colonised by invasive alien species. An ongoing management plan must be implemented for the clearing/eradication of alien species. • Monitor all sites disturbed by construction activities for colonisation by exotics or invasive plants and control these as they emerge. • Avoid planting of exotic plant species in public areas or home gardens, use indigenous species.		
Cumulative impacts: **Low,** With the surrounding area not in their original state and the magnitude of this project is big, the impact won't be moving to the neighbouring farms but will however be localised to the project area.		
Residual Risks: Not currently known		

3. RESULTS AND DISCUSSION

3.1 Site biodiversity

South Africa is considered one of the most biologically diverse country in the world due to its species diversity and endemism as well as its diversity of ecosystems. South Africa occupies only 2% of the world's land surface area yet is home to 10% of the world's plant species and 7% of the reptile, bird and mammal species. Sixty-five percent of its 23 000 plant species are endemic to South Africa. In terms of the number of endemic species of mammals, birds, reptiles and amphibians, South Africa ranks as the fifth richest country in Africa and the 24th in the world. The terrestrial biodiversity of South Africa can be divided into nine biomes. National Red List assessments of the status of South Africa's species indicate that 10% of South Africa's birds and frogs, 20% of its mammals and 13% of its plants are threatened. South Africa's biodiversity is facing threats on several fronts, including habitat loss and degradation, invasive alien species, flow modification, overharvesting, pollution and climate change. Many areas of natural habitat are replaced, often irreversibly, by alternative land uses such as urban development, industrial and mining development, agricultural activities such as clearing land

for cultivation of crops, or forestry plantations. An emerging threat that could result in substantial further loss of natural habitat (and additional pressure on freshwater resources) is crops for biofuel production. Aquatic habitats can be completely transformed by canalisation and marine habitats can be destroyed by trawling and other types of development.

The savannah biome is fairly homogenous and the proposed site is the only area remaining with vegetation in the surrounding area. It was assumed from the site visit and the google earth map that the majority of the site is recovering from an event of disturbance, since the majority of plant species are juveniles. On the site, the croplands are flourishing very well and it is dominated by the indigenous plant species with the exception of very few exotic plant species. The balance of the site was considered to be on their original state and is maintaining the indigenous plant species of conservation concern, however it may still provide valuable foraging area for some bird species but many of these species will be generalist species. There were evidence of presents of birds since there some birds' nests that were sported during the site survey.

There was no mammal species that was found and identified on site but animals that used to occur on the area before has been tabulated below on table 3. All the species that was identified on site was then checked on the SANBI red list and they were found to be endemic and none endemic to South Africa and they were all of least concern and only of them was listed as either protected or endangered and they have been listed in different tables below. Although birds' nest where noticed on site there was presence of different birds' spices noted in the vicinity of site and they have been tabulated below. Therefore, this area can be also identified as an area of medium conservation value with only protected species identified namely *schlerocharia birrea* and there is a no biodiversity sensitive environment in a close proximity of site see the biodiversity map below which shows the area that is to be developed.

Below is the list of the indigenous plant species (grasses included) that were identified onsite

Scientific name	**Family**	**Status**
Themeda triandra	Poaceae	LC
Vachellia tortilis	Fabaceae	LC
Vachellia karroo	Fabaceae	LC

Senegalia nigrescens	Fabaceae	LC
Bauhinia galpinii	Fabaceae	LC
Colophospermum mopane	Fabaceae	LC
Senegalia mellifera	Fabaceae	LC
Dichrostachys cinerea	Fabaceae	LC
Sclerocarya birrea	Anacardiaceae	Protected
Terminalia sericea	Combretaceae	LC
Dombeya rotundifolia	Sterculiaceae	LC
Combretum molle	Combretaceae	LC
Peltophorum africanum Sond	Fabaceae	LC
Senegalia burkei (Benth.)	Fabaceae	LC
Burkea africana	Fabaceae	LC
Albizia adianthifolia	Fabaceae	LC
Grewia monticola	Malvaceae	LC
grewia flavescens	Malvaceae	LC
Ficus sycomorus	Moraceae	LC
Ziziphus rivularis	Rhamnaceae	LC
Ziziphus mucronata	Rhamnaceae	LC

Table 1: The list of the indigenous plant species

The list of Alien invasive plant species on site are listed below

Scientific name	**Family**
Solanum mauritianum	Solanaceae
Melia azedarach	Meliaceae

Table 2: The list of Alien invasive plant species on site

The list of indigenous animals that use to occur onsite are tabulated below

Scientific name	**Family**	**Status**
Tragelaphus strepsiceros	Bovidae	LC
Aepyceros melampus	Bovidae	LC
Tragelaphus sylvaticus	Bovidae	LC
Syncerus caffer	Bovidae	LC
Connochaetes taurinus.	Bovidae	LC
Chlorocebus pygerythrus	Cercopithecidae	LC

Table 3: The list of indigenous animals

List of birds that were found on site are listed below.

Scientific name	**Family**	**Status**
Pternistis swainsonii	Phasianidae	LC
Streptopelia capicola	Columbidae	LC
Numida meleagris	Numididae	LC
Strix nebulosa	Strigidae	LC
Ploceus cucullatus	Ploceidae	LC

Table 4: List of birds that were found on site

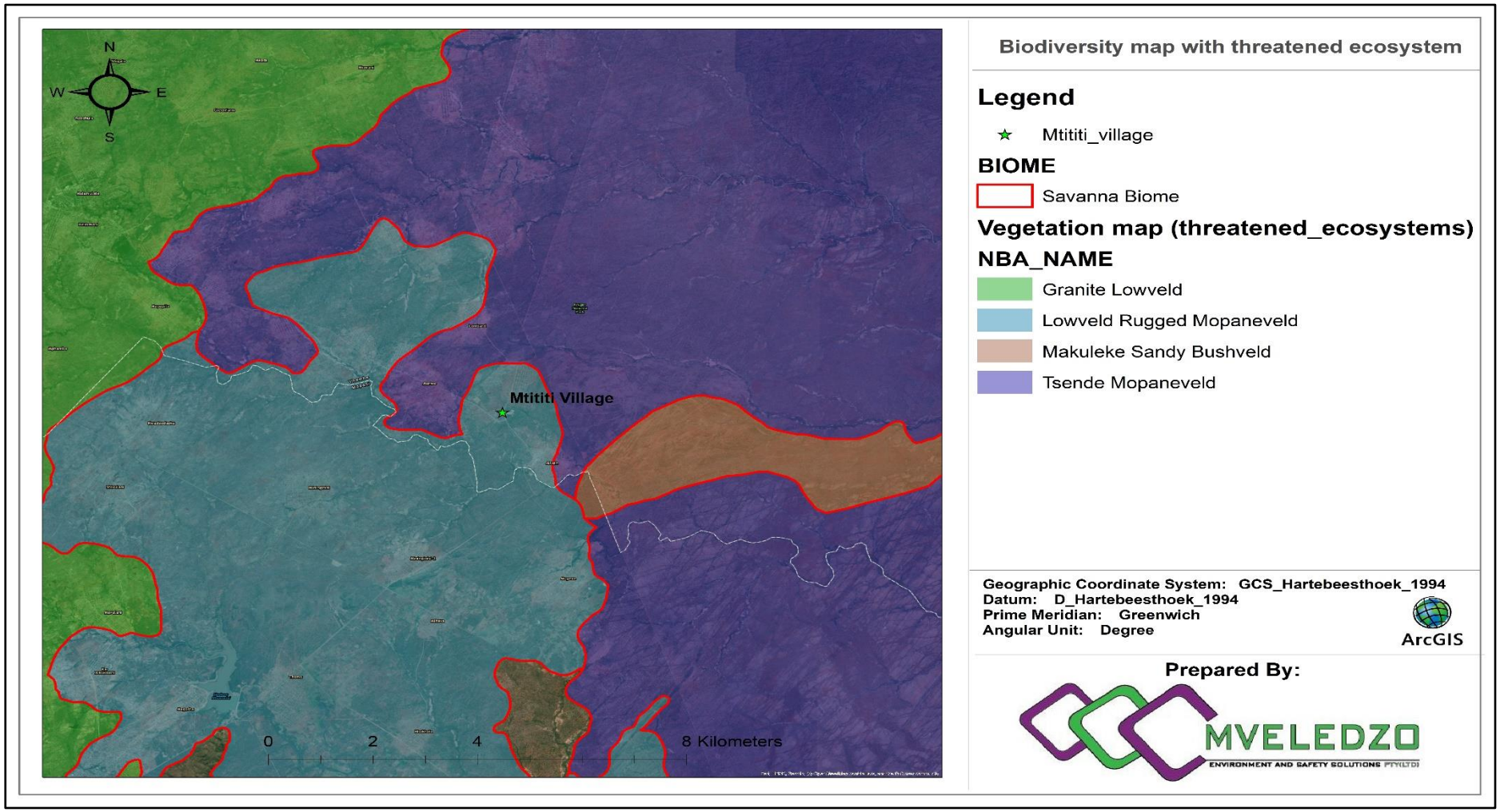


Figure 4: map showing the Biodiversity sensitivity of the area

Photo 1: Shows the stream that intersects the proposed township development area.

Photo 2: Shows the vegetation regrowth (juveniles) on the proposed site.

Photo 3: Shows some mopani and acacia trees on the proposed sites.

Photo 4: Shows the stream and some riparian vegetation.

Photo 5: Shows a dense vegetation onsite

Photo 6: Shows a path that cuts through the site.

4. CONCLUSION AND RECOMENDATIONS:

From an ecological perspective, the site is a favourable location for the township activity since even on the borders of the property is another villages used for residential. There is sufficient space available at the site to accommodate the development and there is no sensitive environment at the proposed site and there were few species of *schlerocharia birrea* species which falls within the protected plant category which were noted on site. The *schlerocharia birrea* species must be avoided and protect as far as it is practically possible, and if there is no way for them to be avoided the permit from the department of Agriculture Forestry and Fisheries to relocate or to cut. The area still maintains the indigenous environment though it is still in the original state and it does support the functional ecology since it is situated within the area that is not totally developed. Vegetation clearing must always be kept at minimal. It is recommended that since the species of (schlerocharia birrea) is mostly large trees they must be avoided and if they can't be avoided they must then contact the department of agriculture fisheries and forestry before any removal, and if one big plant is removed it must be replaced by four juvenile of the same species. If the recommendation made on the EMPr are adhered to then there will be minimal damage to the existing grassland and all associated species close to the proposed township.

It is the responsibility of the applicant that it must rehabilitate and increase the conservation value of the area after the construction of the proposed township. Any risk and impact assessment are but an exercise based on facts, assumptions and perceptions, and can by no means give an exact reflection of all possible scenarios. The success of proposed, and still to be developed, mitigation measures will largely depend on the commitment of the developer to its social and environmental responsibility, management of the impacts and mitigation measures and allocation of financial resources to implement such mitigation measures

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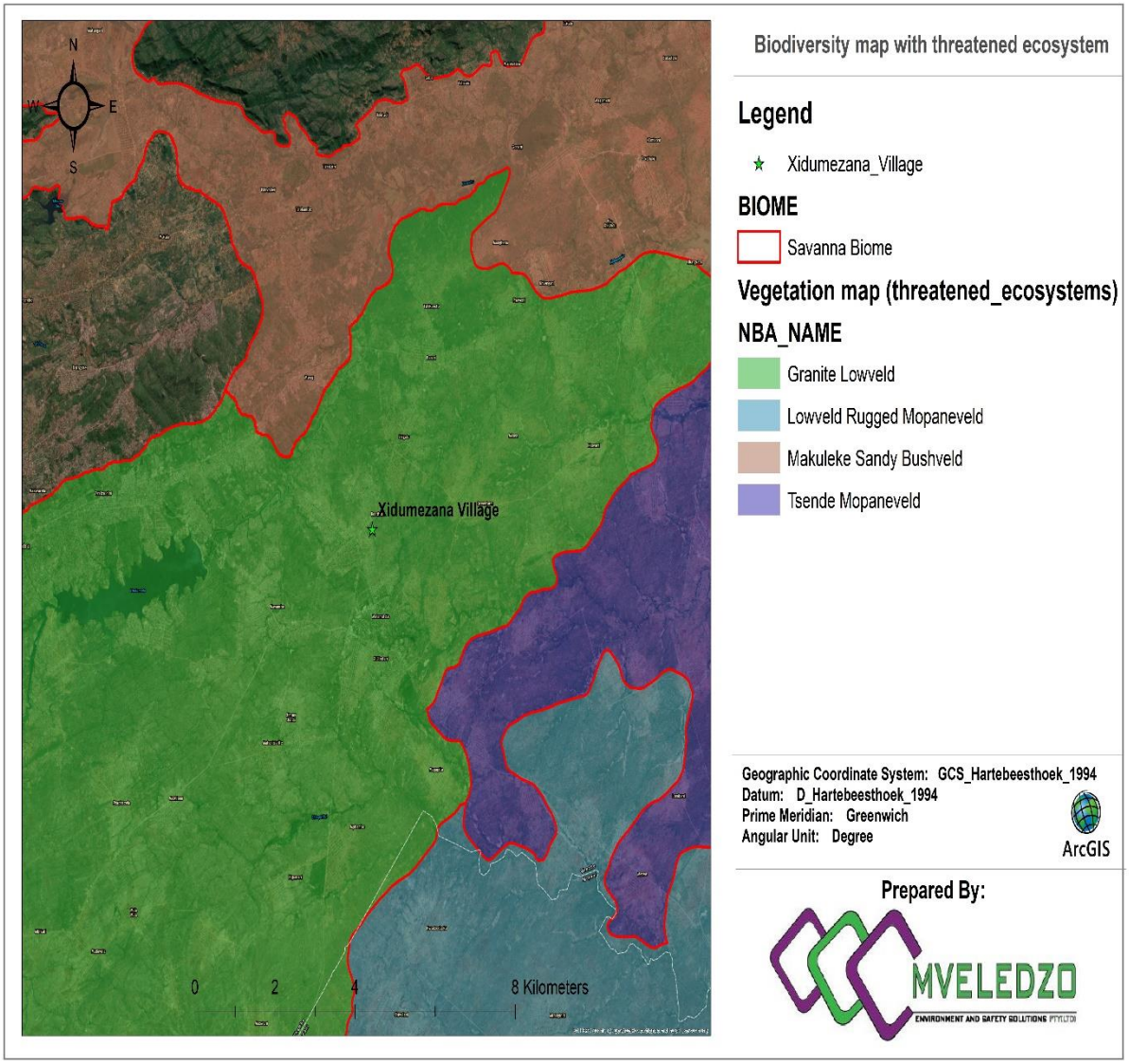
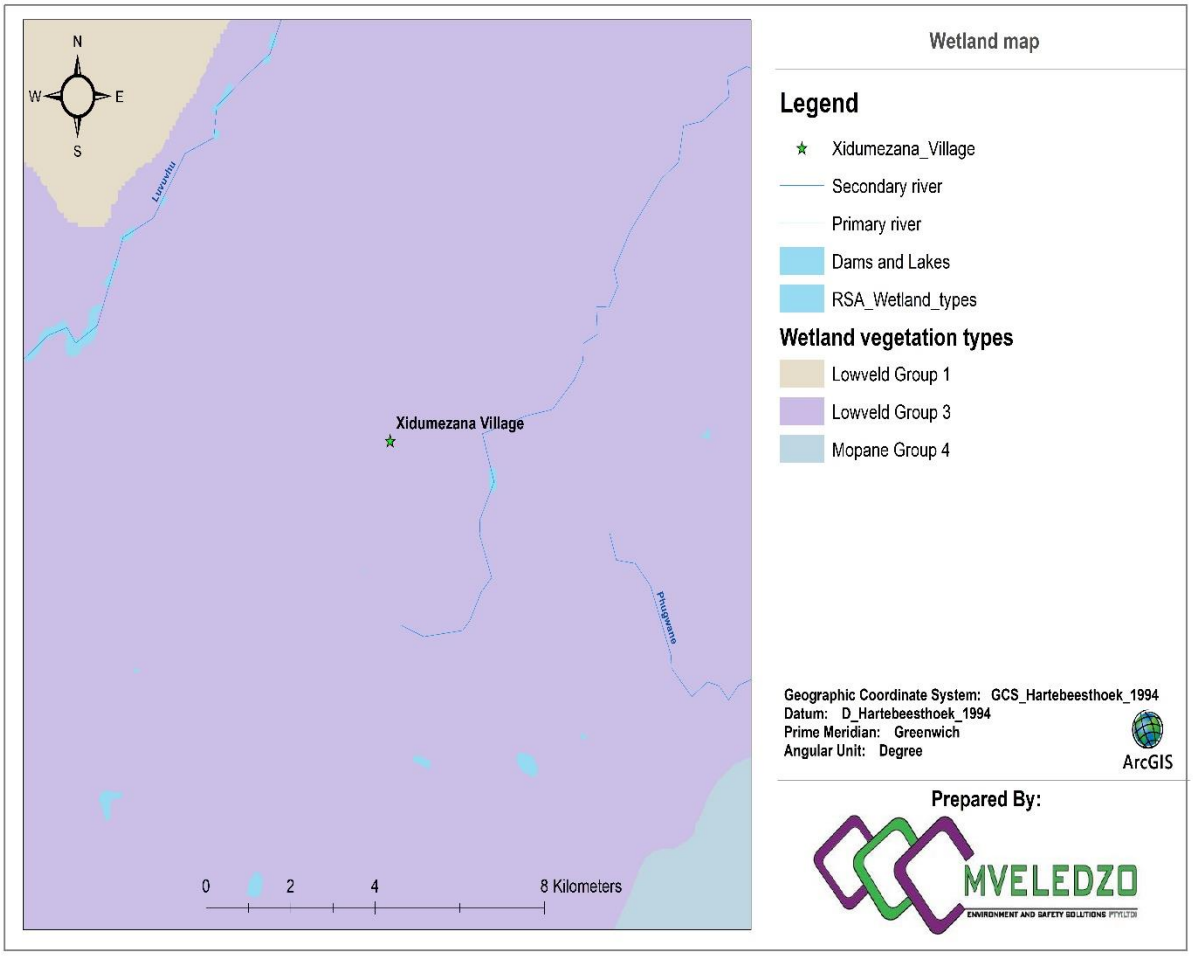
6. APPENDIX

Appendix A



Appendix B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Secondary river
Primary river
Dams and Lakes
RSA_Wetland_types
Wetland vegetation types
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Lowveld Group 3
Mopane Group 4
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Datum: D_Hartebeesthoek_1994
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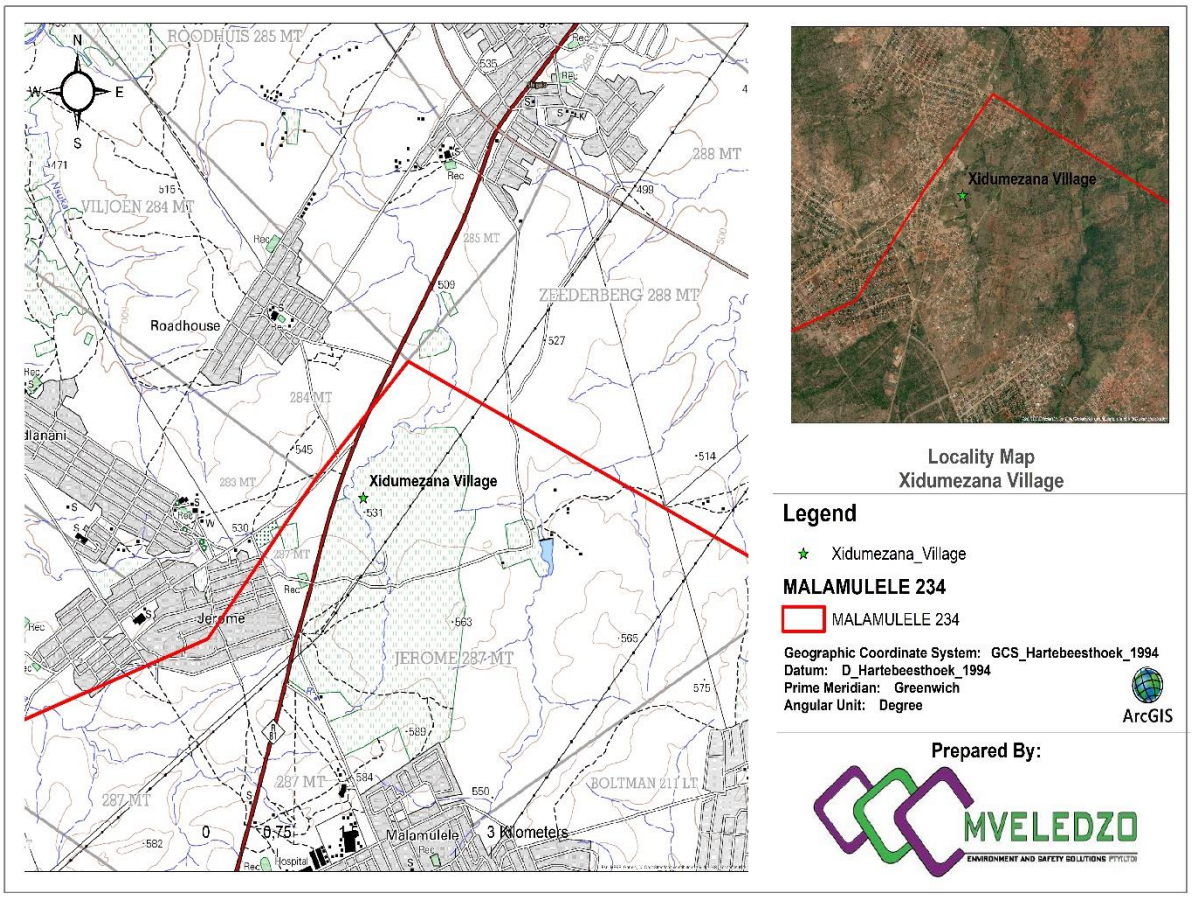
Angular Unit: Degree
ArcGIS
Prepared By:
MVELEDZO
ENVIRONMENT AND SAFETY SOLUTIONS PTY LTD

Appendix C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VILJOEN 284 MT
288 MT
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ZEEDERBERG 288 MT
Roadhouse
284 MT
Xidumezana Village
JEROME 287 MT
BOLTMAN 217 LT
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Locality Map
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Legend
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Geographic Coordinate System: GCS_Hartebeesthoek_1994
Datum: D_Hartebeesthoek_1994
Prime Meridian: Greenwich
Angular Unit: Degree
ArcGIS
Prepared By:
MVELEDZO
ENVIRONMENT AND SAFETY SOLUTIONS PTY LTD

Vhufa Hashu Heritage Consultancy CC

Sustainable community development is our speciality

PHASE 1 HERITAGE IMPACT ASSESSMENT REPORT FOR THE PROPOSED TOWNSHIP ESTABLISHMENT IN PLANGE VILLAGE WITHIN COLLINS CHABANE LOCAL MUNICIPALITY OF VHEMBE DISTRICT, LIMPOPO PROVINCE.

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February 2020

Executive Summary

Local Authority: Collins Chabane Municipality

Magisterial Authority: Vhembe District Municipality

Type of Development: Township Establishment

Status of the Report: Final Report

Date of field work: February 2020

Date of report: February 2020

Purpose of the Study

Vhufa Hashu Heritage Consultants was appointed by Mang Geo-Enviro Services to undertake a phase 1 Heritage Impact Assessment of a proposed Township Establishment in Plange area under Collins Chabane Local Municipality of Vhembe District, Limpopo Province, in compliance with Section 38 of the National Heritage Resources Act 25 of 1999.

The purpose of this study is to identify heritage resources within a proposed development area, assess their significance, the impact of the development on the heritage resources and to provide relevant mitigation measures to alleviate impacts to the heritage resources. An assessment of impacts on heritage resources defined in section 3 of the NHRA, heritage assessment is required in terms of section 38 of the NHRA.

South Africa's historical, archaeological and paleontological heritage resources are unique and non-renewable as defined in section 3 of the NHRA. Heritage Resources as defined in section 3 of the NHRA are given "formal" protection in terms of section 27-29 and 31-32 of the NHRA and "general" protection in terms of sections 33,34,35,36 and 37 of the NHRA. Therefore, no damage, destruction or alteration may occur to heritage resources without a permit issued by a relevant heritage authority.

An assessment of impacts on heritage resources of a development is required in terms of section 38(1 and 8) of the NHRA.Where possible, heritage resources should be preserved *in situ* and conserved for future generations. This can be achieved through a monitoring and management plan that may be stipulated in the conditions issued on a development by an authority as per section 38(4)c of the NHRA.Where it is not possible to retain the heritage resources *in situ*, and the heritage resources are not deemed significant, the loss

of information can be reduced by recording and mitigation of the heritage resources through a process of excavation (or sampling) as a condition on the development in terms of section 38(4)d and e, after obtaining a permit from the relevant Heritage Resources Authority (HRA),at the cost of the developer. This allows us to record a part of the history of the place as part of the national inventory. Assessment and mitigation in the early phase of the development may save the developer considerable delays and related costs.

Heritage Resources Descriptions and Significance

No heritage/archaeological resources was identified within the proposed Township Establishment

Conclusion

No further studies / Mitigations are recommended given the fact that within the proposed Township Establishment and its surrounding there are no archaeological or place of historical significance to be impacted by the Township Establishment Development. From a Heritage perspective, the development should be allowed to continue.

Acknowledgements:

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TEL: (012) 814 2280

HERITAGE CONSULTANT: Vhufahashu Heritage Consultants

CLIENT CONTACT PERSON: Richard R Munyai

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Archaeologist and Heritage Consultant

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EXPLANATION OF ABBREVIATIONS USED IN THIS DOCUMENT

AIA	Archaeological Impact Assessment
ASAPA	South African Archaeological Professional Association
CMP	Conservation Management Plan
EIA	Early Iron Age
EMP	Environmental Management Plan
ESA	Early Stone Age
GPS	Geographical Positioning System
HIA	Heritage Impact Assessment
HMP	Heritage Management Plan
ICOMOS	International Council of Monuments and sites
LIA	Late Iron Age
LSA	Late Stone Age
MIA	Middle Iron Age
MSA	Middle Stone Age
NASA	National Archives of South Africa
NHRA	National Heritage Resources Agency
OSBP	One Stop Border Post
PRHA	Provincial Heritage Resources Authority
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
VHHC	Vhufa Hashu Heritage Consultants

DEFINITIONS

"**Aesthetic value**" Important in exhibiting particular aesthetic characteristics valued by a community or cultural group.

„**Alter**" any action affecting the structure, appearance or physical properties of a place or object, whether by a way of structural or other works, by painting plastering or other decoration or any other means;

"**Conservation**" in relation to heritage resources, includes protection maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance

"**Conservation Management Plan**" A policy aimed at the management of a heritage resource and that is approved by the Heritage Resources Authority setting out the manner in which the conservation of a site, place or object will be achieved

"**Cultural Significance**" As defined in the NHRA means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance

"**Development**" means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future wellbeing, including-

(a) construction, alteration, demolition, removal or change of use of a place or a structure at a place;
(b) carrying out any works on or over or under a place;
(c) subdivision or consolidation of land comprising a place, including the structures or airspace of a place;
(d) construction or putting up for display signs or hoardings;
(e) any change to the natural or existing condition or topography of land; and
(f) any removal or destruction of trees, or removal of vegetation or topsoil.

"**Heritage agreement**" means an agreement referred to in section 42,

"**Heritage Impact Assessment**" A report compiled in response to a proposed development that must meet the minimum requirements set out in the NHRA and should be submitted to a heritage resources authority for consideration.

"**Heritage site**" means a place declared to be a national heritage site by SAHRA or site declared to be a provincial Heritage site by a PHRA

"**Historic value**" Important in the community or pattern of history or has an association with the life or work of a person, group or organization of importance in history.

"**Improvement**" in relation to heritage resources includes repair, restoration and rehabilitation of a place protected in terms of this Act.

"**Interested and Affected Parties**" Individuals, organisations or communities that will either be affected and/or have an interest in a development or the resulting impacts of a development.

"**Management**" in relation to heritage resources includes the conservation, presentation and improvement of a place protected in terms of this Act.

"**Scientific value**" Potential to yield information that will contribute to an understanding of natural or cultural history or is important in demonstrating a high degree of creative or technical achievement of a particular period.

"**Social value**" Have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.

"**Rarity**" Does it possess uncommon, rare or endangered aspects of natural or cultural heritage.

"**Representivity**" Important in demonstrating the principal characteristics of a particular class of natural or cultural places or object or a range of landscapes or environments characteristic of its class or of human activities (including way of life, philosophy, custom, process, land-use, function, design or technique) in the environment of the nation, province region or locality.

TABLE OF CONTENTS

CONTENT **PAGE**

EXECUTIVE SUMMARY **2**

ACKNOWLEDGEMENTS: **4**

DEFINITIONS **6**

1. INTRODUCTION **9**

2. TERMS OF REFERENCE **9**

3. DESCRIPTION OF THE AFFECTED AREA **10**

4. LEGISLATIVE REQUIREMENTS **12**

4.2. THE NATIONAL HERITAGE RESOURCE ACT (25 OF 1999) **13**

5. METHODOLOGY **14**

5.1. SOURCE OF INFORMATION 14

8. ASSESMENT CRITERIA **16**

8.3. Burial grounds and graves *16*

8.4. Significance valuation Burial Ground, Historic Cemeteries and Graves *17*

9. THE SIGNIFICANCE OF GRAVES AND BURIAL SITES **18**

9.1 SITE SIGNIFICANCE 18

9.2. IMPACT RATING 19

9.3 CERTAINTY 20

9.4 DURATION 21

9.5 MITIGATION 21

10. CONCLUSIONS AND RECOMMENDATIONS **21**

11. REFERENCE **22**

1. INTRODUCTION

Vhufa Hashu Heritage Consultants was appointed by Mang Geo-Enviro Services to undertake a phase 1 Heritage Impact Assessment of a proposed Township Establishment in Plange area under Collins Chabane Local Municipality of Vhembe District, Limpopo Province.

The National Heritage Resources Act (NHRA - Act No. 25 of 1999) protects all structures and features older than 60 years (section 34), archaeological sites and material (section 35) graves and burial sites (section 36). In order to comply with the legislations, the Applicant requires information on the heritage resources, and their significance that occur in the demarcated area. This will enable the Applicant to take pro-active measures to limit the adverse effects that the development could have on such heritage resources.

2. TERMS OF REFERENCE

The terms of reference for the study were to conduct heritage impact assessment for the proposed Township Establishment in Plange Village.

- the identification and mapping of all heritage resources in the area affected;
- an assessment of the significance of such resources in terms of heritage assessment criteria set out in regulations;
- an assessment of the impact of the development on heritage resources;
- an evaluation of the impact of the development on heritage resources relative to the interested parties regarding the impact of the development on heritage resources;
- if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and
- plans for mitigation of any adverse effects during and after completion of the proposed development.

3. DESCRIPTION OF THE AFFECTED AREA

The proposed site is situated on the eastern side of Jilongo Village and the Jilongo Foot and Mouth Decease redline gate along the road from Malamulele to Alten. The proposed site is going to be developed on the western side of EMEMGEE Auto Clinic and Mtititi Secondary School. The proposed area was previously used for subsistence farming and it is currently used for grazing. The site Coordinates is (GPS S23.108922° E30.886181°) within Collins Chabane Local Municipality of Vhembe District, Limpopo Province.

Figure 1: Arial View of the proposed site.

Figure 2: View of the gravel road traverses along the proposed site.

Figure 3: View of the agricultural field where they practice subsistence farming.

4. LEGISLATIVE REQUIREMENTS

Two sets of legislation are relevant for the study with regards to the protection of heritage resources and graves. These are the National Heritage Resources Act (Act 25 of 1999) and the National Environmental Management Act (Act 107 of 1998).

4.1 The National Heritage Resources Act

According to the above-mentioned act the following is protected as cultural heritage resources:

- Archaeological artifacts, structures and sites older than 100 years
- Ethnographic art objects (e.g. Prehistoric rock art) and ethnography
- Objects of decorative and visual arts
- Military objects, structures and sites older than 75 years
- Historical objects, structures and sites older than 60 years
- Proclaimed heritage sites
- Grave yards and graves older than 60 years
- Meteorites and fossils
- Objects, structures and sites of scientific or technological value.

The National Estate includes the following:

- Places,buildings,structures and equipment of cultural significance
- Places to which oral traditions are attached or which are associated with living heritage
- Historical settlements and townscapes
- Landscapes and features of cultural significance
- Geological sites of scientific or cultural importance
- Sites of Archaeological and palaeological importance
- Graves and burial grounds
- Sites of significance relating to the history of slavery
- Movable objects (e.g. Archaeological, paleontological, meteorites, geological specimens, military, ethnographic, books etc.)
-

Heritage Impact Assessment (HIA) is the process to be followed in order to determine whether any heritage resources are located within the area to be developed as well as the possible impact of the proposed development thereon. An Archaeological Impact

Assessment (AIA) only looks at archaeological resources. An HIA must be done under the following circumstances:

- The construction of a linear development (road, wall, power line, canal etc.)exceeding 300m in length
- A construction of a bridge or similar structure exceeding 50m in length
- Any development or other activity that will change the character of a site and exceed 5 000m^2 or involve three or more existing erven or subdivisions thereof
- Re-zoning of a site exceeding 10 000 m^2
- Any other category provided for in the regulations of SAHRA or a provincial heritage authority.

4.2. The National Heritage Resource Act (25 of 1999)

This act established the South African Heritage Resource Agency (SAHRA) and makes provision for the establishment of Provincial Heritage Resources Authorities (PHRA).The Act makes provision for the undertaking of heritage resources impact assessments for various categories of development as determined by Section 38.It also provides for the grading of heritage resources and the implementation of a three tier level of responsibilities and functions for heritage resources to be undertaken by the State, Provincial authorities and Local authorities, depending on the grade of the Heritage resources. The Act defines cultural significance, archaeological and palaeontological sites and material (Section 35), historical sites and structures (Section 34), graves and burial sites (Section 36) which falls under its jurisdiction. Archaeological sites and material are generally those resources older than a hundred years, while structures and cultural landscapes older than 60 years, including gravestones, are also protected by Section 34.Procedures for managing grave and burial grounds are clearly set out in Section 36 of the NHRA. Graves older than 100 years are legislated as archaeological sites and must be dealt with accordingly.

Section 38 of the NHRA makes provision for developers to apply for a permit before any heritage resource may be damaged or destroyed.

4.3. The human tissues act (65 OF 1983)

This Act protects graves younger than 60 years. These fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the

exhumation and re-burial must be obtained from the relevant Provincial MEC as well as the relevant Heritage Authorities.

Graves 60 years or older fall under the jurisdiction of the National Heritage Resources Act as well as the Human Tissues Act, 1983.

5. METHODOLOGY

5.1. Source of information

5.1.1. Survey of Literature

The methodological approach used for the study is aimed at meeting the requirements of the relevant heritage legislation. As such a desktop study was undertaken followed by a survey of the impact areas. Most of the information was obtained through the site visit made on the 14 February 2020.In practice, most archaeological and historical sites are found through systematic survey of the target landscapes. The survey therefore, sought to identify cultural heritage sites including graves, burial grounds and contemporary religious or sacred ceremonial sites associated with the proposed Township Establishment. VHHC heritage specialists conducted the reconnaissance survey and impact assessment by transecting the affected landscape on foot looking for indicators of archaeological and any other cultural materials in the affected areas. In part the field officer also inspected soil profiles for potential archaeological materials that may still be trapped *in situ* in an area disturbed by human activities as well the burrowing animals.

5.1.1.2. Field Survey

Standard archaeological observation practices were followed; Visual inspection was supplemented by relevant written sources, and oral communications with local communities from the surrounding area. In addition, the site was recorded by hand held GPS Garmin Oregon 65 and plotted on 1:50 000 topographical map. Archaeological/historical material and the general condition of the terrain were photographed with a Garmin Oregon 65 Camera.

The field assessment section of the study was conducted according to generally accepted HIA practices and aimed at locating all possible objects, sites and features of archaeological significance in the area of the proposed development.

5.1.1.3. Documentation

All sites, objects and features identified were documented according to the general minimum standards accepted by the archaeological profession. Co-ordinates of individual localities are determined by means of the Global Positioning System (GPS).The information is added to the description in order to facilitate the identification of each locality.

6. RESULTS OF THE FIELDWORK

No cultural heritage (archaeological or historical) sites, features or objects were found. There is no structures/buildings on site which are older than 60 years.

7. CHRONOLOGICAL SEQUENCE OF THE STONE AND IRON AGE

The Stone Age is the period in human history when lithics (or stone) was mainly used to produce tools. In South Africa the Stone Age can be divided basically into three periods. It is important to note that these dates are relative and only provide a broad framework for interpretation. A basic sequence for the South African Stone Age is as follows:

Early Stone Age (ESA):	Predominantly the Acheulean hand axe industry complex dating to + 1Myr yrs-250 000 yrs. Before present.
Middle Stone Age (MSA):	Various lithic industries in SA dating from ±250 000 yr.-30 000 yrs. before present.
Late Stone Age (LSA):	The period from ±30 000-yr.to contact period with either Iron Age farmers or European colonists.

There are no known Stone Age sites in the area including rock art. No Stone Age sites or objects were recorded during the assessment of the area.

The Iron Age is the name given to the period of human history when metal was mainly used to produce artifacts:

Early Iron Age (EIA):	Most of the first millennium AD
Middle Iron Age:	10^{th} to 13^{th} centuries AD
Late Iron Age (LIA):	14^{th} century to colonial period. The entire Iron Age represents the spread of Bantu speaking peoples.

8. ASSESMENT CRITERIA

This section describes the evaluation criteria used for determining the significance of archaeological and heritage sites. The significance of archaeological and heritage sites were based on the following criteria:

- The unique nature of a site
- The amount/depth of the archaeological deposit and the range of features (stone walls, activity areas etc.)
- The wider historic, archaeological and geographic context of the site.
- The preservation condition and integrity of the site
- The potential to answer present research questions.

8.1. Archaeological

No archaeological materials were found in the study area.

8.2. Historical

No historical sites/materials found on site.

8.3. Burial grounds and graves

No graves were identified on site

The legislation also protects the interests of communities that have an interest in the graves: they should be consulted before any disturbance takes place. The graves of victims of conflict and those associated with the liberation struggle are to be identified, cared for, protected and memorials erected in their honor.

Graves older than 60 years, but younger than 100 years, fall under Section 36 of Act 25 of 1999 (National Heritage Resources Act) as well as the Human Tissue Act (Act 65 of 1983) and are under the jurisdiction of the South African Heritage Resources Agency (SAHRA).The procedure for Consultation regarding Burial Grounds and Graves (Section 36(5) of Act 25 of 1999) is applicable to graves older than 60 years that are situated outside a formal cemetery administrated by a local authority. Graves in the category located inside a formal cemetery administrated by a local authority will also require the same authorization as set out for graves younger than 60 years, over and above SAHRA authorization.

In terms of the Section 36 (3) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) no person may, without a permit issued by the relevant heritage resources authority:

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;
(b) destroy, damage, alter, exhume or remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority; or
(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) any excavation equipment, or any equipment, which assists in the detection or recovery of metals.

Therefore, in addition to the formal protection of culturally significance graves, all graves which are older than 60 years and which are not already located in a cemetery (such as ancestral graves in rural areas), are protected. Communities, which have an interest in the graves, must be consulted before any disturbance can take place. The graves of victims of conflict and those associated with the liberation struggle will have to be included, cared for, protected and memorials erected in their honor where practical. Regarding graves and burial grounds, the NHRA distinguishes between the following:

- Ancestral graves
- Royal graves and graves of traditional leaders
- Graves of victims of conflict
- Graves of individuals designated by the Minister by notice in the Gazette
- Historical graves and cemeteries
- Other human remains, which are not covered in terms of the Human Tissue Act, 1983 (Act No.65 of 1983).

8.4. Significance valuation Burial Ground, Historic Cemeteries and Graves

The significance of burial grounds and gravesites is closely tied to their age and historical, cultural and social context. Nonetheless, every burial should be considered as of high significance. Should any grave previously unknown be identified during construction, every effort should be made not disturb them. The streets designs should be shifted to ensure the grave or burial ground is not disturbed.

8.5. Previously unidentified burial sites/graves –

Although the possibilities of this occurring are very limited, should burial sites outside the NHRA be accidentally found during the proposed development, they must be reported to the nearest police station to ascertain whether or not a crime has been committed. If there

is no evidence for a crime having been committed, and if the person cannot be identified so that their relatives can be contacted, the remains may be kept in an institution where certain conditions are fulfilled. These conditions are laid down in the Human Tissue Act (Act No. 65 of 1983). In contexts where the local traditional authorities give their consent to the unknown remains to be re-buried in their area, such re-interment may be conducted under the same regulations as would apply for known human remains.

9. THE SIGNIFICANCE OF GRAVES AND BURIAL SITES

The significance of burial grounds or graves has been indicated by means of stipulations derived from the National Heritage Resources Act (Act No 25 of 1999)

Heritage Significance	:	GP.A; High/Medium Significance
Impact	:	Negative
Impact Significance	:	High
Certainty	:	Probable
Duration	:	Permanent
Mitigation	:	C

- *Informal graves and Formal grave yards (Cemeteries)*

Informal and formal grave yards (Cemeteries) can be considered to be sensitive remains of high significance and are protected by various laws. Legislation with regard to graves includes the National Heritage Resources Act (no 25 of 1999) this act applies whenever graves are older than sixty years. The act also distinguishes various categories of graves and burial grounds. Other legislation with regards to graves includes those which apply when graves are exhumed and relocated, namely the Ordinance on exhumation (Ordinance no 12 of 1980) and the Human Tissue Act (Act no 65 of 1983 as amended).

9.1 Site significance

The site significance classification standards as prescribed and endorsed by the South African Heritage Resources Agency (2006) and approved by the Association for Southern African Professional Archaeologists (ASAPA) for the Southern African Development Community (SADC) region, were used as guidelines in determining the site significance for the purpose of this report.

FIELD RATING	GRADE	SIGNIFICANCE	RECOMMENDED MITIGATION
National Significance (NS)	Grade 1	-	Conservation; National Site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; Provincial Site nomination
Local Significance (LS)	Grade 3A	High Significance	Conservation; Mitigation not advised
Local Significance (LS)	Grade 3B	High Significance	Mitigation (Part of site should be retained)
Generally Protected A (GP.A)	Grade 4A	High / Medium Significance	Mitigation before destruction
Generally Protected B (GP.B)	Grade 4B	Medium Significance	Recording before destruction
Generally Protected C (GP.C)	Grade 4C	Low Significance	Destruction

Grading and rating systems of heritage resources

9.2. Impact rating

VERY HIGH

These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or cultural) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects.

Example: The loss of a species would be viewed by informed society as being of VERY HIGH significance.

Example: The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with VERY HIGH significance.

HIGH

These impacts will usually result in long term effects on the social and /or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light.

Example: The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated.

Example: The change to soil conditions will impact the natural system, and the impact on affected parties (e.g. farmers) would be HIGH.

MODERATE

These impacts will usually result in medium- to long-term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by the public or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are real, but not substantial.

Example: The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.

Example: The provision of a clinic in a rural area would result in a benefit of MODERATE significance.

LOW

These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect.

Example: The temporary changes in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels.

Example: The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people living some distance away.

NO SIGNIFICANCE

There are no primary or secondary effects at all that are important to scientists or the public.

Example: A change to the geology of a certain formation may be regarded as severe from a geological perspective, but is of NO SIGNIFICANCE in the overall context.

9.3 CERTAINTY

DEFINITE : More than 90% sure of a particular fact. Substantial supportive data exist to verify the assessment.

PROBABLE : Over 70% sure of a particular fact, or of the likelihood of an impact occurring.

POSSIBLE : Only over 40% sure of a particular fact, or of the likelihood of an impact occurring.

UNSURE : Less than 40% sure of a particular fact, or of the likelihood of an impact occurring.

9.4 DURATION

SHORT TERM : 0 – 5 years

MEDIUM : 6 – 20 years

LONG TERM : more than 20 years

DEMOLISHED : site will be demolished or is already demolished

9.5 MITIGATION

Management actions and recommended mitigation, which will result in a reduction in the impact on the sites, will be classified as follows:

- **A** – No further action necessary
- **B** – Mapping of the site and controlled sampling required
- **C** – Preserve site, or extensive data collection and mapping required; and
- **D** – Preserve site

10. CONCLUSIONS AND RECOMMENDATIONS

No further studies / Mitigations are recommended given the fact that within the proposed Township Establishment area and its surrounding there are no archaeological or place of historical significance to be impacted by the proposed project development. However, should any chance archaeological or any other physical cultural resources be discovered subsurface, heritage authorities should be informed. From an archaeological and cultural heritage resources perspective, there are no objections to the proposed Township Establishment. We recommend to the Provincial Heritage Resource Agency, South African Heritage Resource Agency to approve the project as planned.

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GEOTECHNICAL INVESTIGATION THE PROPOSED TOWNSHIP SITUATED ON THE FARM PLANGE 221 LT UNDER THE JURISDICTION OF COLLINS CHABANE LOCAL MUNICIPALITY, LIMPOPO PROVINCE

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12 JULY 2021

TABLE OF CONTENT

LIST OF FIGURES iii

LIST OF TABLES iii

ACRONYMS AND ABBREVIATIONS iv

EXECUTIVE SUMMARY v

1. INTRODUCTION 1

2. OBJECTIVES OF THE STUDY 1

3. TERMS OF REFERENCE 1

4. INFORMATION SOURCES 2

5. SITE DESCRIPTION 3

5.1. Location 3

5.2. Topography 3

5.3. Climate and Vegetation 4

6. GEOLOGY OF THE AREA 4

7. SOIL PROFILE 5

Top soils 5

Residual soils 5

8. GEOHAZARDS 6

8.1. Seismic Hazard / Activities 6

8.2. Ground Subsidence 7

8.3. Sinkhole Formation 7

8.4. Landslides and Mudslides 8

8.5. Falls and Rockslides 8

8.6. Volcanic Activities 8

9. METHOD OF INVESTIGATION 8

9.1. Desktop study 8

9.2. Field Mapping 9

9.3. Inspection of Test Pits 9

10. LABORATORY RESULTS 10

11. HYDROGEOLOGY 14

11.1. Drainage patterns 14

11.2. Ground water 14

12. GEOTECHNICAL EVALUATION 15

12.1. Expansive soils 16

12.2. Collapsible soils 16
12.3. Compressible soils 17
12.4. Soil site classification 17
12.5. Excavation Classification 18
12.6. Stability of excavations sidewalls 18
12.7. Construction material suitability 19
12.8. Construction Monitoring 19
13. CONCLUSIONS 19
14. RECOMMENDATIONS 19
14.1. Foundations 19
14.1.1. Foundations on residual soils 20
14.1.2. Raft Foundation 20
15. REFERENCES 21
16. REPORT SIGNATURE 22
APPENDIX A: SITE PHOTOS 23
APPENDIX B: LABORATORY TEST RESULTS 28
APPENDIX C: SOIL PROFILES 29

LIST OF FIGURES

Figure 1: Layout of the site....2
Figure 2: Locality Map of the site....3
Figure 3: Geological setting of the site....5
Figure 4: Seismic Hazard Zones of South Africa (SANS 10160-4,2011)....7
Figure 5: Test pit positions....10

LIST OF TABLES

Table 1: Summary of the test pit soil profiles....6
Table 2: Summary of the foundation indicators test results....12
Table 3: Summary of the CBR test results....13
Table 4: Residential site class designations....15
Table 5: Geotechnical Classification for Urban Development (GFSH-2 Document)....16

ACRONYMS AND ABBREVIATIONS

AASHTO : American Association of State Highway and Transportation Officials

ARS : Acceleration Response Spectra

DCP : Dynamic Cone Penetrometer

DSI : Dolomite Stability Investigation

CBR : Californian Bearing Ratio

M : Meter

MDD : Maximum Dry Density

MBGL : Meters Below Ground Level

NHBRC : The National Home Builders Registration Council

OMC : Optimum Moisture Content

CL : Clay

TP : Trial Pit

TLB : Tractor Loader Backhoe

SANS : South African National Standards

SANAS : South African National Accreditation System

SACNASP : South African Council Natural Scientific Professions

USC : Unified Soil Classification

EXECUTIVE SUMMARY

Client	Mahlori Development Consultants
Consultant Company	MangGeo Environmental Consultants
Site location	The Geographical Positioning System (GPS) coordinates of the proposed development site is 23°06'28.09"S 30°53'22.37"E at an average elevation of 483 meters above sea level.
Purpose of investigation	The main objective of the investigation was aimed at defining the founding materials and establishing broader geotechnical conditions and their suitability to the proposed township establishment.
Regional geology	The site under investigation falls under the Giyani Group. It must be noted that outcrops which were observed during site geological examination reveal the mafic and ultramafic rocks such as Amphibolite, Serpentine, this rocks are predominately composed of minerals such amphiboles and pyroxene and other accessory minerals. The site doesn't have many exposed outcrops; majority of the site is overlaid by soil. The geological map in figure 3 indicates the geological setting of the site and its surrounding.
Top layer	Topsoil layer was observed in all of the trial pits. The material didn't show road bearing capacity. There was no sample taken from this layer. The layer has an average thickness of 0.33m in the range 0 to 0.45m below ground level. It is characterized by cohesive materials typically described as "Dry, reddish brown, stiff, intact, Silty Clay."
Laboratory Results	Nine samples were collected from the slightly moist, reddish, intact, _firm to stiff, ~Sand silty clay. & slightly moist, reddish, Matrix supported _Medium dense to dense, ~ gravelly clay. These soils originate from the in-situ weathering of the mafic & ultramafic parent rock which is underlined by the Amphibolite, serpentine (met., mafic and ultramafic rock) which is situated adjacent to the Guodplaats Gneiss. Furthermore, homogeneity of material underlying the site was observed hence a choice of nine bulk representative samples. The PI along with the clay content indicated that the samples exhibit medium potential expansiveness. The samples indicated CBR of 3 at 95% MOD AASHTO with a grading modulus of 0.63 for TP7, a CBR of 5 at 95% MOD

	AASHTO with a grading modulus of 0.65 for TP8 and a CBR of 16 at 95% MOD AASHTO with a grading modulus of 2.00 for TP10 . Based on the grading modulus, Atterberg limits and CBR the sample were classified as G9 for TP10 according to COLTO classification.
Site classification designation	A review of the test pit data indicates that the site is generally underlined by mafic & ultramafic bedrocks. The laboratory tests indicated that material underlying the site exhibits medium potential expansiveness. The development potential has been broadly classified in terms of a Geotechnical Sub-Area based on field observations/investigation (geological, hydrogeological, and geomorphological), and laboratory soil testing of soil samples. From the above discussion the site is classified into main soil area namely compressible and potential Expansive soils: According to AASHTO and COLTO the soil samples were classified as A-2-6(1) and G9 respectively. **The foundation design options as per SANS10400 H- NHBRC soil symbol is "S1/H1".**
Foundation Design	The recommended Foundation types in accordance with SANS 10400H- ***Reinforced Deep Strip Foundation/ Raft Foundation***

1. INTRODUCTION

MangGeo Environmental Consultants was appointed by Mahlori Development Consultants on behalf of Collins Chabane Local Municipality to carry out a geotechnical investigation study for the proposed township situated on the farm Plange 221 LT. The proposed development will materialize on a site that is approximately 14.94 hectares in size on portions of the farm Plange 221 LT in Mtititi Village under the jurisdiction of Collins Chabane Local Municipality, Limpopo Province of South Africa.

2. OBJECTIVES OF THE STUDY

This report evaluates the geotechnical characteristics associated with the underlying geology and any geotechnical constraints that might affect structural integrity of the subject property. However, it is also essential to Identify engineering properties' potential influence on the design, construction and operation of the intended infrastructures. It must be noted that there were internal streets dividing the site during the course of the investigation.

The main objective of the investigation was aimed at defining the founding materials and establishing broader geotechnical conditions and their suitability to the proposed township establishment.

The following are some of the objectives of geotechnical investigation:

- To determine the geology of the site
- To establish in broad terms, the nature and relevant engineering properties of the upper soil and rock strata underlying the site.
- To ascertain the soil chemistry including pH determination and electrical conductivity of the soil.
- To comment on suitable excavation procedures for the installation of services.
- To present general foundation recommendations for the proposed development.
- To comment on any other geotechnical aspects as these may affect the development.
- Potential geotechnical limiting factors by determining the behavior and suitability of soil/rocks and their effects on the intended development;
- Assess excavation conditions
- Determine the presence or occurrence of groundwater
- Classification of the site material according to the TRH14 classification system

3. TERMS OF REFERENCE

The study was requested by Mahlori Development Consultants on behalf of Collins Chabane Local Municipality. The main objective was to conduct a geotechnical investigation study for the proposed township situated on the farm

Plange 221 LT Mtititi Village Limpopo Province. The investigation comprised a test pits investigation and the soil/ laboratory tests.

We understand that the proposed development is to comprise of the following:

The proposed project entails the demarcation of 102 sites for:

- 94 residential use,
- 4 public open space,
- 2 business sites, and
- 1 Creche
- 1 Church

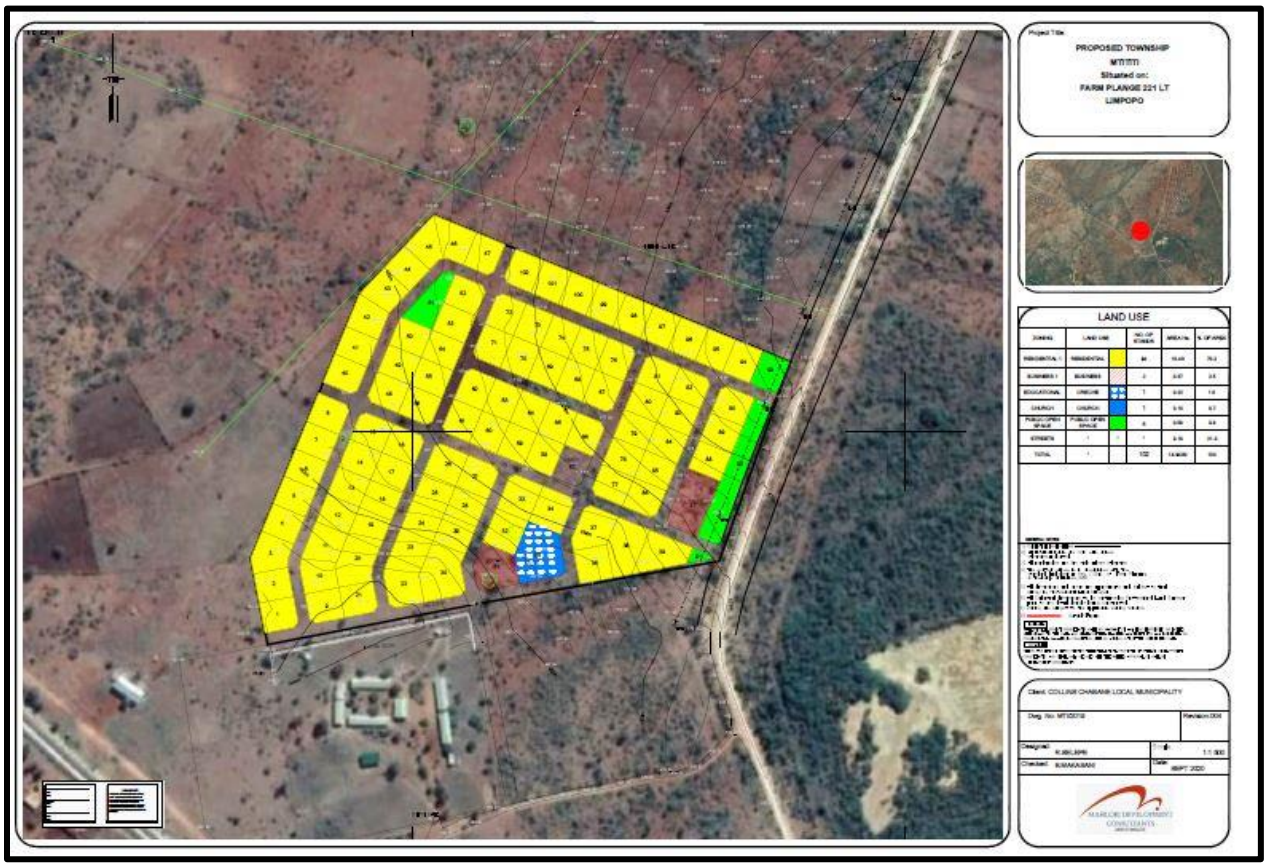


Figure 1: Layout of the site

4. INFORMATION SOURCES

The following sources of information were used during the investigation:

- **Geological Map**
- **Land Type Map**

Google earth image; scale 1: 250 000 (Digital/internet)

- **Topographical Map.**

5. SITE DESCRIPTION

5.1. Location

The site for the proposed development is located between Plange Village and Mtititi Villages in the Collins Chabane Local Municipality. The Geographical Positioning System (GPS) coordinates of the proposed development site is 23°06'28.09"S 30°53'22.37"E at an average elevation of 483 meters above sea level. The proposed site locality map is shown in Figure 2 below.

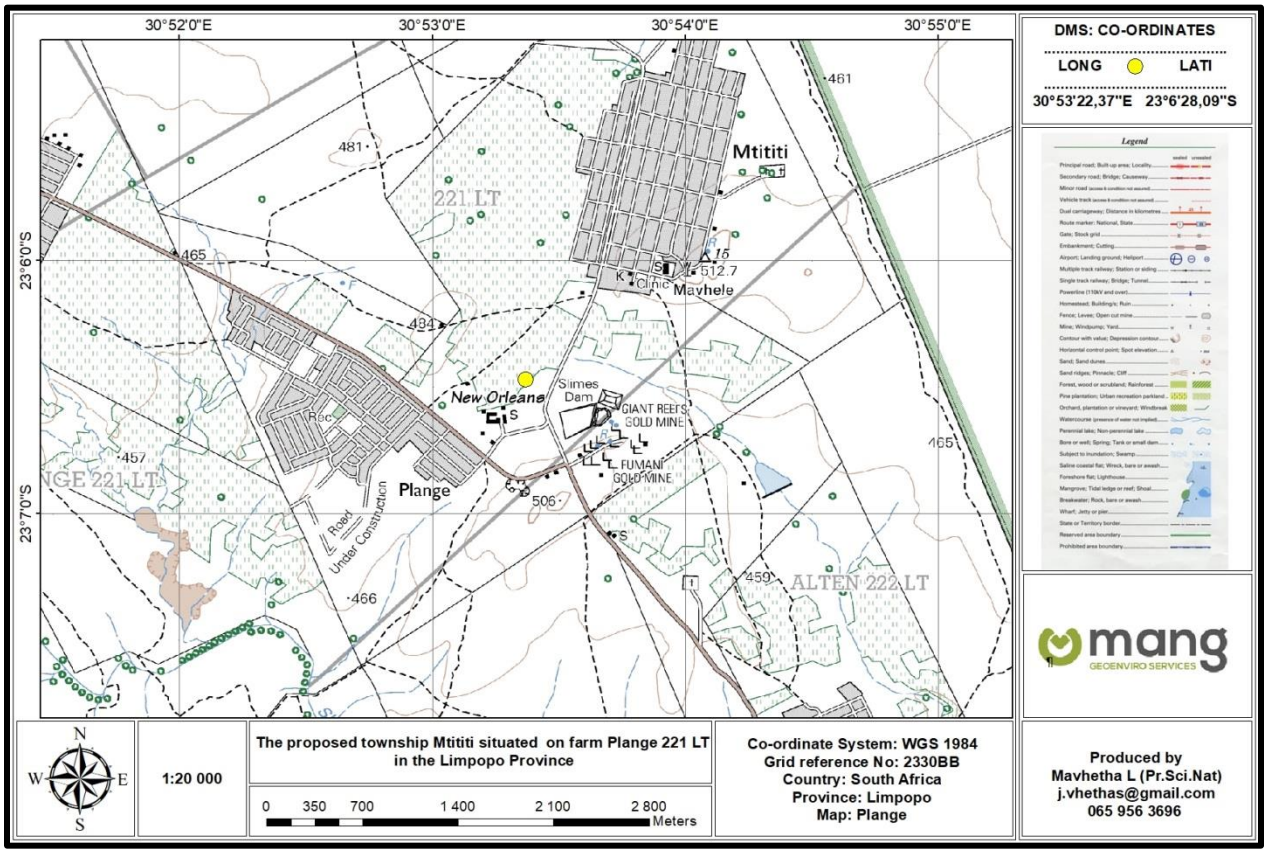


Figure 2: Locality Map of the site

5.2. Topography

The Vhembe District Municipality is characterized by both high-lying and low-lying areas. Its relief is divided into the lowveld in the east; the Limpopo valley in the north and northwest; the Soutpansberg region in the central part, and the Pietersburg plateau in the south. The altitude above sea level of the Vhembe District varies between 200m in the northeastern part of the area and over 1 500 m in the Soutpansberg mountain range. The topography on site is of low

relief and relatively flat gradient that have angle less than that of critical angle of repose, the general altitude of the proposed site is approximately 485 meters above the sea level. There is no evidence of heavy soil erosion on the entire site. Drainage of water is expected to align with site topography, particularly during periods of heavy or prolonged rainfall.

5.3. Climate and Vegetation

The climate in the area under investigation is referred to as local steppe climate. There is little rainfall throughout the year. The average annual temperature is 24.6 °C. Moreover, about 411mm of precipitation falls annually. The least amount of rainfall occurs in July with an average of 90mm. the temperatures are highest on average in January, at around 28.2 °C. June has the lowest average temperature of the year, it is 18.9 °C. The variation in the precipitation between the driest and wettest months is 88mm. during the year, the average temperatures vary by 9.3 °C.

The climatic condition plays a fundamental role in the development of a soil profile and the weathering of rock. Chemical decomposition is the predominant mode of rock weathering in areas where the climatic "N-value" is less than 5. In areas where the climatic N-value is between 5 and 10, disintegration is the predominant form of weathering, although some chemical decomposition of the primary rock minerals still takes place. Where the climatic N-value is greater than 10, secondary minerals do not develop to an appreciable extent and all weathering takes place by mechanical disintegration of the rock. However, weinert's climatic N-value for the study area is less than 5. This implies that rocks are extensively weathered, often to depths of several metres, and decomposition is pronounced.

The Vhembe District Municipality is characterized by the Savanna biome and it covers approximately 98% of the vegetation with the remainder being made up of Forest (1%) and Grassland (0.2%) biome.

6. GEOLOGY OF THE AREA

Chronology	Group	Lithology	Environmental Class
Swazian	Giyani Group	Amphibolite, serpentine	Monocyclic deformation

The site under investigation falls under the Giyani Group. It must be noted that outcrops which were observed during site geological examination reveal the mafic and ultramafic rocks such as Amphibolite, Serpentine, this rocks are predominately composed of minerals such amphiboles and pyroxene and other accessory minerals. The site doesn't have many exposed outcrops; majority of the site is overlaid by soil. The geological map in figure 3 indicates the geological setting of the site and its surrounding.

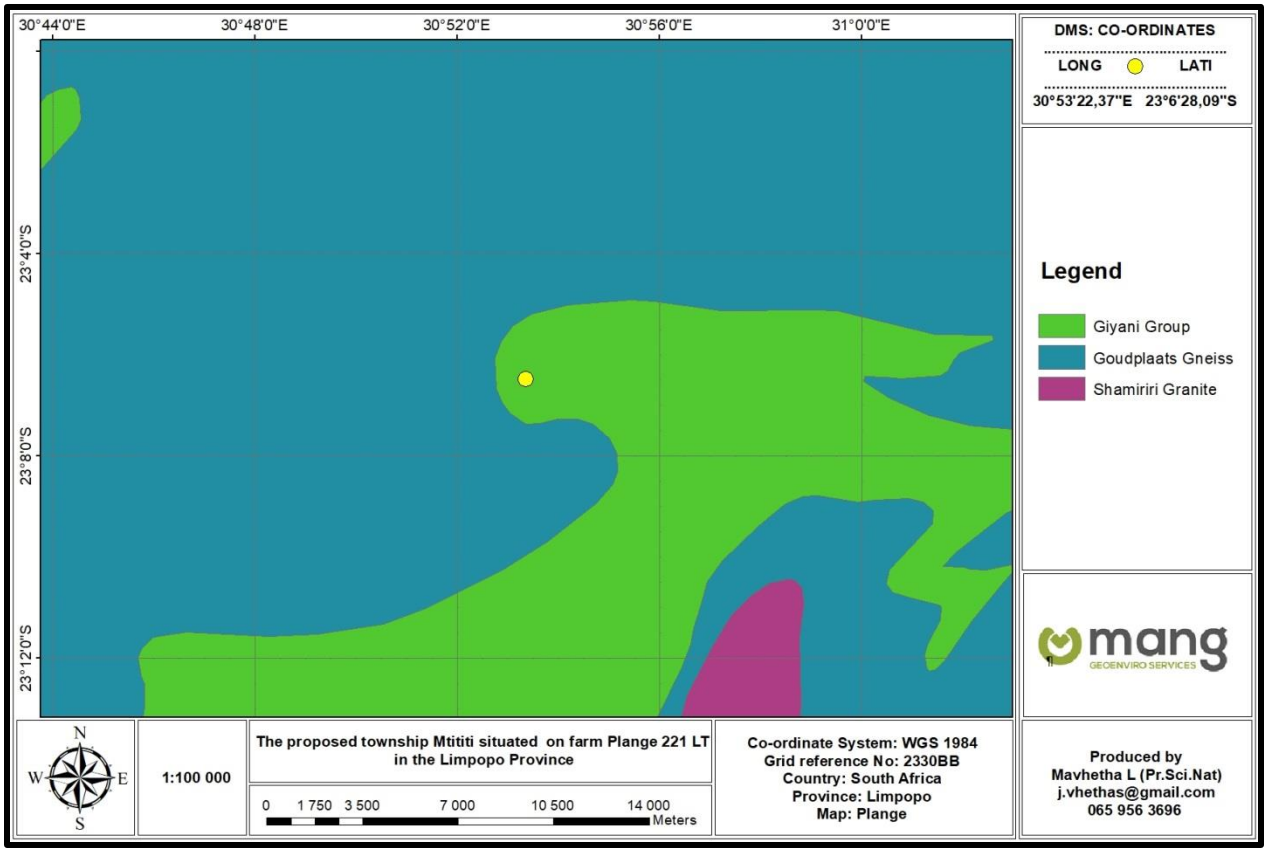


Figure 3: Geological setting of the site

7. SOIL PROFILE

Several soil strata that were encountered in the test pits during the field investigations are given below. Moreover, the summary of the test pit profiles is shown in Table 1 and test pit position in figure 3.

Top soils

The topsoil is characterized by an upper stratum of Silty clay which has an average thickness of 0.33m in the range 0 to 0.45m below ground level. It is characterized by cohesive materials typically described as “Dry, reddish brown, stiff, intact, Silty Clay.”

Residual soils

Residual soil was encountered in almost all test pits with an average thickness of 1.03m in the range 0.25 to 1.4m below ground level.

These soils originate from the in-situ weathering of the mafic & ultramafic parent rock which is underlined by the Amphibolite, serpentine (met., mafic and ultramafic rock) which is situated adjacent to the Guodplaats Gneiss. This

stratum is typically described as “Slightly moist, reddish, intact, _firm to stiff, ~Sand silty clay. & Slightly moist, reddish, Matrix supported, _Medium dense to dense, ~Gravelly clay.”

Table 1: Summary of the test pit soil profiles

Test pits	Thickness of the layers		Water Seepage	End of hole	
	TOPSOIIL	RESIDUAL SOIL		Depth (m)	Material
	Silty sand	Gravelly sand			
TP 1	0-0.3m	0.3 – 0.9m	None	0.9m	Silty clay
TP 2	0-0.3m	0.3 – 1.0m	None	1.0m	Sandy clay
TP 3	0.27m	0.27 - 0.85m	None	0.85m	Silty clay
TP 4	0.4m	0.4 - 1.2m	None	1.2m	Silty clay
TP 5	0.25m	0.25 – 0.9m	None	0.9m	Silt
TP 6	0.3m	0.3 – 1.4m	None	1.4m	Sandy silt
TP 7	0.37m	0.37 - 1m	None	1m	Silty clay
TP 8	0.33m	0.33– 0.93m	None	0.93m	Silty clay
TP 9	0.45m	0.45 - 1.1m	None	1.1m	Gravelly clay
TP 10	0.27m	0.27 – 0.8m	None	0.8m	Gravelly sand
TP 11	0.38m	0.38 - 1.24m	None	1.24m	Gravelly sand
TP 12	0.34m	0.34 – 0.95m	None	0.95m	Silty clay
TP 13	0.37m	0.37 - 1.18m	None	1.18m	Gravelly sand
TP 14	0.36m	0.36 - 0.98m	None	0.98m	Silty clay
TP 15	0.3m	0.3- 0.95m	None	0.95m	Gravelly sand

8. GEOHAZARDS

8.1. Seismic Hazard / Activities

The seismic zones are determined from the seismic hazard map which represents peak ground acceleration with a 10% probability of being exceeded in a 50-year period.

Two types of seismic activities occur in South Africa, namely:

- Regions of natural seismic activity (Zone I), and

- Regions of mining-induced and natural seismic activity (Zone II).

In accordance with the seismic hazard zones contained in SANS 10160-4 (2011), the site does not fall within either Zone I or Zone II, as shown in Figure 4.

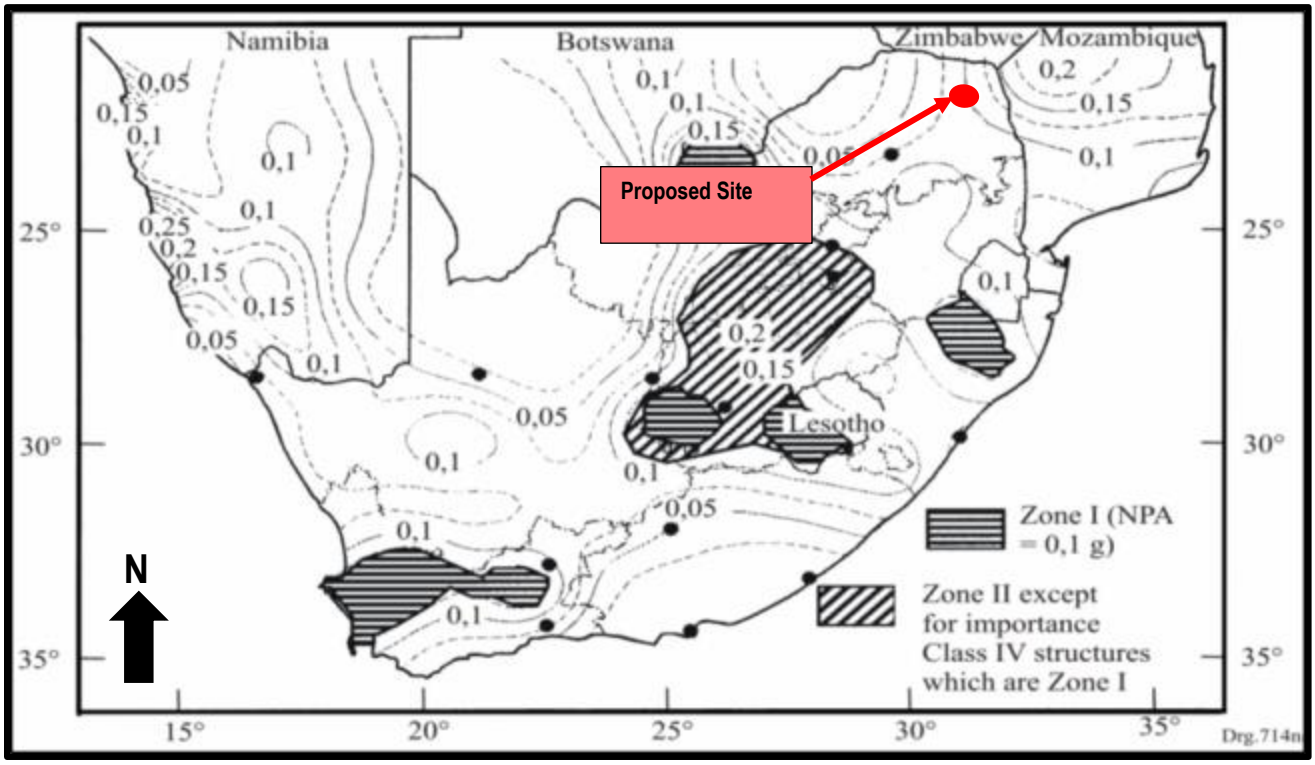


Figure 4: Seismic Hazard Zones of South Africa (SANS 10160-4,2011)

Both the seismic hazard zones and the seismic hazard maps of South Africa produced by Kijko (2003), show the site is situated in the area where the peak ground acceleration with a 10% probabilistic of exceedance in a 50-year period is approximately 0.08 to 0.04g.

8.2. Ground Subsidence

Subsidence occurs in areas with large underground cavities typically resulting from large scale shallow to very shallow mining and from dolomite/limestone dissolution. It may also appear where thick deposits of unconsolidated material exist.

No signs of previous subsidence were evident during the site investigation and no mining activity has occurred in this area.

8.3. Sinkhole Formation

Similar to subsidence, sinkhole formation happens in areas with very large to extremely large underground cavities resulting from mining poorly designed shallow underground activities. Coal Mines in Mpumalanga Province and Gold

Mines in Limpopo Province are typical examples of such calamity. Dissolution of dolomites or limestone over millions of years also lead to cavity formations that might later manifest into sinkhole formation as evidenced very much so in Limpopo and Gauteng Provinces.

According to the research done, there are no records of wide shallow underground mining activities directly below this site. There is no dolomite or limestone underlying the site so the chances of dolomite related sinkhole formation are unlikely.

The available geological maps indicate that the site is not underlain by dolomite.

8.4. Landslides and Mudslides

The probability of landslides and mudslides occurring at this area are rare. This is primarily due to the low relief, relatively flat gradient of the area, climatic conditions and composition of residual and transported materials in this particular area. Furthermore, the soil on site is relatively compacted and its void ratio doesn't promote infiltration and percolation which are among the primary factors in occurrence of landslide and mudslide.

8.5. Falls and Rockslides

The probability of the occurrence of rock falls and rockslides is very low due to the low relief and shallow gradient.

8.6. Volcanic Activities

South Africa has seen its last volcanic activity approximately 65 million years ago during the massive historical eruption of the Drakensberg Lava forming the Basaltic Drakensberg Mountain Ranges that we see today. Recent studies showed no signs for the possibility of volcanic eruption in the foreseeable future.

9. METHOD OF INVESTIGATION

The fieldwork was undertaken on the 19 July 2021 and comprised of the following:

- Desktop study
- Walk over survey and Pit excavation
- Test Pits
- Soil Sampling/ Laboratory Tests

9.1. Desktop study

The desk study comprises the review of existing regional, site and surface information. Sources of information include:

- Topographic maps, geological data such as lithology of nearby rock outcrops, landforms and erosion patterns;
- Existing geotechnical reports prepared for areas in close proximity to the site;
- Data on seismic aspects, such as ground motion and liquefaction potential.

9.2. Field Mapping

A walk-over survey was carried out on the proposed site to obtain as much information as possible of the subsurface conditions from existing soil. A granite rock outcrops were identified during this investigation other field testing discussed below.

9.3. Inspection of Test Pits

The field investigation was conducted on the 19 July 2021. Based on the "Site Investigation Code of Practice" (SAICE Geotechnical Division, 2010), which provides standards for "acceptable engineering practice", a total of 15 (Fifteen) test pits were planned for the proposed development.

This chapter of the report describes the field work and activities that were conducted in order to assess the geotechnical conditions at the proposed site. Test pits were positioned using a hand held GPS and the position of the test pits is shown on figure 4. The method of investigation was based on a near surface investigation, to a maximum depth of 1.4 m below existing ground level with an aid of an auger, crowbar and a shovel in order to obtain information on the subsurface soil; each pit was marked, photographed and profiled by a field engineering geologist in accordance with the current standard procedures proposed by Brink and Bruin (2002). The test pit photographs are presented in Appendix A of this report.

These included the following components:

- Excavation of 15 (Fifteen) test pits with an aid of an auger, crowbar and shovel.
- Representative samples were retrieved from the test pits for laboratory testing at SANAS accredited laboratory.

Test pits were positioned using a hand held GPS, below is layout indicating the position of test pits on site.

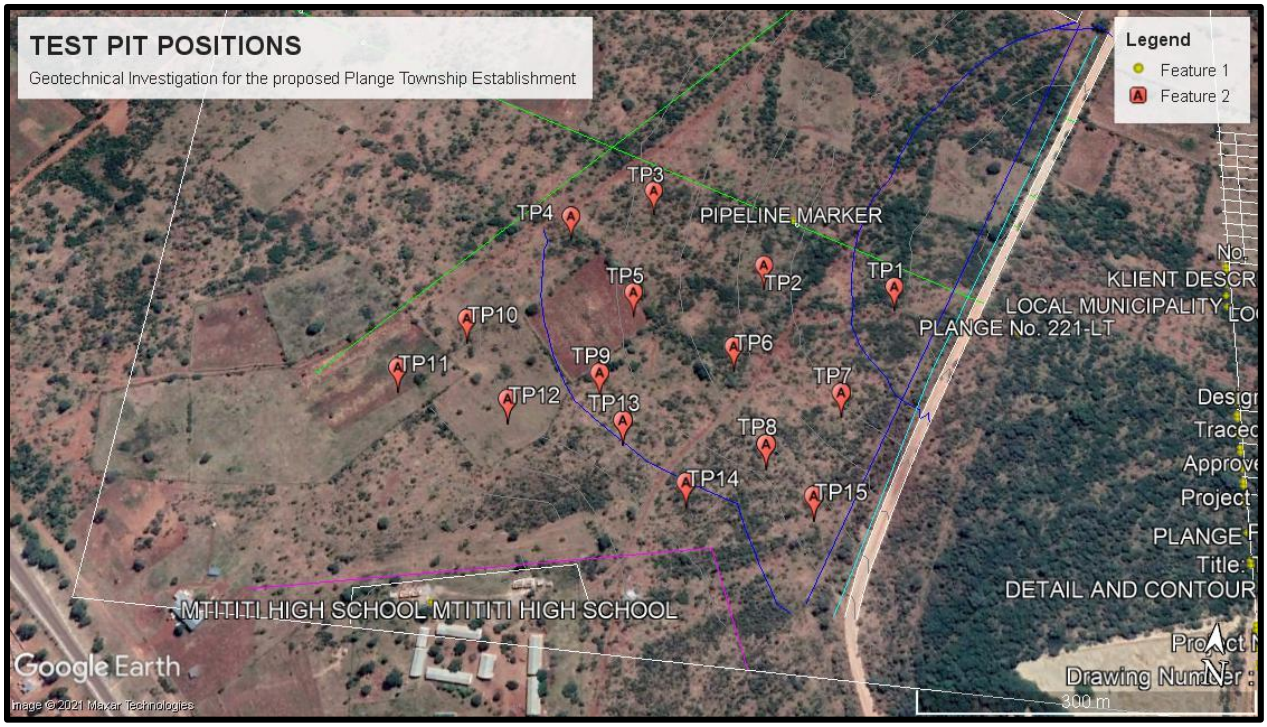


Figure 5: Test pit positions

10. LABORATORY RESULTS

The field work indicated a general homogeneity of the subsurface soils comprising of slightly moist, reddish, intact, _firm to stiff, ~Sand silty clay. & Slightly moist, reddish, Matrix supported, _Medium dense to dense, ~Gravelly clay. Representative disturbed subsoil samples retrieved from the inspection pits during the investigation were taken to a commercial laboratory for testing. These tests aid in assessing the behavior of soils due to moisture changes particularly below foundations. The following tests were conducted on soil samples taken during the field work phase by a suitable SANAS accredited soils laboratory (Civilab, Johannesburg (Booysens): Gauteng Province):

Standard foundation indicator tests were conducted on disturbed soil samples in order to determine its composition, to evaluate the heave and compressibility potential of these soils, and to calculate the maximum heave and/or differential settlement that can be expected. The following tests were conducted:

- 9 Atterberg Limits (plastic limit, liquid limit and plasticity index);
- 9 Grading analysis and;
- 3 MOD and 3 CBR,
- 1 pH and 1 Conductivity

The laboratory tests were conducted in order to assist with the classification, description, and delineation of homogenous zones. The results of the foundation indicator, MOD and CBR tests are presented in Appendix B and

are summarized in Table 2 and Table 3 respectively. The samples were taken from the test pit position denoted in the same manner.

Topsoil Material – Topsoil layer was observed in all of the trial pits. The material didn't show road bearing capacity. There was no sample taken from this layer. The layer has an average thickness of 0.33m in the range 0 to 0.45m below ground level. It is characterized by cohesive materials typically described as "Dry, reddish brown, stiff, intact, Silty Clay."

Residual soils – Nine samples were collected from the slightly moist, reddish, intact, _firm to stiff, ~Sand silty clay. & slightly moist, reddish, Matrix supported _Medium dense to dense, ~ gravelly clay. These soils originate from the in-situ weathering of the mafic & ultramafic parent rock which is underlined by the Amphibolite, serpentine (met., mafic and ultramafic rock) which is situated adjacent to the Guodplaats Gneiss. Furthermore, homogeneity of material underlying the site was observed hence a choice of nine bulk representative samples. The PI along with the clay content indicated that the samples exhibit medium potential expansiveness. The samples indicated CBR of 3 at 95% MOD AASHTO with a grading modulus of 0.63 for TP7, a CBR of 5 at 95% MOD AASHTO with a grading modulus of 0.65 for TP8 and a CBR of 16 at 95% MOD AASHTO with a grading modulus of 2.00 for TP10 . Based on the grading modulus, Atterberg limits and CBR the sample were classified as G9 for TP10 according to COLTO classification.

PH and Conductivity – pH measurements conducted indicated that the pH of the area is 5.8 for TP10 at a depth of 0.27-0.8m. This pH of the site indicates more of acidic to neutral. Conductivity measurements indicated that the conductivity of the area is 0.031 Ms/m for TP10 at a depth of 0.27-0.8m, 0.089 Ms/m. The area can be classified as Slightly-corrosive (SC). Corrosive materials (pipelines) installation must include measures against corrosion.

Table 2: Summary of the foundation indicators test results

Sample No.	HRB (AASHTO)	Depth (m)	Atterberg Limit			GM	Grading analysis (%)				Potential expansiveness
			LL %	LS %	PI %		Clay	Silt	Sand	Gravel	
TP01	A-7-6(9)	0.3-0.9	45	11.0	25	1.06	17	30	31	22	Medium
TP02	A-6(7)	0.3-1.0	38	9.0	18	0.79	20	32	36	11	Medium
TP03	A-6(10)	0.27-0.85	36	6.5	16	0.47	31	36	29	3	Medium
TP04	A-6(6)	0.4-1.2	30	6.0	14	0.50	16	32	50	2	Medium
TP05	A-6(8)	0.25-0.9	31	7.0	15	0.44	12	47	41	1	Medium
TP06	A-7-6(12)	0.3-1.4	44	11.0	22	0.63	15	46	37	3	Medium
TP07	A-7-6(10)	0.37-1.0	42	9.0	19	0.65	37	24	35	3	Low
TP08	A-6(8)	0.33-0.93	35	7.5	19	0.72	15	38	40	6	Medium

TP10	A-2-6(1)	0.27-0.8	33	6.5	15	2.00	8	16	16	60	Low

LL: Liquid Limit **PI**: Plasticity Index **LS:** Linear Shrinkage **GM:** Grading Modulus **NP: Non-**Plastic

Table 3: Summary of the CBR test results

Sample No.	HRB (AASHTO)	Depth (m)	CBR @						GM	Max. Swell (%)	OMC (%)	Max Dry Density (kg/m^3)	COLTO Classification
			90%	93%	95%	97%	98%	100 %					
TP07	A-7-6(12)	0.37-1.0	2	3	3	5	5	7	0.63	2.7	15.4	1717	-
TP08	A-7-6(10)	0.33-0.93	2	3	5	7	8	11	0.65	1.6	18.2	1713	-
TP10	A-2-6(1)	0.27-0.8	5	10	16	25	31	50	2.00	0.7	9.4	2075	G9

PI: Plasticity Index **GM:** Grading Modulus **OMC:** Optimum Moisture Content **CBR: California** Bearing Ratio

11. HYDROGEOLOGY

11.1. Drainage patterns

The Vhembe District Municipality (VDM) lies within two of the water management areas (WMA), namely the Limpopo WMA and the Luvuvhu and Letaba WMA.

The National Freshwater Ecosystem Priority Areas (NFEPA) (Nel et al 2011) identifies rivers, wetlands and estuaries in South Africa that are most important for sustaining the integrity and continued functioning of our freshwater ecosystems. The following is relevant for the Vhembe District Municipality:

- The Shigwedzi River which forms the southern boundary of the VDM is classified as a Class B river.
- The Sand River in the north is also a Class B river.
- The Limpopo and Mutale Rivers are classified as Class C Rivers.

There is no storm water drainage systems observed on site. Site drainage should be designed in such a way that water is channeled from roads into a suitable storm water drainage system to avoid structural distress over a period of time.

Absolutely no ponding of water should be permitted on the site expect on natural water bodies on site. All storm water from downpipes and gutters from buildings and structures shall discharge onto concrete-lined channels which, in turn, shall discharge the water at least 1.5 m away from structures onto areas permitting surface drainage away from buildings and structures. Joints between any open channel drains and buildings shall be suitably sealed.

11.2. Ground water

Groundwater may negatively affect structures founded on non-cohesive soil (sands and gravel). It has been shown that when non-cohesive soils become saturated, their stiffness, vertical stress and effective confining stress are reduced resulting in lower bearing pressures of the soil. Furthermore, a shallow/perched groundwater table normally presents a problem of rising damp on structures.

Therefore, appropriate remedial measures such as damp proofing needs to be incorporated in the construction of structures in areas where a shallow/ perched water table is anticipated. Various Pedogenic soils (ferricrete/silicrete and signs of ferruginisation/silification) may indicate fluctuating or seasonally perched water table commonly caused by retarded vertical infiltration and percolation rates.

Groundwater and groundwater seepage were not encountered in all 15 test pits excavated on the site. The site is mainly underlain by cohesive soil (Silty clay) with moderate drainage characteristics. Although groundwater was not encountered during the current site investigation, groundwater level is subject to seasonal fluctuation. Therefore,

measures such as damp proofing and subsurface drainage should be considered on site because of the non-cohesive nature of the material onsite.

12. GEOTECHNICAL EVALUATION

This report focuses on the geotechnical site investigation aimed at determining various geotechnical properties of the near surface soil horizons in accordance with SAICE Code of Practice, SANS guidelines and NHBRC guidelines and the GFSH-2 document. Table 4 gives the basis of the soil site classification that was applied during the investigation and Table 5 gives the geotechnical classification for urban development

Table 4: Residential site class designations

TYPICAL FOUNDING MATERIAL	CHARACTER OF FOUNDING MATERIAL	EXPECTED RANGE OF TOTAL SOIL MOVEMENTS (mm)	ASSUMED DIFFERENTIAL MOVEMENT (%OF TOTAL)	SITE CLASS
Rock (excluding mud rocks which may exhibit swelling to some depth)	STABLE	NEGLIGIBLE	-	R
Fine grained soils with moderate to very high plasticity (clays, silty clays, clayey silts and sandy clays)	EXPANSIVE SOILS	<7,5 7,5-15 15-30 >30	50% 50% 50% 50%	H H1 H2 H3
Silty sands, sands, sandy and gravelly soils	COMPRESSIBLE AND POTENTIALLY COLLAPSIBLE SOILS	<5,0 5,0-10 >10	75% 75% 75%	C C1 C2
Fine grained soils (clayey silts and clayey sands of low plasticity), sands, sandy and gravelly soils	COMPRESSIBLE SOIL	<10 10-20 >20	50% 50% 50%	S S1 S2

Contaminated soils, Controlled fill, Dolomitic areas, Landslip Land fill, Marshy areas Mine waste fill Mining subsidence Reclaimed areas Very soft silt/silty clays Uncontrolled fill	VARIABLE	VARIABLE		P

Table 5: Geotechnical Classification for Urban Development (GFSH-2 Document)

Geotechnical Sub-Area	Definition
1	Areas recommended or favorable for development
2	Areas where development can be considered with certain precautionary measures.
3	Areas that are not recommended for development

Other related engineering geological characteristics such as collapse settlement, compressibility, slope stability groundwater etc. were evaluated. The geotechnical properties relevant to the development are discussed below.

12.1. Expansive soils

Active/expansive soils are defined as fine grained soils (generally with high clay content) that change in volume in response to the change in moisture content. These soils may increase in volume (heave/swell) upon wetting and decrease in volume (shrink) upon drying out. These soils are classified as (H) according to the SAICE site classes. Depending on the severity of the predicted movement, expansive soils can be classified as H, H1, H2 or H3 (Table 4).

The site is predominately underlain by Silty sand> silt >with low to medium content of clay. Almost all laboratory results of all the samples analyzed exhibit a medium potential expansiveness. The site is therefore classified with the soil site class **H1** according to the SAICE site classification system.

12.2. Collapsible soils

Collapsible soils are defined as soils that have a potential for collapse and are commonly open textured with a high void ratio (Brink, 1985). These soils are typically silty sands, sands, sandy and gravelly soils commonly found in

colluvial and aeolian sands. Soils which exhibit potentially collapsible characteristics are classified with the soil site class 'C' according to the SAICE site classification system (Table 4).

The soils encountered on the site typically comprise of gravelly clay with no visual open-textured structures such as voids and pinholes which indicate collapse potential. Undisturbed soil samples could not be retrieved for collapse potential testing. From the site observations it is anticipated that the site will exhibit low collapse potential. Therefore, Class C is not applicable to the site under investigation according to the GFSH-2 classification.

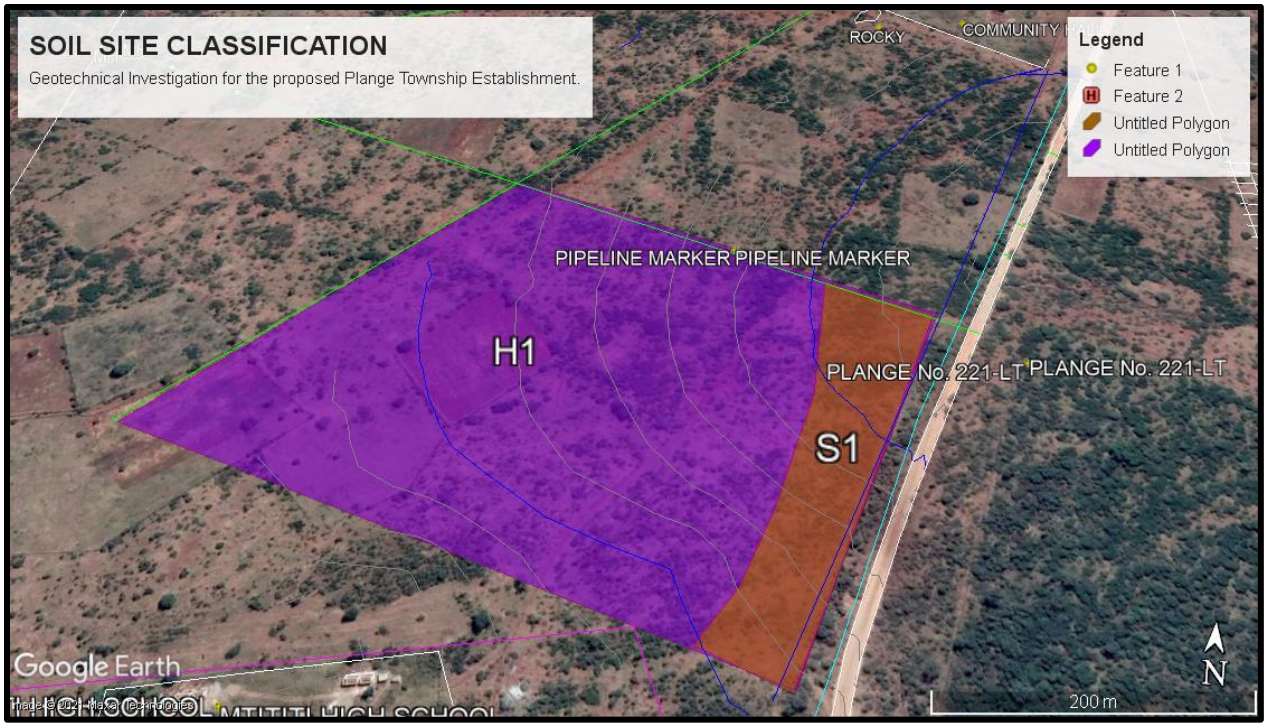
12.3. Compressible soils

Compressible soils are soils in which the bulk volume of the soil may gradually decrease with time when subjected to an applied load. These soils typically comprise fine grained soils such as clay, clayey sand and clayey silt with low plasticity, gravelly and sandy soil. According to the SAICE soil site class these soils are denoted as class 'S' and may very (S, S1, S2) depending on the severity of the bulk volume change (Table 4).

The site is generally underlain by soils with low – medium plasticity index. The laboratory results indicate that the samples have a low clay content and high sand content. The site is therefore classified with the soil site class **S1** according to the SAICE site classification system.

12.4. Soil site classification

A review of the test pit data indicates that the site is generally underlined by mafic & ultramafic bedrocks. The laboratory tests indicated that material underlying the site exhibits medium potential expansiveness. The development potential has been broadly classified in terms of a Geotechnical Sub-Area based on field observations/investigation (geological, hydrogeological, and geomorphological), and laboratory soil testing of soil samples. From the above discussion the site is classified into main soil area namely compressible and potential Expansive soils: According to AASHTO and COLTO the soil samples were classified as A-2-6(1) and G9 respectively. **The foundation design options as per SANS10400 H- NHBRC soil symbol is "S1/H1". The recommended Foundation types in accordance with** SANS 10400H- Reinforced Deep Strip Foundation/ Raft Foundation



12.5. Excavation Classification

The in-situ soils and slightly weathered granitic bedrock were excavated to an average depth of 1.5m below ground level.

Based on the test pits excavations, it is anticipated that site should classify as “soft excavation” to an average depth of 1m, in accordance with SANS 1200 DA classification using similar plant as employed during this investigation. This means it can easily be removed by a tractor loader backhoe (TLB) of flywheel power >0.10 kW per mm of tined bucket width.

Allowance should be made for “intermediate to hard excavation” where deeper excavations are required from a depth 1 m where there’s granitic bedrock.

12.6. Stability of excavations sidewalls

It was noted during trail pit excavations that the sidewalls retain its initial condition without crumbling. This is a good indication for the behavior of the materials; excavated ground must retain its stature vertically without unsupported.

For safety reasons, sidewalls of excavations deeper than 1.5 m should be battered back to 1:1 in dry conditions. Should oblique jointing or any seepage be noted, then the sidewalls may need to be battered at a much flatter gradient. This is only acceptable for excavation depths restricted to less than 3.0 m. All safety precautions should be adhered to. Should battering be deemed unpractical due to some site conditions, sidewalls should be supported by suitably designed shoring technique.

12.7. Construction material suitability

The aim of this geotechnical site investigation report was to determine the different engineering geological properties of the surface and subsurface soils in accordance with the GFSH–2 guidelines, NHBRC. The intention is to be able to recommend for the founding levels for the foundation design for the proposed township situated on the farm Plange 221 LT, Mtititi Village and Limpopo Province of South Africa. The soil was mainly composed of compressible soils and expansive soils; hence it was found to be of low plastic behavior. This soil was classified as G9 according to COLTO Classification. Furthermore, the materials are not ideal for construction but development can be considered with precautionary measures stated on this report.

12.8. Construction Monitoring

It is recommended that all foundations be inspected by a competent person prior to placing any concrete and regular checks on the quality and compaction of the backfill to the terraces should be made.

13. CONCLUSIONS

Taking all factors into account, it is considered that conditions prevailing at the site are generally adequate for the proposed development.

This report sets out the results of a Geotechnical Investigation carried out for the proposed township situated on the farm Plange 221 LT, Mtititi Village, and Limpopo Province of South Africa.

The excavation on site is likely to classify as “soft” to an average depth of 1m below existing ground level. Below this, “intermediate to hard” excavation is expected.

Foundation recommendations include ***reinforced deep strip foundations*** /***Raft foundation*** on the residual soils on an engineering soil mattress or a.

The site is considered suitable for the proposed development from a geotechnical perspective provided the recommendations given in this report are adhered to.

All rainwater should be channeled away from the structures (Adequate drainage should be implemented).

Earthworks and opening of foundations excavations should be carried out by a competent person.

14. RECOMMENDATIONS

14.1. Foundations

Based on site conditions and evaluation described in this report the following foundation types are provisionally recommended.

14.1.1. Foundations on residual soils

Residual soils were encountered at various, uneven depths ranging from 0.25 to 1.4m below the ground level.

Therefore, the recommended foundation type is a ***reinforced strip foundation founded on a G6/G7 engineered soil mattress***. Reinforcement should be designed by a competent person. The following construction procedures apply.

- All topsoil to be stripped to spoil;
- Foundation trenches for 500mm wide strip footing to be over-excavated to 1.0m wide by 1.5m deep below existing ground level;
- Excavation to be backfill with G6 quality material to a depth of 0.6m existing ground level;
- G6 material to be compacted in 150mm thick layers to 93% Mod AASHTO density at –1% to +2% OMC;
- Strip footings 500mm wide and adequately reinforced should be constructed at a depth of 0.6m;
- The allowable bearing capacity should be limited to 150kPa on the engineered soil mattress;
- Articulation joints at some internal doors and all external doors;
- Light reinforcement in masonry;
- Good site drainage requirements.

14.1.2. Raft Foundation

Excavate the in-situ material down to 0.9 m – To spoil and stockpile [Excavated sand may be mixed with coarse materials (sand/concrete) and utilized for construction and foundation lining

- Bottom of excavation to be approved by a Geotechnical Engineer
- Import more competent material (G5/G7) and compact into layers of not more than 750 mm thickness,
- The foundation bed is then compacted by ramming
- Lay reinforcement on spacers over the foundation bed
- The foundation may stiffen by ribs or beams built in during construction which will add extra strength and rigidity

15. REFERENCES

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16. REPORT SIGNATURE

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Compiled by: Neduvhuledza Nduvho (Cand.Nat.Sci) SACNASP

_____

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APPENDIX A: SITE PHOTOS

APPENDIX B: LABORATORY TEST RESULTS

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sanas Testing Laboratory T0062

Civilab

Civil Engineering Testing Laboratories

Client	:	MANG GEOENVIRO SERVICE (PTY) LTD			
Address	:	UNIT 2, BLOCK 9	**Client Reference**	:	
	:	BOARDWALK OFFICE PARK	**Order No.**	:	Mavhetha
	:	6 EROS ROAD			
Attention	:		**Date Received**	:	22/06/2021
Facsimile	:		**Date Tested**	:	22/06/2021-06/072021
E-mail	:	fnmathebula@gmail.com; mahlogonolomago	**Date Reported**	:	08/07/2021
Project	:	Plange Township Establishment			
Project No.	:	2021-B-825	**Report Status**	:	Final
			Page	:	1 of 12

Herewith please find the test report(s) pertaining to the above project. All tests were conducted in accordance with prescribed test method(s). Information herein consists of the following:

Test(s) conducted / Item(s) measured	Qty.	Test Method(s)	Authorized By**	Page(s)
Moisture Density Relationship	3.000	SANS 3001 GR30	J Marques/B Mvubu/S Pullen	7-9
Atterberg Limits <0.425mm	9.000	SANS 3001 GR10	S Pullen/B Mvubu/J Marques	2-12, 10-11
Sieve Analysis 0.075mm	9.000	SANS 3001 GR1	J Marques/B Mvubu	2-12, 10-11
California Bearing Ratio (CBR)	3.000	SANS 3001 GR40	J Marques	10-11
Hydrometer Analysis	9.000	SANS 3001 GR3	J Marques/B Mvubu	2-12

Any test results contained in this report and marked with * in the table above are "not SANAS accredited" and are not included in the schedule of accreditation for this laboratory.

Any information contained in this test report pertain only to the areas and/or samples tested. Documents may only be reproduced or published in their full context.

While every care is taken to ensure that all tests are carried out in accordance with recognised standards, neither Civilab (Proprietary) Limited nor its employess shall be liable in any way whatsoever for any error made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequences thereof.

All interpretations, Interpolations, Opinions and/or Classifications contained in this report falls outside our scope of accreditation.

The following parameters, where applicable, were excluded from the classification procedure: Chemical modifications, Additional fines, Fractured Faces, Soluble Salts, pH, Conductivity, Coarse Sand Ratio, Durability (COLTO: G4-G9).

The following parameters, where applicable, were assumed: Rock types were assumed to be of an Arenaceous nature with Siliceous cementing material.

Unless otherwise requested or stated, all samples will be discarded after a period of 3 months.

Deviations in Test Methods:

Technical Signatory:	B Mvubu
Signature:	

**All results are authorized electronically by approved managers and/or technical signatories.

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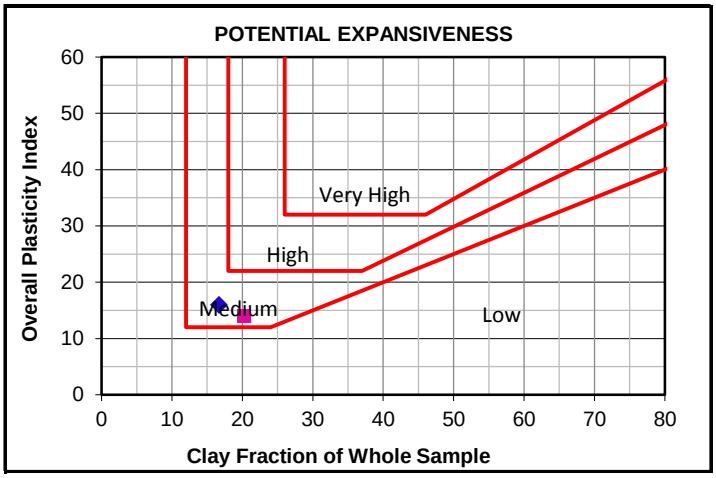
Client	:	MANG GEOENVIRO SERVICE (PTY) LTD	Date Received:	22/06/2021
Project	:	Plange Township Establishment	Date Reported:	08/07/2021
Project No	:	2021-B-825	Page No. :	2 of 12

FOUNDATION INDICATOR

Laboratory Number		S-3276 ◆	S-3277 ■
Field Number		TP1	TP2
Client Reference			
Depth (m)		0.3-0.9	0.3-1.0
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

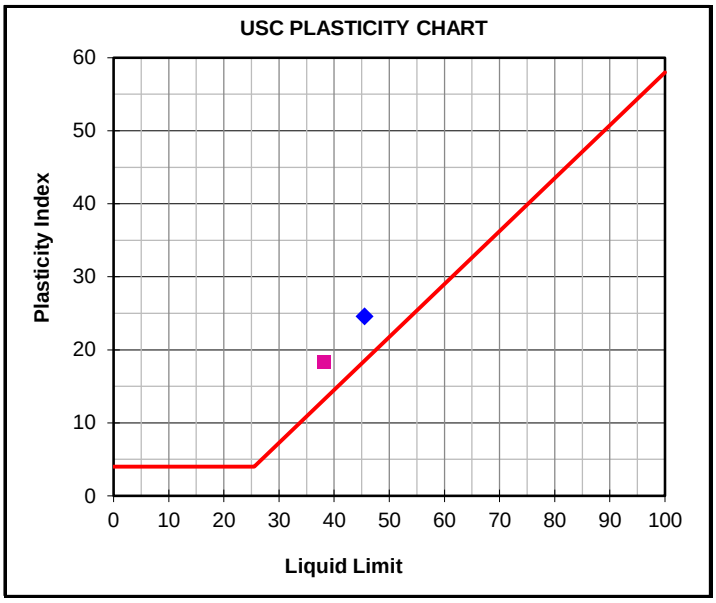


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	99	99
	5 mm	99	93
	2 mm	78	89
	1 mm	74	85
	0.425 mm	66	78
	0.250 mm	63	73
	0.150 mm	57	66
	0.075 mm	51	55
Grading Modulus		1.06	0.79



Hydrometer Analysis

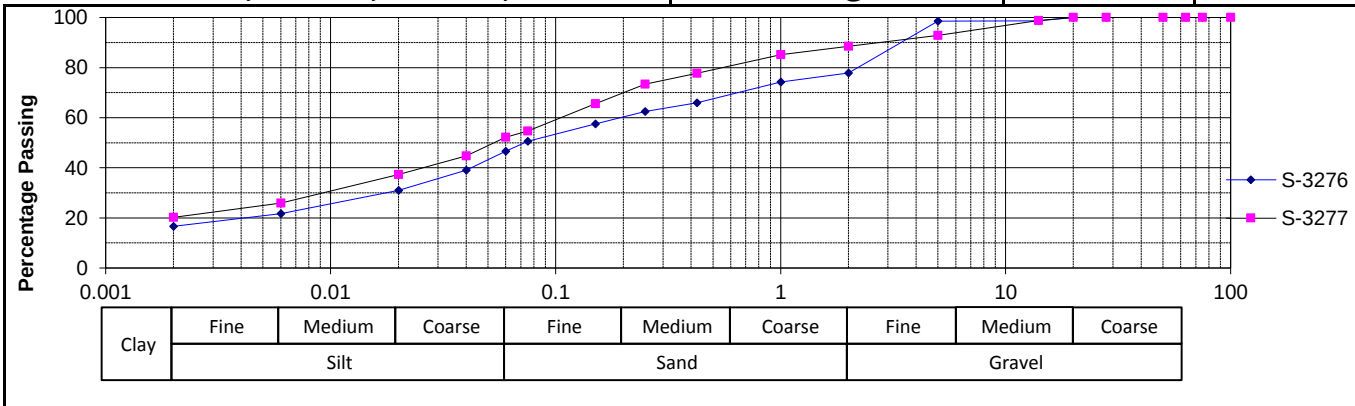
Percentage Passing	0.060 mm	47	52
	0.040 mm	39	45
	0.020 mm	31	37
	0.006 mm	22	26
	0.002 mm	17	20
Gravel	%	22	11
Sand	%	31	36
Silt	%	30	32
Clay	%	17	20

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		S-3276 ◆	S-3277 ■
Atterberg Limits -425µ			
Liquid Limit	%	45	38
Plasticity Index	%	25	18
Linear Shrinkage	%	11.0	9.0
Overall PI	%	16	14

Classifications

HRB (AASHTO)	A-7-6(9)	A-6(7)
Unified (ASTM D2487)	CL	CL
Weston Swell @ 1 kPa		



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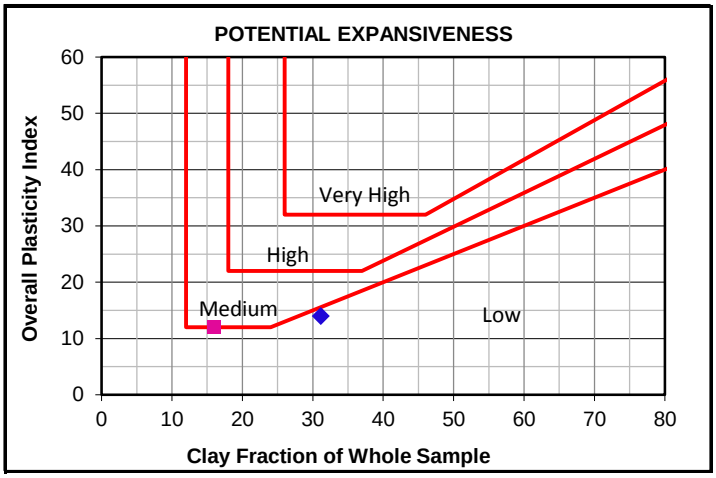
Client	:	MANG GEOENVIRO SERVICE (PTY) LTD	Date Received:	22/06/2021
Project	:	Plange Township Establishment	Date Reported:	08/07/2021
Project No	:	2021-B-825	Page No. :	3 of 12

FOUNDATION INDICATOR

Laboratory Number		S-3278 ◆	S-3279 ■
Field Number		TP3	TP4
Client Reference			
Depth (m)		0.27-0.85	0.4-1.2
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

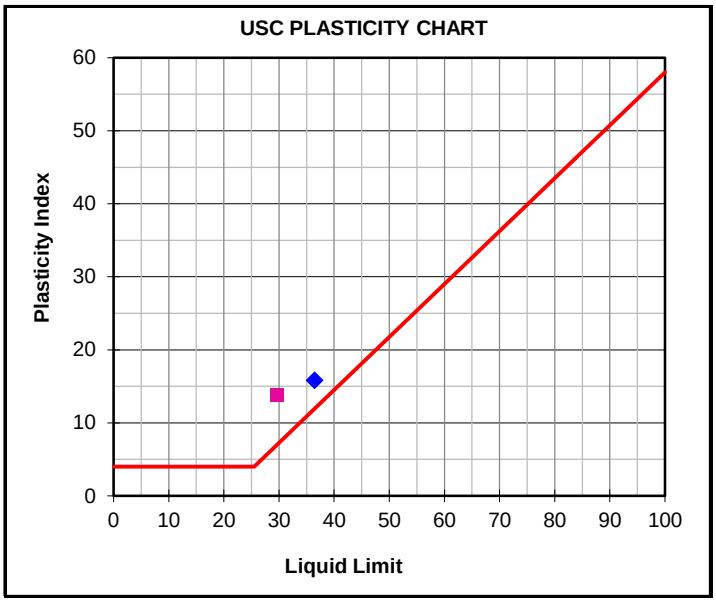


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	99	100
	5 mm	99	99
	2 mm	97	98
	1 mm	94	95
	0.425 mm	86	88
	0.250 mm	83	84
	0.150 mm	78	76
	0.075 mm	70	64
Grading Modulus		0.47	0.50



Hydrometer Analysis

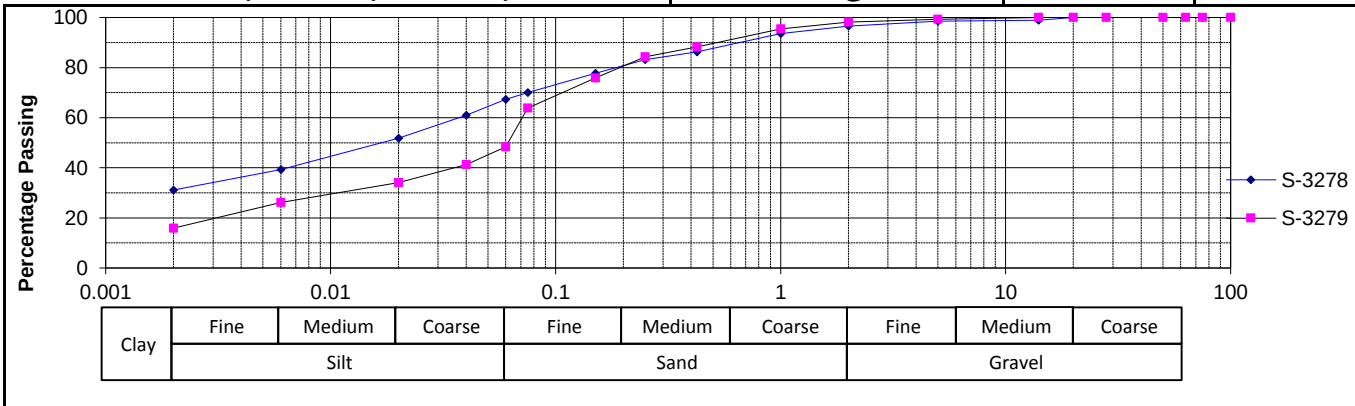
Percentage Passing	0.060 mm	67	48
	0.040 mm	61	41
	0.020 mm	52	34
	0.006 mm	39	26
	0.002 mm	31	16
Gravel	%	3	2
Sand	%	29	50
Silt	%	36	32
Clay	%	31	16

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		S-3278 ◆	S-3279 ■
Atterberg Limits -425µ			
Liquid Limit	%	36	30
Plasticity Index	%	16	14
Linear Shrinkage	%	6.5	6.0
Overall PI	%	14	12

Classifications

HRB (AASHTO)	A-6(10)	A-6(6)
Unified (ASTM D2487)	CL	CL
Weston Swell @ 1 kPa		



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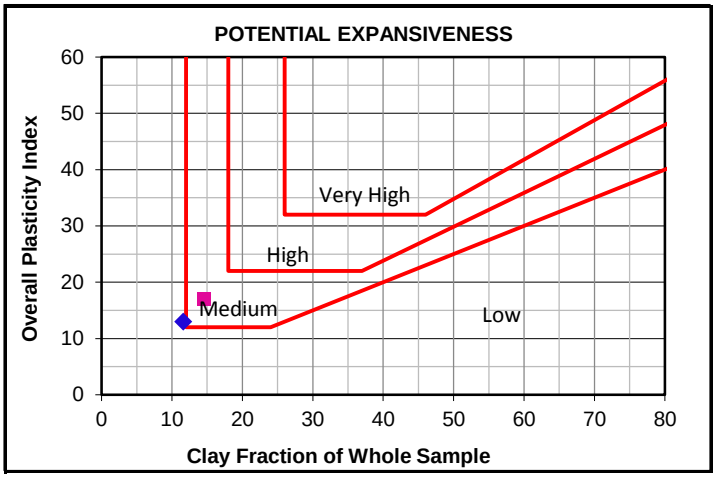
Client	:	MANG GEOENVIRO SERVICE (PTY) LTD	Date Received:	22/06/2021
Project	:	Plange Township Establishment	Date Reported:	08/07/2021
Project No	:	2021-B-825	Page No. :	4 of 12

FOUNDATION INDICATOR

Laboratory Number		S-3280 ◆	S-3281 ■
Field Number		TP5	TP6
Client Reference			
Depth (m)		0.25-0.9	0.3-1.4
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

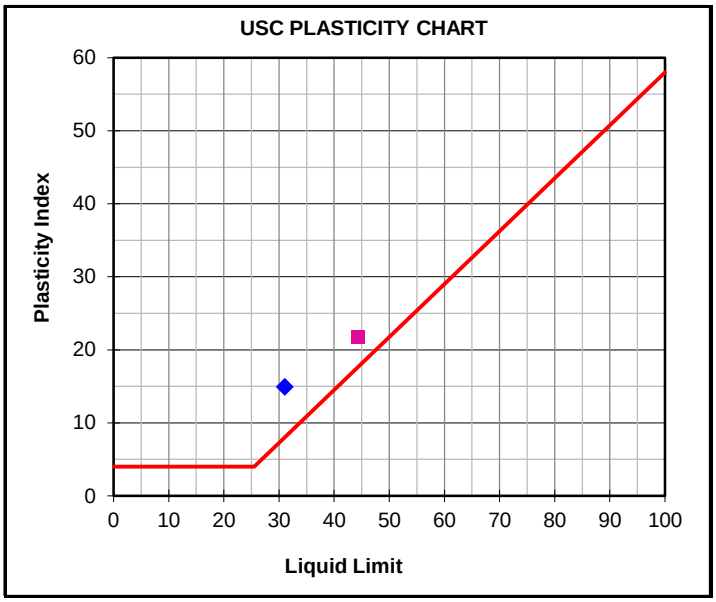


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		2.654

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	99
	2 mm	99	97
	1 mm	97	92
	0.425 mm	90	77
	0.250 mm	86	74
	0.150 mm	79	69
	0.075 mm	67	63
Grading Modulus		0.44	0.63



Hydrometer Analysis

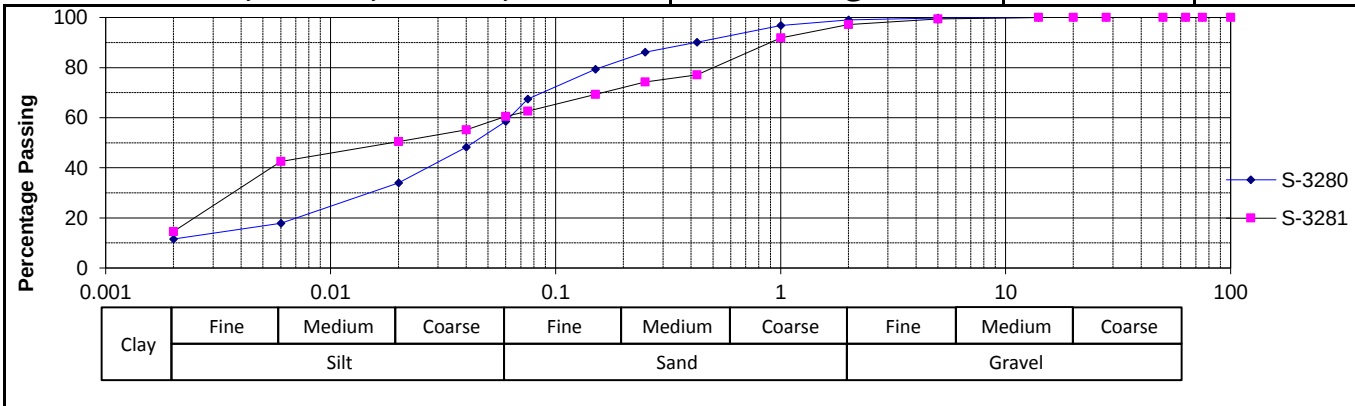
Percentage Passing	0.060 mm	58	60
	0.040 mm	48	55
	0.020 mm	34	50
	0.006 mm	18	42
	0.002 mm	12	15
Gravel	%	1	3
Sand	%	41	37
Silt	%	47	46
Clay	%	12	15

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		S-3280 ◆	S-3281 ■
Atterberg Limits -425µ			
Liquid Limit	%	31	44
Plasticity Index	%	15	22
Linear Shrinkage	%	7.0	11.0
Overall PI	%	13	17

Classifications

HRB (AASHTO)	A-6(8)	A-7-6(12)
Unified (ASTM D2487)	CL	CL
Weston Swell @ 1 kPa		



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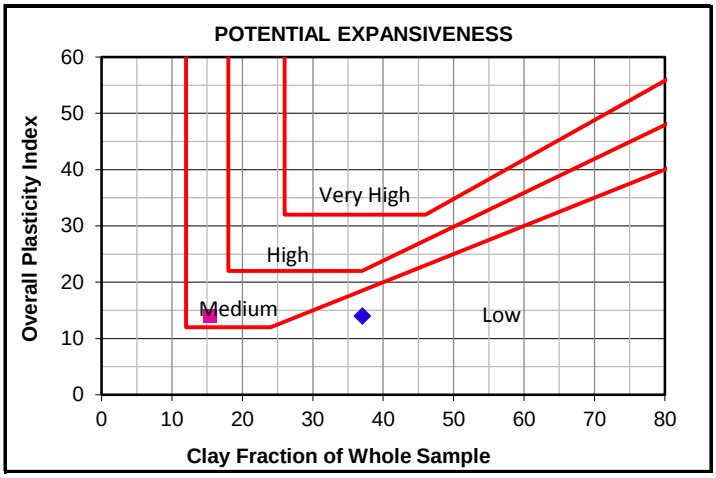
Project No	:	2021-B-825	Page No. :	5 of 12

FOUNDATION INDICATOR

Laboratory Number		S-3282 ◆	S-3283 ■
Field Number		TP7	TP8
Client Reference			
Depth (m)		0.37-1.0	0.33-0.93
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

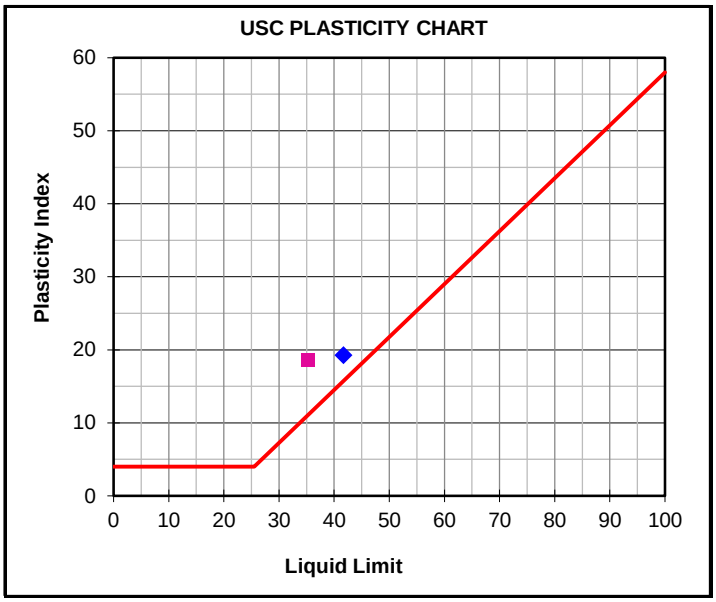


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)	2.758	2.586

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	99	100
	5 mm	98	99
	2 mm	97	94
	1 mm	91	87
	0.425 mm	75	77
	0.250 mm	73	73
	0.150 mm	69	66
	0.075 mm	63	57
Grading Modulus		0.65	0.72



Hydrometer Analysis

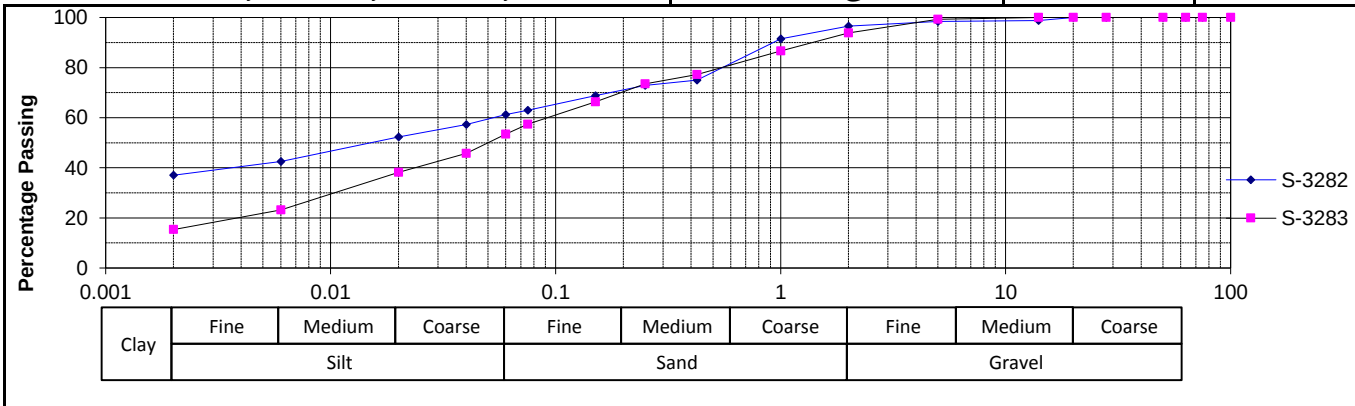
Percentage Passing	0.060 mm	61	53
	0.040 mm	57	46
	0.020 mm	52	38
	0.006 mm	43	23
	0.002 mm	37	15
Gravel	%	3	6
Sand	%	35	40
Silt	%	24	38
Clay	%	37	15

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

Laboratory Number		S-3282 ◆	S-3283 ■
Atterberg Limits -425µ			
Liquid Limit	%	42	35
Plasticity Index	%	19	19
Linear Shrinkage	%	9.0	7.5
Overall PI	%	14	14

Classifications

HRB (AASHTO)	A-7-6(10)	A-6(8)
Unified (ASTM D2487)	CL	CL
Weston Swell @ 1 kPa		



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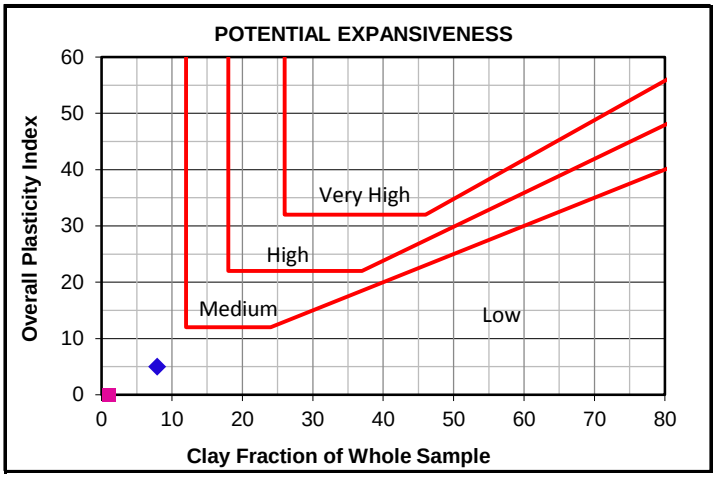
Project	:	Plange Township Establishment	Date Reported:	08/07/2021
Project No	:	2021-B-825	Page No. :	6 of 12

FOUNDATION INDICATOR

Laboratory Number		S-3284 ◆	■
Field Number		TP10	
Client Reference			
Depth (m)		0.27-0.8	
Position			
Coordinates	X		
	Y		
Description			
Aditional Information			
Calcrete / Crushed			
Stabilizing Agent			

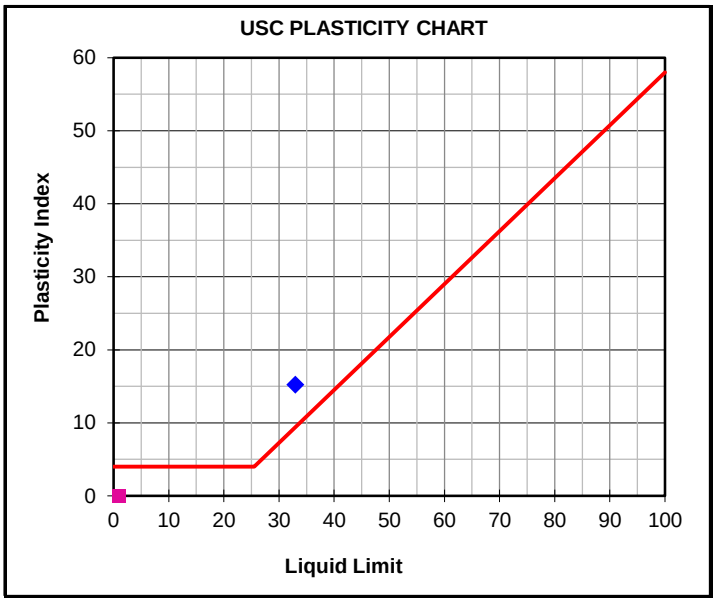


Moisture Content & Relative Density

Moisture Content (%)		
Relative Density (S.G.)		

Sieve Analysis (Wet Prep)

Percentage Passing	100 mm	100	
	75 mm	100	
	63 mm	100	
	50 mm	95	
	37.5 mm	87	
	28 mm	80	
	20 mm	68	
	14 mm	57	
	5 mm	45	
	2 mm	40	
	1 mm	37	
	0.425 mm	34	
	0.250 mm	33	
	0.150 mm	30	
	0.075 mm	26	
Grading Modulus		2.00	



Hydrometer Analysis

Percentage Passing	0.060 mm	24	
	0.040 mm	19	
	0.020 mm	16	
	0.006 mm	11	
	0.002 mm	8	
Gravel	%	60	
Sand	%	16	
Silt	%	16	
Clay	%	8	

Note: An assumed S.G. may be used in Hydrometer Analysis calculations

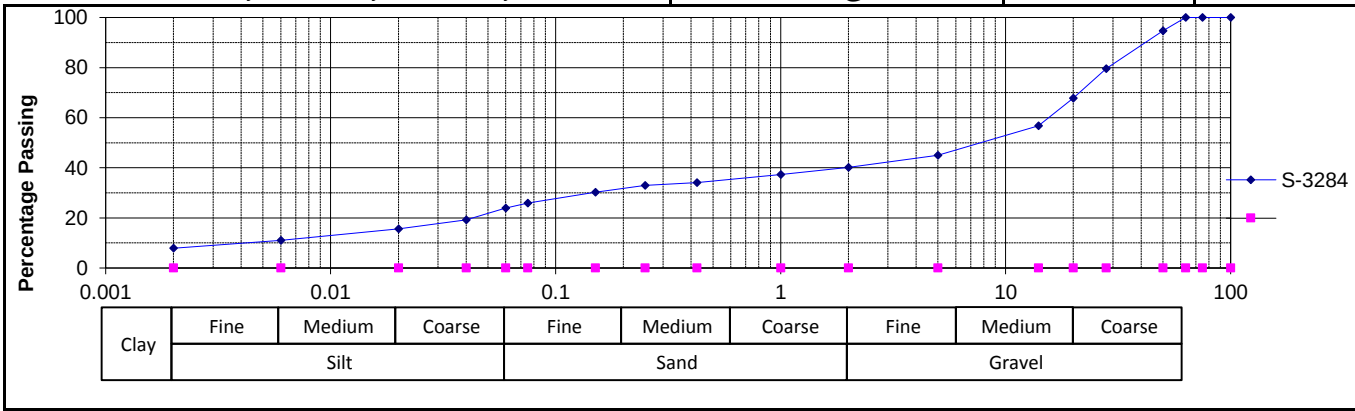
Laboratory Number		S-3284 ◆	■

Atterberg Limits -425µ

Liquid Limit	%	33	
Plasticity Index	%	15	
Linear Shrinkage	%	6.5	
Overall PI	%	5	

Classifications

HRB (AASHTO)	A-2-6(1)	
Unified (ASTM D2487)	GC	
Weston Swell @ 1 kPa		



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Project	: Plange Township Establishment	Date Reported:	08/07/2021
Project No:	2021-B-825	Page No. :	7 of 12

MOISTURE DENSITY RELATIONSHIP

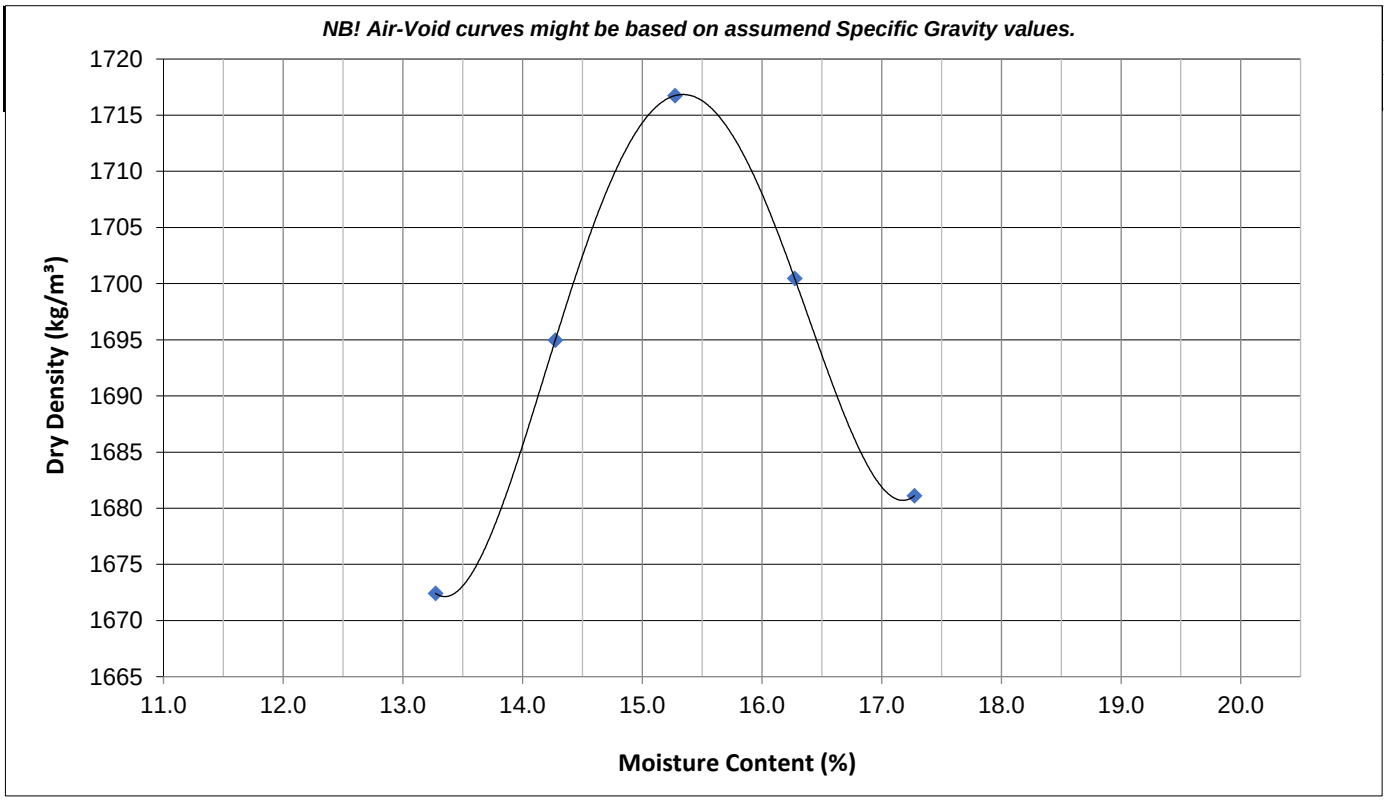
Laboratory Number		S-3281
Field Number		TP6
Client Reference		
Depth (m)		0.3-1.4
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
% of Sample Scalped		0% scalped on 37.5mm
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO

Dry Density	kg/m³	1700	1717	1695	1672	1681	
Moisture Content	%	16.3	15.3	14.3	13.3	17.3	

Max. Dry Density	kg/m³	1717
Optimum Moisture	%	15.4



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Project No:	2021-B-825	Page No. :	8 of 12

MOISTURE DENSITY RELATIONSHIP

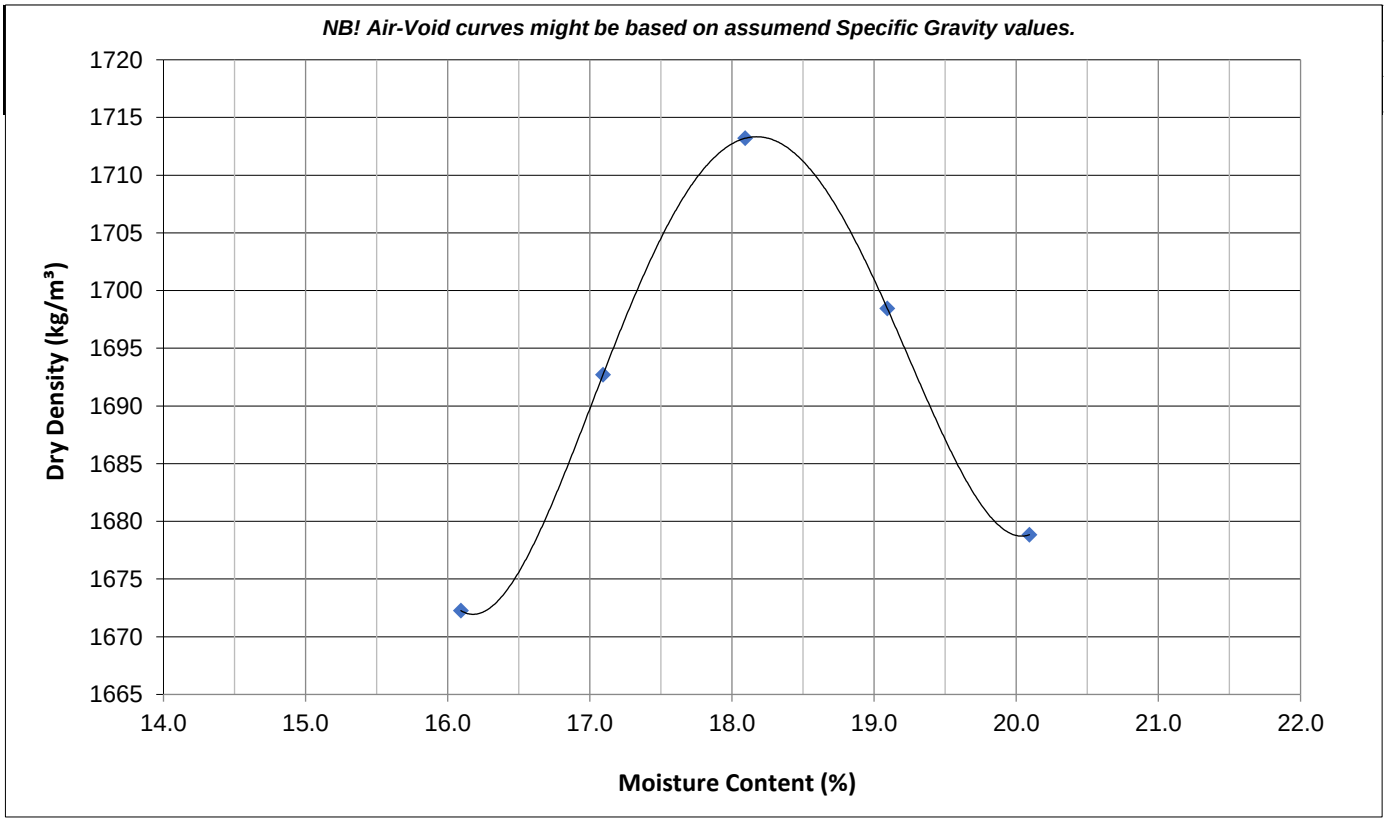
Laboratory Number		S-3282
Field Number		TP7
Client Reference		
Depth (m)		0.37-C1181.0
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
% of Sample Scalped		0% scalped on 37.5mm
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO

Dry Density	kg/m³	1679	1698	1713	1693	1672	
Moisture Content	%	20.1	19.1	18.1	17.1	16.1	

Max. Dry Density	kg/m³	1713
Optimum Moisture	%	18.2



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Project No:	2021-B-825	Page No. :	9 of 12

MOISTURE DENSITY RELATIONSHIP

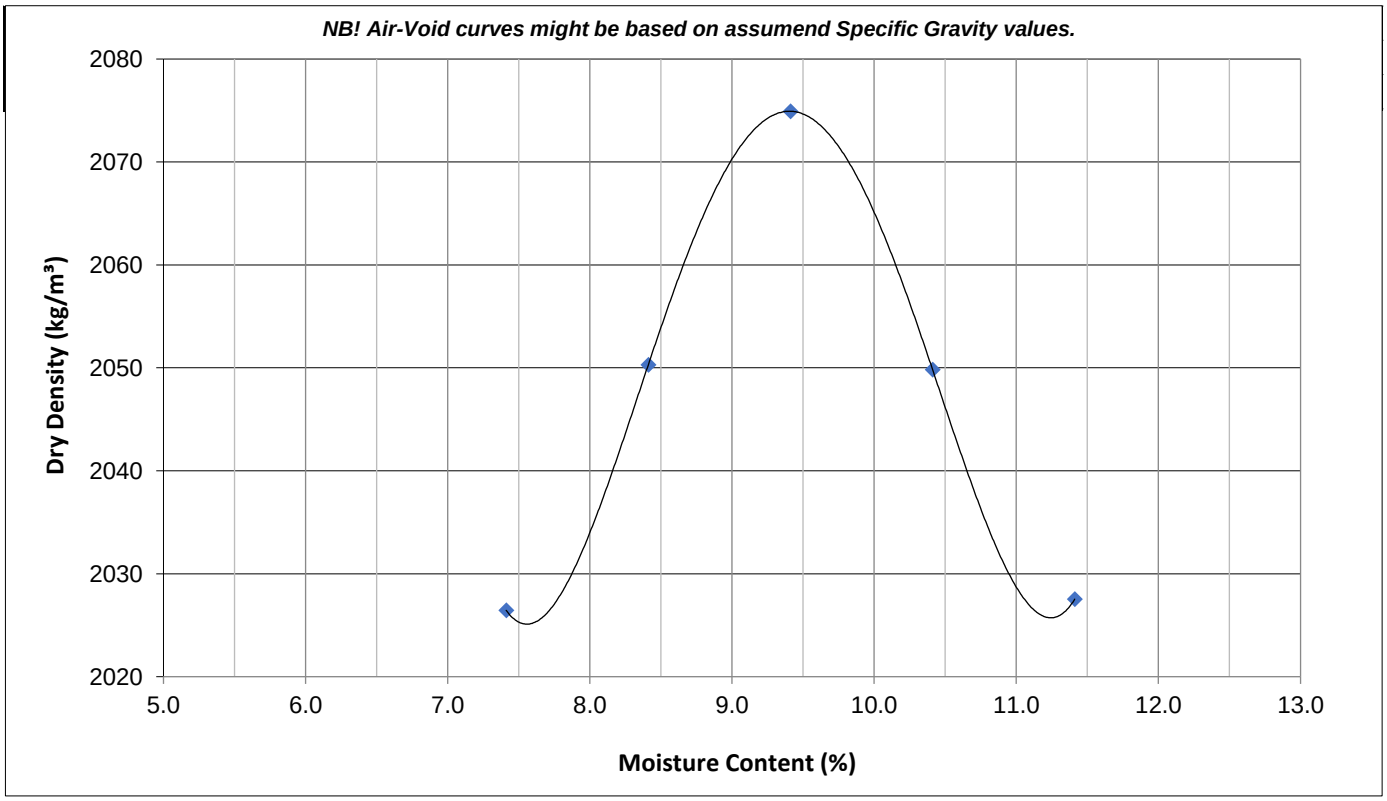
Laboratory Number		S-3284
Field Number		TP10
Client Reference		0.27-0.8
Depth (m)		
Position		
Coordinates	X	
	Y	
Description		
Additional Information		
% of Sample Scalped		
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001 GR30

Compactive Effort:	Modified AASHTO

Dry Density	kg/m³	2075	2050	2050	2028	2026	
Moisture Content	%	9.4	10.4	8.4	11.4	7.4	

Max. Dry Density	kg/m³	2075
Optimum Moisture	%	9.4



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Project	:	Plange Township Establishment	Date Reported	:	08/07/2021
Project No.	:	2021-B-825	Page No.	:	10 of 12

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		S-3281 ◆	S-3282 ■
Field Number		TP7	TP8
Client Reference			
Depth (m)		0.37-1.0	0.33-0.93
Position			
Coordinates	X		
	Y		
Description			
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	53 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	99
	5 mm	99	98
	2 mm	97	97
	1 mm	92	91
	0.425 mm	77	75
	0.250 mm	74	73
	0.150 mm	69	69
	0.075 mm	63	63
Grading Modulus		0.63	0.65

Soil Mortar Analysis

Coarse Sand	21	22
Coarse Fine Sand	3	2
Medium Fine Sand	5	4
Fine Fine Sand	7	6
Silt and Clay	64	65

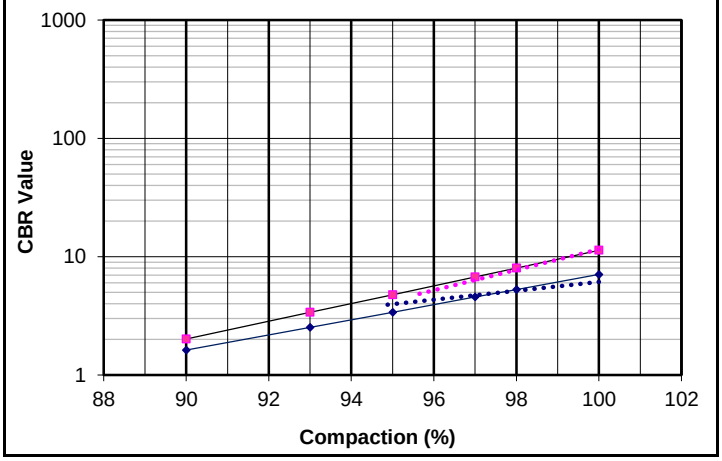
Atterberg Limits

Liquid Limit (%)	44	42
Plasticity Index (%)	22	19
Linear Shrinkage (%)	11.0	9.0

Laboratory No.		S-3281 ◆	S-3282 ■
Maximum Dry Density & Optimum Moisture Content			
MDD	kg/m^3	1717	1713
OMC	%	15.4	18.2

California Bearing Ratio

Compaction Data							
Moisture	%	15.4			18.3		
Dry Density	kg/m^3	1732	1644	1557	1724	1646	1555
Compaction	%	100.0	94.9	89.8	100.0	95.5	90.2
Penetration Data							
CBR at	2.54 mm	6	4	2	12	5	2
	5.08 mm	6	5	2	11	5	2
	7.62 mm	6	5	2	11	5	2
Swell	%	2.1	2.4	2.7	0.7	0.9	1.6
Final Moisture (%)		24.9	25.47	27.75	22.02	26.94	27.94

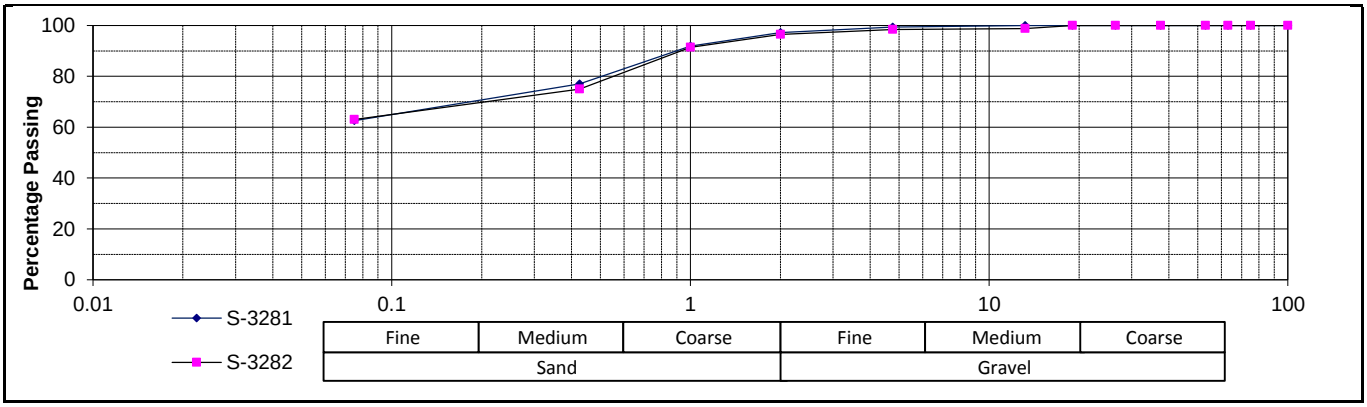


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	7	11
	@ 98%		5	8
	@ 97%		5	7
	@ 95%		3	5
	@ 93%		3	3
	@ 90%		2	2
	@ SANS3001 Midpoint		5	7

Classifications

HRB (AASHTO)	A-7-6(12)	A-7-6(10)
COLTO		
TRH14		



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Project No.	:	2021-B-825	Page No.	:	11 of 12

CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		S-3284 ◆	■
Field Number		TP10	
Client Reference			
Depth (m)		0.27-0.8	
Position			
Coordinates	X		
	Y		
Description			
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation)

Percentage Passing	100 mm	100	
	75 mm	100	
	63 mm	100	
	53 mm	95	
	37.5 mm	87	
	28 mm	80	
	20 mm	68	
	14 mm	57	
	5 mm	45	
	2 mm	40	
	1 mm	37	
	0.425 mm	34	
	0.250 mm	33	
	0.150 mm	30	
	0.075 mm	26	
Grading Modulus		2.00	

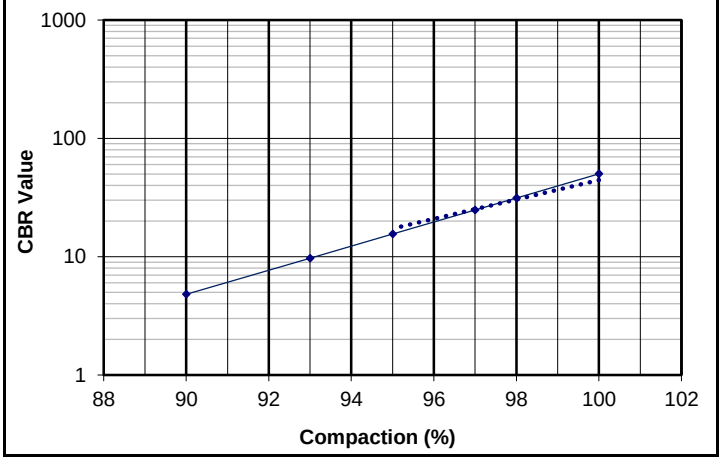
Soil Mortar Analysis

Coarse Sand	15	
Coarse Fine Sand	3	
Medium Fine Sand	7	
Fine Fine Sand	11	
Silt and Clay	64	

Atterberg Limits

Liquid Limit (%)	33	
Plasticity Index (%)	15	
Linear Shrinkage (%)	6.5	

Laboratory No.			S-3284 ◆				■	
Maximum Dry Density & Optimum Moisture Content								
MDD	kg/m^3		2075					
OMC	%		9.4					
California Bearing Ratio								
Compaction Data								
Moisture	%		9.4					
Dry Density	kg/m^3		2099	1996	1893			
Compaction	%		100.0	95.1	90.2			
Penetration Data								
CBR at		2.54 mm	44	18	5			
		5.08 mm	60	16	5			
		7.62 mm	60	14	5			
Swell	%		0.2	0.5	0.7		0.0	0.0
Final Moisture (%)			14.8	16.5	18.19			

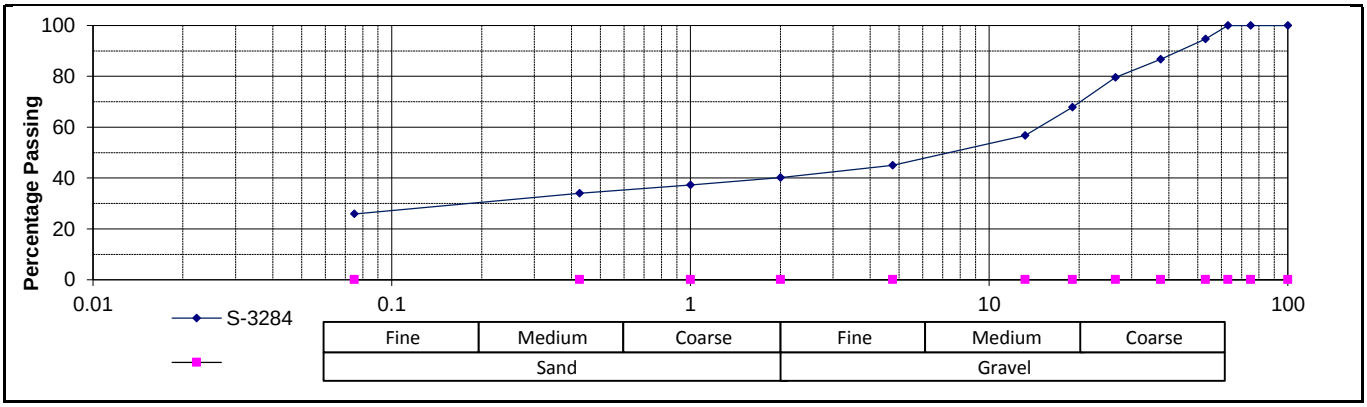


Interpolated CBR Data

CBR Mod. AASHTO	@ 100%		50	
	@ 98%		31	
	@ 97%		25	
	@ 95%		16	
	@ 93%		10	
	@ 90%		5	
	@	SANS3001 Midpoint	28	

Classifications

HRB (AASHTO)	A-2-6(1)	
COLTO	G9	
TRH14	G10	



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Client : MANG GEOENVIRO SERVICE (PTY) LTD
Project : Plange Township Establishment
Project No: 2021-B-825

Date Received : 22/06/2021
Date Reported : 08/07/2021

pH, CONDUCTIVITY, RESISTIVITY and ORGANIC IMPURITIES

Lab No	Field No	Depth (m)		Coordinates	Description / Additional Information	pH	Electrical Conductivity (S/m)	Electrical Resistivity (Ω/m) *	Organic Impurities
S-3284	TP10	0.27-0.8	X:			5.8	0.031	32.258	
			Y:						
			X:						
			Y:						
			X:						
			Y:						
			X:						
			Y:						
			X:						
			Y:						
			X:						
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			Y:						
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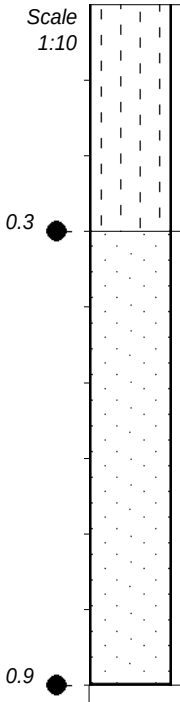
Note : * Electrical resistivity is calculated from the elecrical conductivity

APPENDIX C: SOIL PROFILES

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 01
Sheet: 1 of 1

JOB NUMBER: 000



0.00 Dry, reddish brown, stiff, intact, Silty Clay. **TOPSOIL.**

0.30 Slightly moist, reddish, intact, firm to stiff, Sandy silty clay. **RESIDUAL SOILS.**

0.90

NOTES

1) Roots inclusion from a depth of 0.0 - 0.28m
2) Stable side walls
3) No water seepage encountered
4) No refusal encountered at 0.9m
5) Disturbed sample taken at 0.3 - 0.9 m
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 483m
X-COORD : 30°53'27.79"E
Y-COORD : 23°6'25.49"S

HOLE No: TP 01

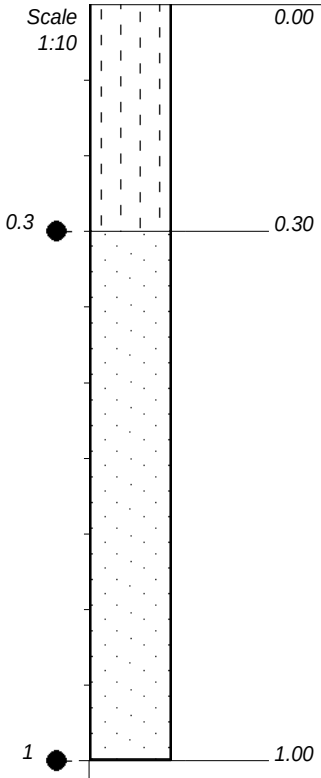
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 02
SHEET: 1

JOB NUMBER: 000



Dry to slightly moist, reddish brown, stiff, intact, Silty Clay. **TOPSOIL.**

Slightly moist, reddish, intact, firm to stiff, Sandy clay. **RESIDUAL SOILS.**

NOTES

1) Roots inclusion from a depth of 0.0 - 0.35m
2) Stable side walls
3) No water seepage encountered
4) No refusal encountered at 1 m
5) Disturbed sample taken at 0.3 - 1 m
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 483m
X-COORD : 30°53'23.20"E
Y-COORD : 23°6'25.22"S

HOLE No: TP 02

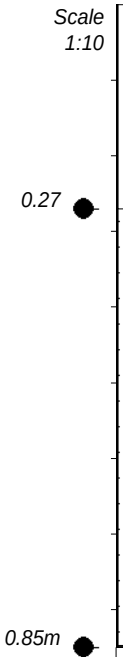
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 03
Sheet: 1 of 1

JOB NUMBER: 000



0.00 Dry, dark brown, stiff to very stiff, intact, Silty Clay. **TOPSOIL.**

0.27 Slightly moist, reddish brown, intact, Stiff, Sandy silty clay. **RESIDUAL SOILS.**

0.85

NOTES

1) Roots inclusion from a depth of 0.0 - 0.35m
2) Stable side walls
3) No water seepage encountered
4) No refusal encountered at 0.85m
5) Disturbed sample taken 0.27 - 0.85m
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 485m
X-COORD : 30°53'19.08"E
Y-COORD : 23°6'22.95"S

HOLE No: TP 03

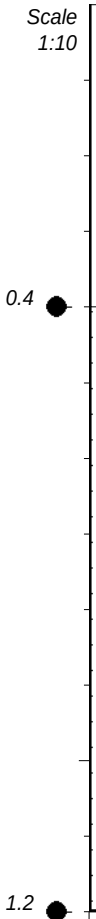
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 04
SHEET 1 of 1

JOB NUMBER: 000



0.00 Dry, reddish brown, stiff, intact, Silty Clay. **TOPSOIL.**

0.40 Slightly moist, reddish, intact, firm to stiff, Sand silty clay. **RESIDUAL SOILS.**

1.20

NOTES

1) Roots inclusion from a depth of 0.0 - 0.5m
2) Stable side walls
3) No water seepage encountered
4) No refusal encountered at 1.2 m
5) Disturbed sample taken at 0.4 - 1.2 m
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 486m
X-COORD : 30°53'16.26"E
Y-COORD : 23°6'24.18"S

HOLE No: TP 04

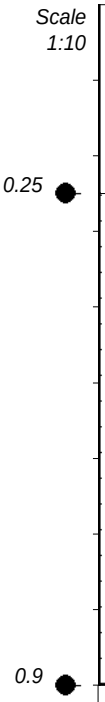
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 05
SHEET 1 of 1

JOB NUMBER: 000



Dry, reddish brown, dense to very dense, intact, Silt. **TOPSOIL.**

Slightly moist, reddish brown, intact, medium dense, Sandy silt. **RESIDUAL SOILS.**

NOTES

1) Roots inclusion from a depth of 0 - 0.34m
2) Stable side walls
3) No water seepage encountered
4) No Refusal encountered at 0.9 m
5) Disturbed sample taken 0.25 - 0.9 m
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 485m
X-COORD : 30°53'18.76"E
Y-COORD : 23°6'26.61"S

HOLE No: TP 05

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

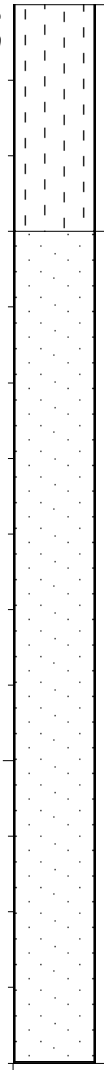
DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 06
SHEET : 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry to slightly moist, reddish brown, firm to stiff, intact, Silty Clay. **TOPSOIL.**

0.3 *0.30* Slightly moist, reddish, intact, Medium dense, Sandy silt. **RESIDUAL SOILS.**

1.4 *1.40*

NOTES

1) Roots inclusion from a depth of 0 - 0.4m
2) Stable side walls
3) No water seepage encountered
4) No Refusal encountered at 1.4 m
5) Disturbed sample taken 0.3 - 1.4 m
6) No Undisturbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 483m
X-COORD : 30°53'22.37"E
Y-COORD : 23°6'28.09"S

HOLE No: TP 06

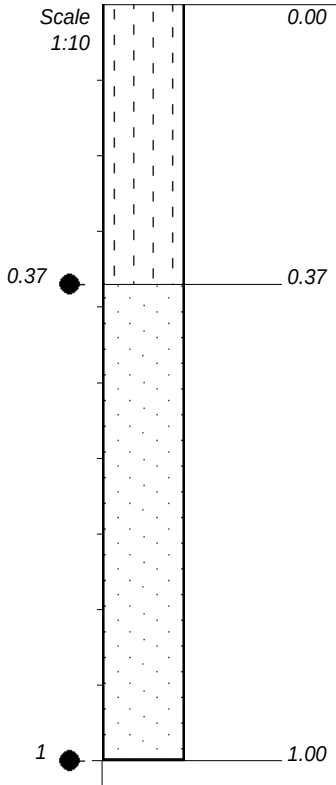
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 07
Sheet: 1 of 1

JOB NUMBER: 000



Dry, reddish brown, stiff, intact, Silty Clay. **TOPSOIL.**

Slightly moist, reddish, intact, firm to stiff, Sandy silty clay. **RESIDUAL SOILS.**

NOTES

1) Roots inclusion from a depth of 0 - 0.4m
2) Stable side walls
3) No water seepage encountered
4) No Refusal encountered at 1 m
5) Disturbed sample taken at 0.37 - 1 m
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 483m
X-COORD : 30°53'26.10"E
Y-COORD : 23°6'29.23"S

HOLE No: TP 07

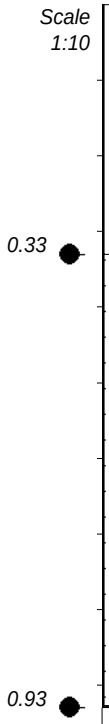
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 08
Sheet: 1

JOB NUMBER: 000



Dry, reddish brown, Dense, intact, Silty Clay. **TOPSOIL.**

Slightly moist, reddish, intact, Medium dense to dense, Sand silty. **RESIDUAL SOILS.**

NOTES

1) Roots inclusion from a depth of 0.0 - 0.5m
2) Stable side walls
3) No water seepage encountered
4) No refusal encountered at 0.93m
5) Disturbed sample taken at 0.33 - 0.93 m
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 484m
X-COORD : 30°53'23.69"E
Y-COORD : 23°6'31.14"S

HOLE No: TP 08

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

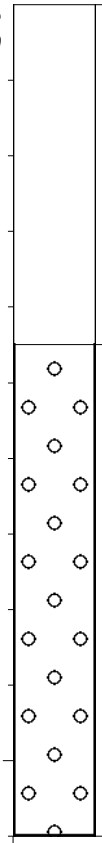
DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 09
Sheet: 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry, reddish brown mottled light brown, medium dense, Matrix supported, Gavelly sandy clay. **TOPSOIL.**

0.45 Slightly moist, reddish, Matrix supported, Medium dense to dense, Gravelly clay. **RESIDUAL SOILS.**

1.10

NOTES

1) Roots inclusion from a depth of 0.0 - 0.35m
2) Stable side walls
3) No water seepage encountered
4) No refusal encountered at 1.1 m
5) No Disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 486m
X-COORD : 30°53'17.93"E
Y-COORD : 23°6'29.41"S

HOLE No: TP 09

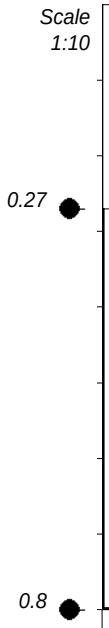
TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 10
Sheet: 1 of 1

JOB NUMBER: 000



0.00 Dry, reddish brown mottled light brown, medium dense, Matrix supported, Gavelly sandy clay. **TOPSOIL.**

0.27 Slightly moist, reddish, Matrix supported, Medium dense to dense, Gravelly Sand. **RESIDUAL SOILS.**

0.80

NOTES

1) Roots inclusion from a depth of 0.0 - 0.28m
2) Stable side walls
3) No water seepage encountered
4) No refusal encountered at 0.8m
5) Disturbed sample taken 0.27 - 0.8 m
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 487m
X-COORD : 30°53'13.18"E
Y-COORD : 23°6'28.06"S

HOLE No: TP 10

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

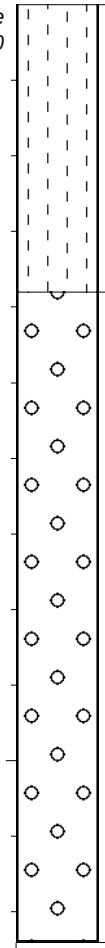
DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 11
Sheet: 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry, reddish brown, stiff, intact, Silty Clay. **TOPSOIL.**

0.38 Slightly moist, reddish mottled light brown, Matrix supported, Medium dense to dense, Gravelly Sand. **RESIDUAL SOILS.**

1.24

NOTES

1) Roots inclusion from a depth of 0.0 - 0.5m
2) Stable side walls
3) No water seepage encountered
4) No refusal encountered at 1.24 m
5) No disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 488m
X-COORD : 30°53'11.14"E
Y-COORD : 23°6'29.9"S

HOLE No: TP 11

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

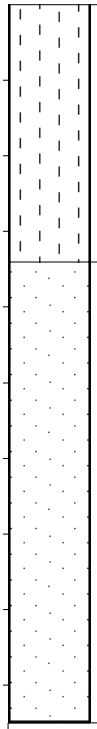
DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 12
SHEET 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry, reddish brown, stiff, intact, Silty Clay. **TOPSOIL.**

0.34 Slightly moist, reddish, intact, firm to stiff, Sandy silty clay. **RESIDUAL SOILS.**

0.95

NOTES

1) Roots inclusion from a depth of 0 - 0.4m
2) Stable side walls
3) No water seepage encountered
4) No Refusal encountered at 0.95 m
5) No Disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 487m
X-COORD : 30°53'14.97"E
Y-COORD : 23°6'30.55"S

HOLE No: TP 12

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

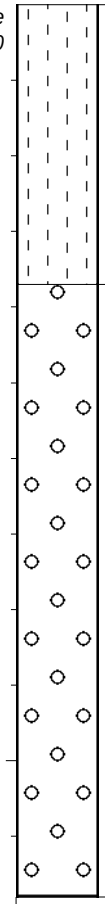
DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 13
Sheet: 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry to slightly moist, reddish brown, Dense, intact, Silty Clay. **TOPSOIL.**

0.37 Slightly moist, reddish, Matrix supported, Medium dense to dense, Gravelly Sand. **RESIDUAL SOILS.**

1.18

NOTES

1) Roots inclusion from a depth of 0 - 0.3m
2) Stable side walls
3) No water seepage encountered
4) No Refusal encountered at 1.18 m
5) No Disturbed sample taken
6) No Unditurbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 487m
X-COORD : 30°53'18.88"E
Y-COORD : 23°6'30.87"S

HOLE No: TP 13

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

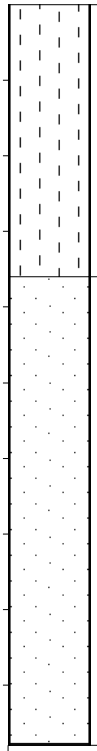
DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 14
Sheet: 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry, reddish brown, stiff, intact, Silty Clay. **TOPSOIL.**

0.36 Slightly moist, reddish, intact, firm to stiff, Sandy silty clay. **RESIDUAL SOILS.**

0.98

NOTES

1) Roots inclusion from a depth of 0 - 0.29m
2) Stable side walls
3) No water seepage encountered
4) No Refusal encountered at 0.98 m
5) No Disturbed sample taken
6) No Undisturbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 486m
X-COORD : 30°53'21.16"E
Y-COORD : 23°6'32.58"S

HOLE No: TP 14

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

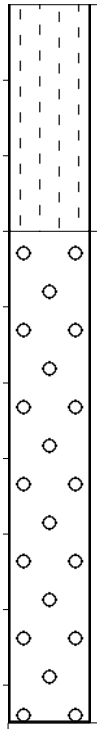
DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

HOLE No: TP 15
Sheet: 1 of 1

JOB NUMBER: 000

Scale 1:10



0.00 Dry, reddish brown, Dense, intact, Silty sand. **TOPSOIL.**

0.30 Slightly moist, reddish mottled light brown, Matrix supported, Medium dense to dense, Gravelly Sand. **RESIDUAL SOILS.**

0.95

NOTES

1) Roots inclusion from a depth of 0 - 0.34m
2) Stable side walls
3) No water seepage encountered
4) No Refusal encountered at 0.95 m
5) No Disturbed sample taken
6) No Undisturbed sample taken

CONTRACTOR :
MACHINE : Tractor Loader Backhoe (TLB).
DRILLED BY :
PROFILED BY : Mavhetha Lavhelesani

INCLINATION :
DIAM : 0.7 m
DATE :
DATE : 19/06/2021

ELEVATION : 484m
X-COORD : 30°53'25.35"E
Y-COORD : 23°6'32.58"S

HOLE No: TP 15

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

Mahlori Development Consultant
Near surface geotechnical investigation for the proposed township at Mtititi of the farm

LEGEND
Sheet 1 of 1

JOB NUMBER: 000

	GRAVELLY	{SA03}
	SAND	{SA04}
	SANDY	{SA05}
	SILT	{SA06}
	SILTY	{SA07}
Name	DISTURBED SAMPLE	{SA38}

CONTRACTOR :
MACHINE :
DRILLED BY :
PROFILED BY :

INCLINATION :
DIAM :
DATE :
DATE :

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY : Mavhetha Lavhelesani
SETUP FILE : STANDARD.SET

DATE : 11/07/2021 15:33
TEXT : ..00\Examples\Examples.TXT

LEGEND
SUMMARY OF SYMBOLS

PLANGE PROPOSED TOWNSHIP

BULK ENGINEERING SERVICES REPORT

FEBRUARY 2020, REV 0

PREPARED BY:

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34 Jorrisen street
Polokwane
0699

Tel: 079 368 8414
Fax: 086 518 0234
Email: admin@dalimede.com

PREPARED FOR:

Mang GeoEnviro Services
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Pretoria, 0004

Tel: 012 770 4022
Cell: +27 72 573 2390
Email: fnmathebula@gmail.com /
info@manggeoenviro.co.za

Table of Contents

1 INTRODUCTION 5

2 SITE DESCRIPTION 5

3 TOWN PLANNING 7

4 TOPOGRAPHY AND ACCESS 9

5 WATER SERVICE 11

5.1 Water source 11

5.2 Bulk water pipelines 12

5.3 Altein Water Treatment Works 15

5.4 Boreholes 17

5.5 Water Storage 17

5.6 Water Reticulation 18

5.7 Water design criteria 19

5.8 Water demands 19

6 SEWER SERVICE 22

6.1 Existing Waste Water Treatment Works 22

6.2 Wastewater Generated 22

6.3 Sewer treatment 23

7 Electricity 24

8 TOWNSHIP ROADS 24

8.1 Classification of roads 24

8.2 Geometric Design Standards 24

8.3 Pavement Design 25

9 Stormwater Drainage 25

9.1 Stormwater systems 25

9.2 Hydrology 26

9.3 Design Standards 26

10 SOLID WASTE 27

11 Conclusion 27

ANNEXURES 28

Tables

Table 1 Land use 7
Table 2 The water design criteria 19
Table 3 The water demands 20
Table 4 Fire flow demands 21
Table 5 Sewer flow 22
Table 6 Classification of roads 24
Table 7 Class 5d – Access road 24
Table 8 Class 5f – Internal roads 24
Table 9 Proposed pavement design 25
Table 10 Hydrological data 26
Table 11 Stormwater design standard 26

Annexures

ANNEXURE 1 Township Layout Plan 29
ANNEXURE 2 Electricity 30

Figures

Figure 1 Plange site 5
Figure 2: Locality plan 6
Figure 3: Proposed land use 8
Figure 4 Access roads 9
Figure 5 Access through road D3643 10
Figure 6 Settlement supplied by the Malamulele water scheme (NN7S) 12
Figure 7 Unauthorised water bulkline connection structure 13
Figure 8 Villages worst affected by the Fumani line vandalism 14
Figure 9 Altein Water Treatment Works locality 15
Figure 10 Currently defunct, Altein Water Treatment Works 16
Figure 11 Mtititi / Plange water storage at Altein plant 17
Figure 13 Proposed water bulkline (blue) for Plange township 18

Abbreviations

L/s	-	Litres per second
Mℓ /day	-	Mega litres per day
kℓ/day	-	Kilo Litres per day
kℓ	-	Kilo Litres
PSC	-	Project Steering Committee
WC	-	Water Committee
IDP	-	Infrastructure Development Plan
DWS	-	Department of Water and Sanitation
RWS	-	Regional Water Scheme
StatsSA	-	Statistics South Africa
m^3	-	cubic metre
AADD	-	Average Annual Daily Demand
VIP toilet	-	Ventilated Improved Pit toilet
MAP	-	Mean Annual Precipitation
ADWF	-	Average Dry Weather Flow

1 INTRODUCTION

There is an open portion of land in the vicinity of Mtititi village and Plange / Mtititi RDP village. This open space is where the proposed Plange proposed township is envisaged to be. The proposed township will have 103 stands, mainly for housing.

Figure 1 Plange site

Mang GeoEnviro Services appointed Dalimede Projects (PTY) Ltd to prepare the bulk engineering services report for the proposed township.

This report outlines the engineering services needed for the township, i.e. roads, water, sewer, and electricity.

2 SITE DESCRIPTION

Plange is situated 26km east of Malamulele town along the D4 road. The area is administered by Collins Chabane Local Municipality, under the Vhembe District Municipality, Limpopo Province, South Africa. GPS coordinates of site are 23° 6'26.71"S 30°53'22.98"E. The locality map is presented on the figure below.

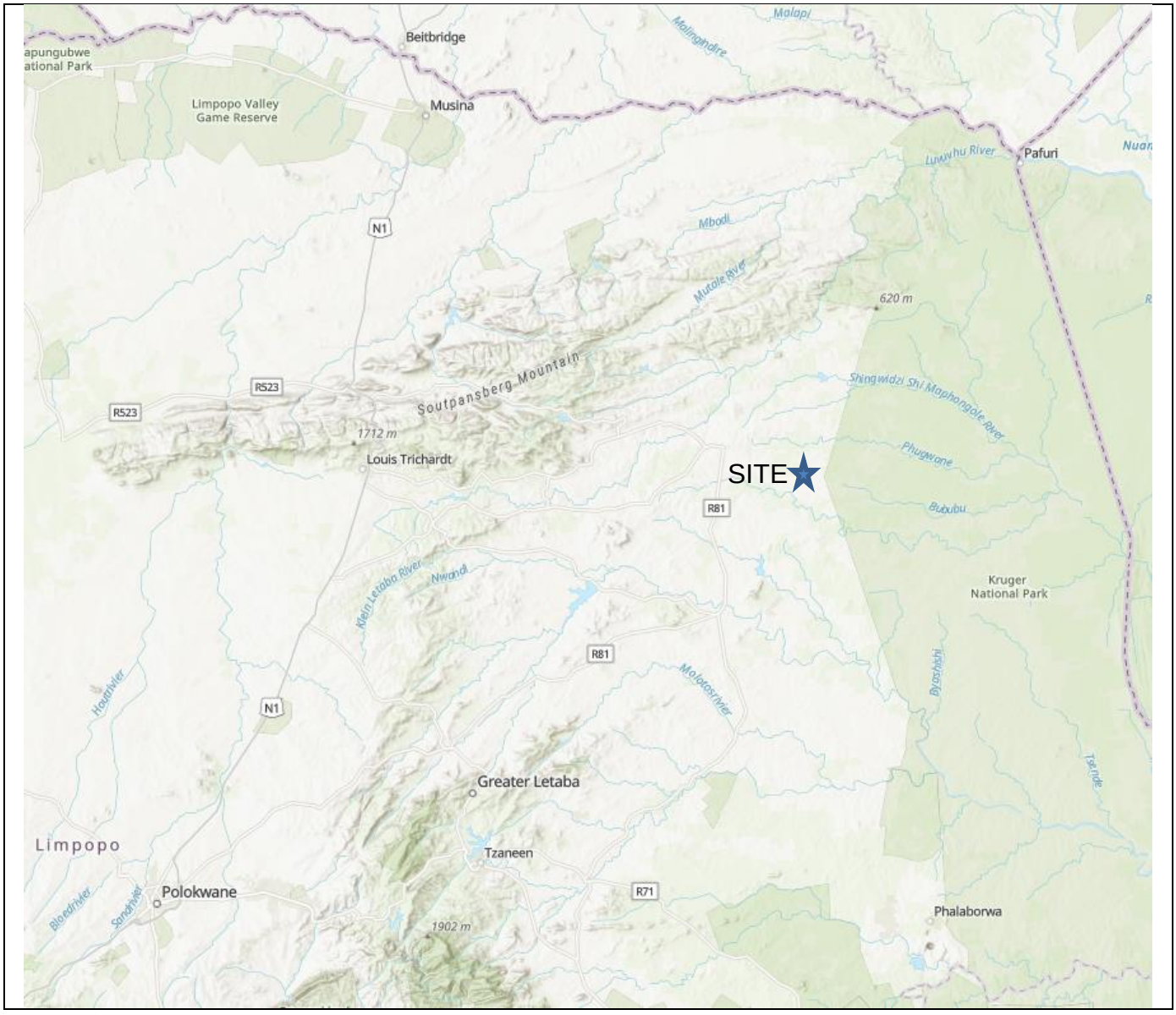

Figure 2: Locality plan

3 TOWN PLANNING

The proposed township is to be partitioned as follows:

LAND USE					
ZONING	LAND USE		NO. OF STANDS	AREA Ha.	% OF AREA
RESIDENTIAL 1	RESIDENTIAL		98	10.83	72.6
BUSINESS 1	BUSINESS		1	0.15	1
EDUCATIONAL	CRECHE		1	0.24	2
PUBLIC OPEN SPACE	PUBLIC OPEN SPACE		3	0.61	4
STREETS	*	*	*	3.11	20
TOTAL	*		103	14.9400	100

Table 1 Land use

The proposed land use is shown in the figure below.

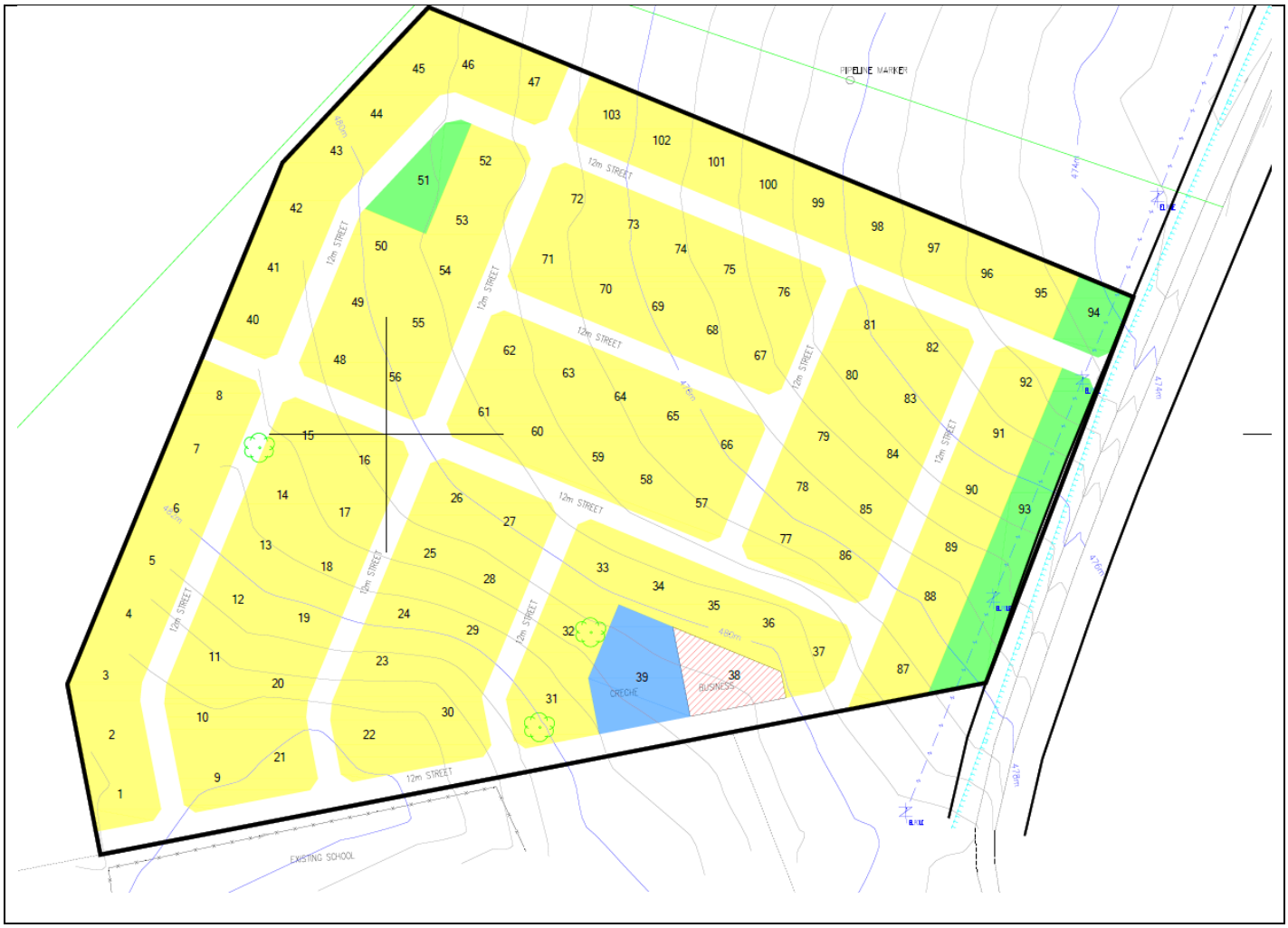

Figure 3: Proposed land use

4 TOPOGRAPHY AND ACCESS

The proposed township site is generally flat. The flat slopes will not require bulk earthworks platforms for buildings.

The proposed township can be accessed from road D3643, the access road to Mtititi village from Fumani Gold Mine. The D3643 access road is currently a gravel road. An application to connect the township to the existing road has to be approved by road authorities prior to construction.
See the figures below.

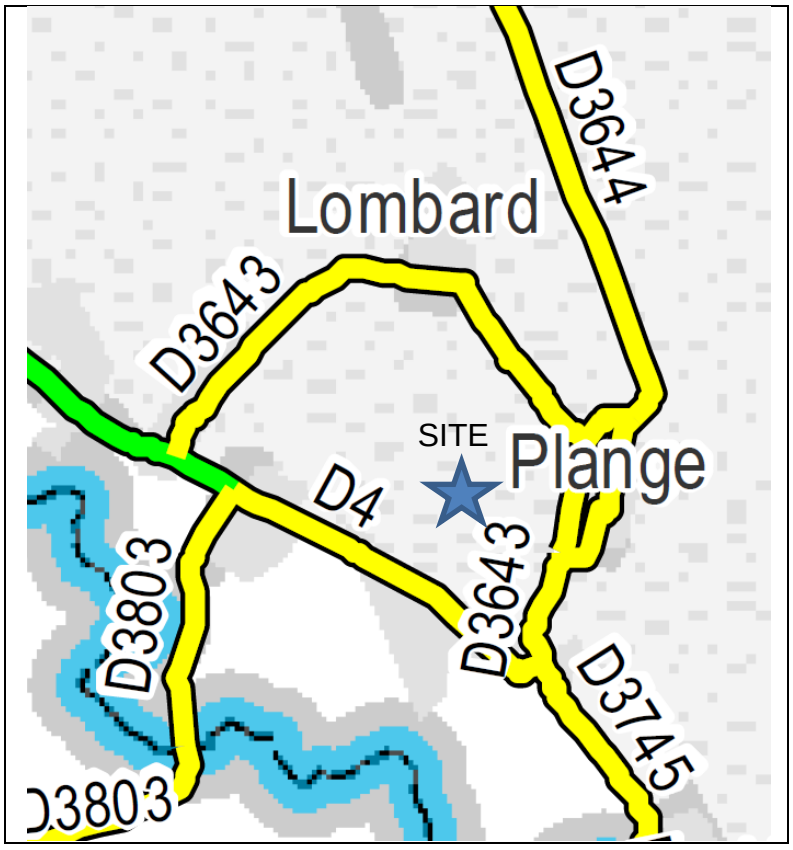

Figure 4 Access roads

Figure 5 Access through road D3643

5 WATER SERVICE

5.1 Water source

The villages in close proximity to the Plange proposed township fall under the Malamulele East Regional Water Scheme South (NN7S). Therefore, the proposed township will also be under the same water scheme.

The Malamulele water scheme raw water source is the Nandoni Dam and the Luvuvhu river. The Department of Water and Sanitation water use licence for the scheme was not available.

The water scheme has two major treated water source points, viz;

- Malamulele Water Treatment Plant, and
- Allocation from Nandoni Water Treatment Plant.

The existing and operational Malamulele Water Treatment Plant (WTP), draws water from the Luvuvhu River.

The design capacity of the Malamulele WTW is 21.6 Mℓ/d, however, the current water produced is 16 Mℓ/d.

The allocation from Nandoni Water Treatment Plant, is pumped from the Mavambe booster pump station. The water allocation which is estimated to be 10 Mℓ/d.

The total potable water available for the scheme = 10 + 16 = 26 Mℓ/d

Water is pumped from the two major treated water source points to the Gandlanani reservoir, Jerome command reservoir, and the command reservoirs in Malamulele Town.

The command reservoirs then supply the following;

- Gandlanani. From Gandlanani reservoir.
- Jerome command 3.5Mℓ sub-scheme bulk pipeline.
- Malamulele Town. From the Malamulele command reservoirs.
- Fumani bulk pipeline. From the Malamulele command reservoirs.
- Ntlhaveni Pipeline. From the Malamulele command reservoirs.

The settlements fed by the water scheme are shown in the figure below.

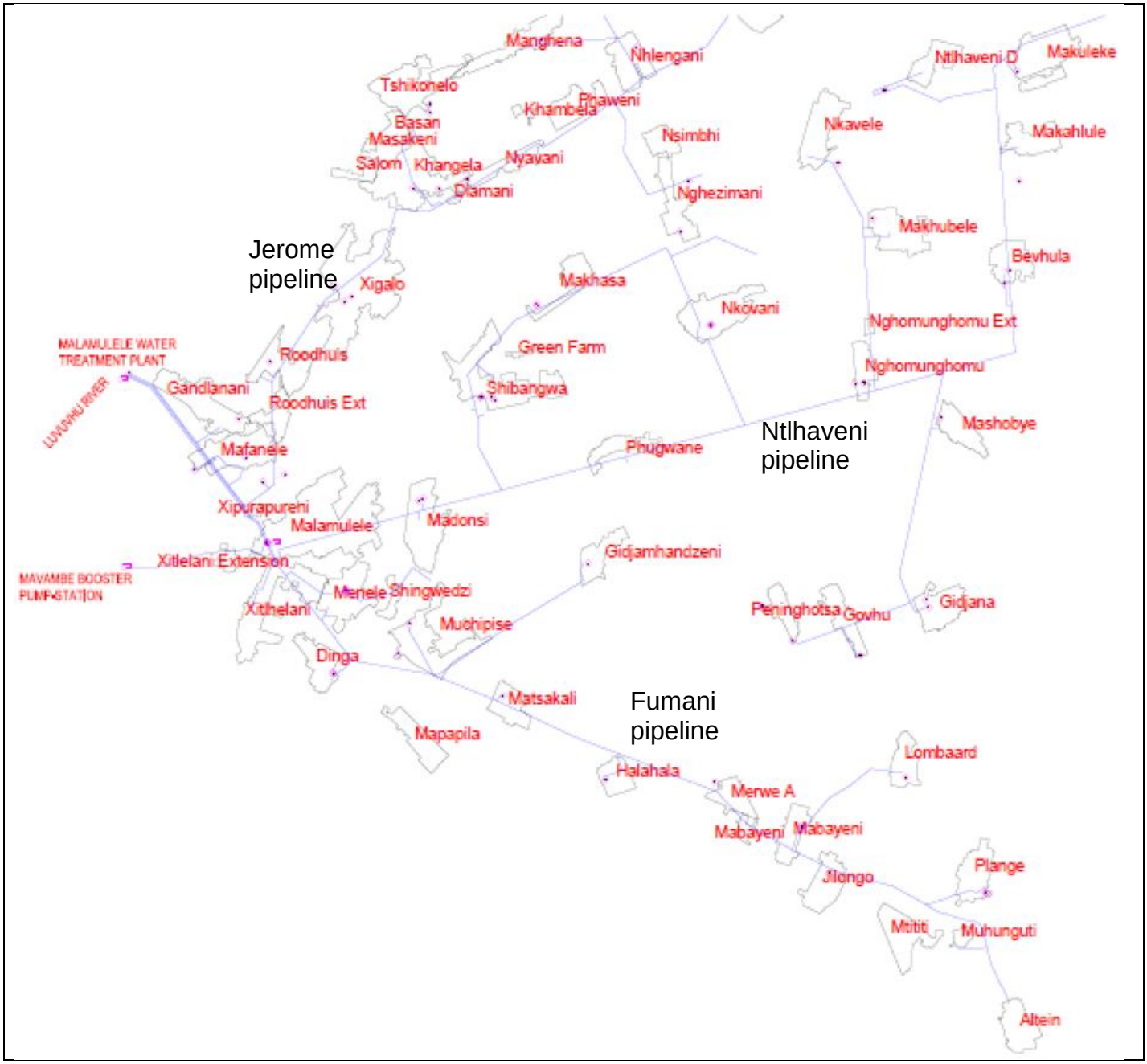

Figure 6 Settlement supplied by the Malamulele water scheme (NN7S)

The 26 Mℓ/d water source is not meeting the water demand for the scheme as seen by the water service delivery demands from villages and bakkie commercial water merchants across the scheme.

5.2 Bulk water pipelines

The existing water supply bulklines are shown in the figure above as blue lines linking the settlements. The existing bulklines are characterised but vandalism and unauthorised connections. Some pipe sections have houses built over them.

See figure below.

Figure 7 Unauthorised water bulkline connection structure

The structure shown above is taping water on the 200mm diameter Fumani bulk pipeline, locals call it xi bobomeni. Villagers use it as a source of water. Water supply from the Fumani pipeline is severely handicapped for villages shown in the figure below after the xi bobomeni structure.

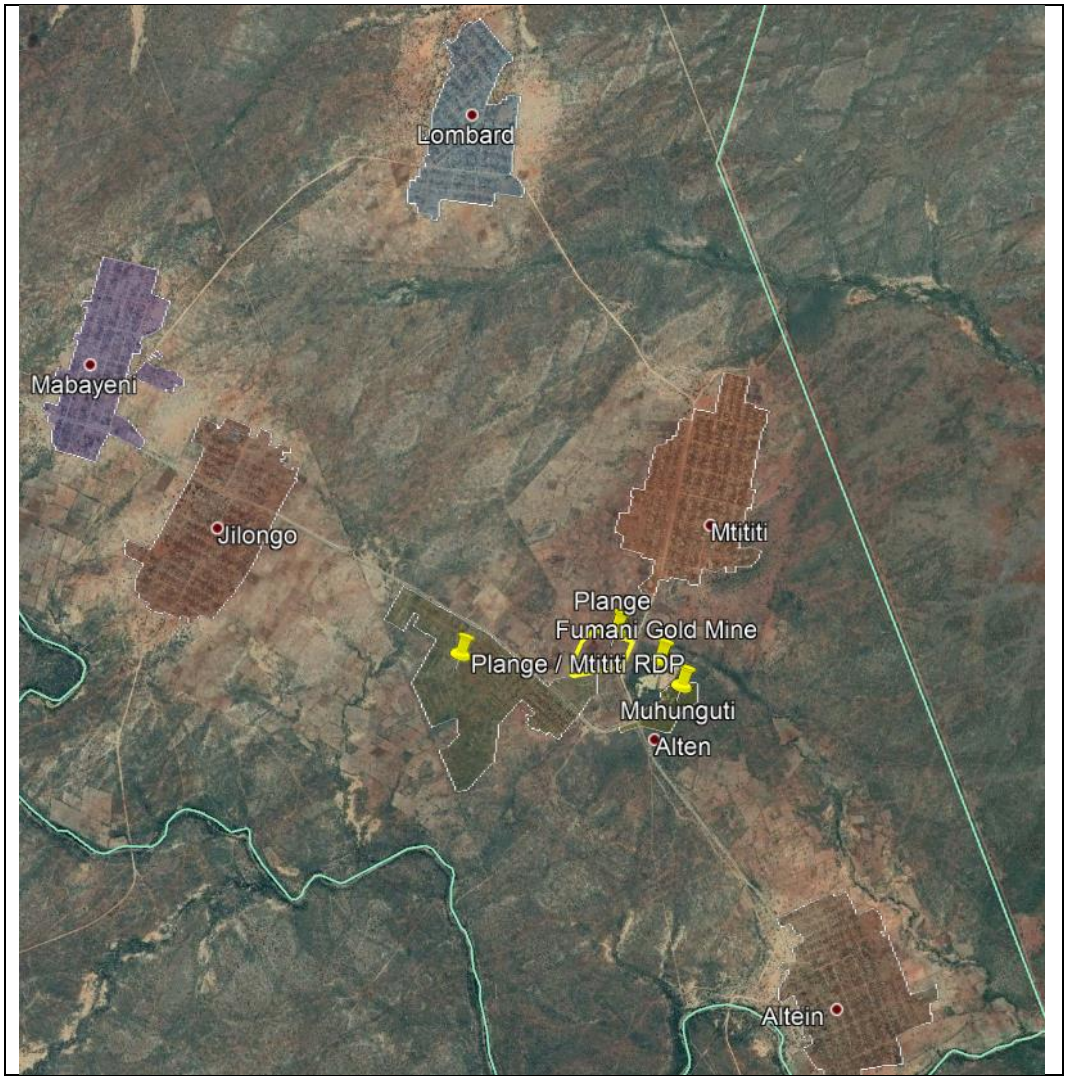

Figure 8 Villages worst affected by the Fumani line vandalism

5.3 Altein Water Treatment Works

The Altein Water Treatment Works is located in Mtititi / Plange village. The existing Altein water plant used to receive raw water from the Fumani Gold Mine. The treated potable water would then feed the Mtititi, Plange and Altein villages. The mine is now defunct, hence the raw water source for the water plant has ceased.

The Altein water plant capacity is 2 Mℓ/d. However, the current capacity is 0 Mℓ/d.

Therefore, the Altein Water Treatment Works is also now not operational for treatment of water.

Figure 9 Altein Water Treatment Works locality

Figure 10 Currently defunct, Altein Water Treatment Works

5.4 Boreholes

The Mtititi / Plange village cannot depend on the Fumani water bulkline. Hence, two boreholes were developed to supply water to Mtititi / Plange village.
However, currently only one borehole is operational as the other one is currently not working.
The two boreholes pump water to the existing water storages at the Altein water treatment works yard, namely the 600kℓ concrete reservoir and the 300kℓ elevated tank.

The working borehole is reliable as the village receives water daily. The boreholes yield, depth, water class could not be established.

5.5 Water Storage

The storages at the Altein water treatment works yard are of relevance to the proposed township as they are serving water to the existing Mtititi / Plange community.

The existing water storage structures are as follows;

- 600kℓ concrete reservoir,
- 1200kℓ concrete reservoir, and
- 300kℓ elevated tank.

Figure 11 Mtititi / Plange water storage at Altein plant

The storage currently in use, viz 600kℓ, 300kℓ are connected to the Fumani line but only receive water from the borehole source. These storages get full of water occasionally.

It is proposed that a new borehole be developed to increase the water supply to the storages on the advent of the proposed Plange township.

5.6 Water Reticulation

The proposed township is to be connected to the storages at the Altein plant. The reticulation is to be for a house connection standard.

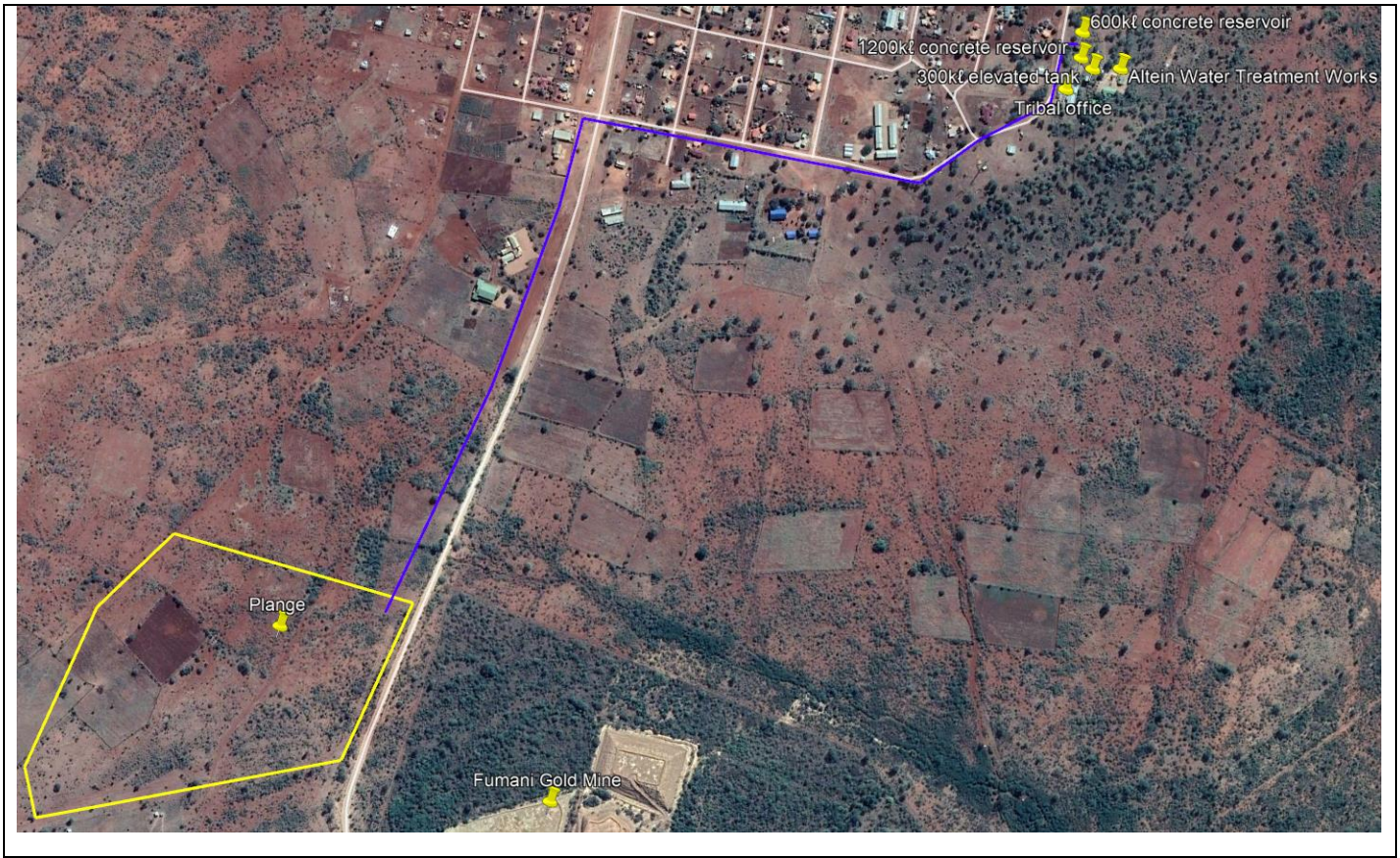

Figure 12 Proposed water bulkline (blue) for Plange township

The water bulkline is estimated to be 2km long with a diameter of 90mm.

5.7 Water design criteria

The water design criterion to be used is listed in the table below. The water demands and fire flow were adopted from document titled: *The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, Version 1.1.*

Item	Design element	Criteria
i.	Average Annual Daily Demand (AADD), for residential 1	0.6kℓ/unit/day
ii.	Average Annual Daily Demand (AADD), for residential 2	0.5kℓ/unit/day
iii.	Average Annual Daily Demand (AADD), for business	0.400kℓ/100m^2
iv.	Average Annual Daily Demand (AADD), for park	12.5-15kℓ/hectare
v.	Average Annual Daily Demand (AADD), for Municipal	400ℓ/100m^2
vi.	Average Annual Daily Demand (AADD), for Institutional	400ℓ/100m^2
vii.	Gross Average Annual Daily Demand (GAADD)	Allow 10% losses
viii.	Daily Instantaneous Peak Factor (DIPF)	1.5
ix.	Design Peak Flow Rate (DPFR) for domestic flows.	25ℓ/s
x.	Maximum static head	90m
xi.	Minimum residual head under conditions of domestic peak flow	10m
xii.	Maximum linear flow velocity under conditions of domestic peak flow	3m/s
xiii.	Pipe type	uPVC
xiv.	Minimum pipe class	9
xv.	Fire flow at any one hydrant under the conditions of domestic peak flows (one hydrant at a time)	15 ℓ/s
xvi.	Minimum residual head (fire plus domestic peak flow)	25m
xvii.	Maximum linear flow velocity under conditions of fire-fighting	3m/s
xviii.	DWS storage reservoirs sizing criteria: 48 Hrs x AADD Pumped from One Source 36 Hrs x AADD Pumped from Multiple Sources 24 Hrs x AADD Gravity Source	
xix.	Hospital, building according to Floor Area Ratio (FAR)	1.2 kℓ/100m^2
xx.	Church buildings	0.3 kℓ/100m^2
xxi.	Church grounds	1.2 kℓ/Ha
xxii.	School, crèche, educational buildings	60 ℓ/student
xxiii.	School, crèche, educational grounds	12 kℓ/Ha
xxiv.	Institutional, FAR = 0.4	0.6 kℓ/100m^2
xxv.	Sport grounds / Recreational	40 kℓ/Ha

Table 2 The water design criteria

5.8 Water demands

The estimated water demand for the township is shown in table below.

As per the table below, the water demand calculations indicate that the township will require 67.2kℓ/d AADD and 73.9kℓ/d Gross Average Annual Daily Demand.

Township water demand

Land Use	**No. of Erven**	**Area (Ha)**	**No. of Units**	**Floor Area Ratio, FAR**	**Unit flow**	**Unit of measure**	**Water Demand**	
Residential 1	98	10.83	98		0.6	kℓ/capita/day	58.8	kℓ/d
Business 1	1	0.15		0.4	0.400	kℓ/100m^2	2.4	kℓ/d
Educational (Creche)	1	0.24	100.0		0.060	kℓ/student	6.0	kℓ/d
Public Open Space	3	0.61						
Streets		3.11						
Totals	103	14.94						
Sub-total Average Annual Daily Demand (AADD)							67.2	kℓ/d
Gross Average Annual Daily Demand (GAADD) (added 10%)							73.9	kℓ/d
Gross Average Annual Daily Demand (GAADD) (added 10%)							0.9	ℓ/s
Multiply by a peak factor (Summer Peak Factor)					1.5	peak factor	1.3	ℓ/s
Peak Water Flow							1.3	ℓ/s

Table 3 The water demands

The Fire flow calculations are presented in the table below.

RISK CLASSIFICATION	**Total Fire Flow (ℓ/s)**	**Duration of Fire flow (h)**	**Total Fire Flow (l/s)**	**Required Fire Flow Storage**	
Low risk: Single residential housing	15	1	15	54.0	kℓ/d

Table 4 Fire flow demands

The new development will require 54kℓ fire water storage onsite. Fire flow pipelines should be designed to the capacity of 15ℓ/s.

The proposed township water storage = AADD + Fire storage
= 67.2 + 54 = 121.2 kℓ
The proposed township water storage = <u>say 150 kℓ</u>

The existing under-utilised 1200 kℓ can be utilised to cater for the storage required.

6 SEWER SERVICE

6.1 Existing Waste Water Treatment Works

There is no existing bulk waste water treatment infrastructure in Mtititi / Plange village. Domestic wet or dry sanitation is utilised in the village. This is the form of pit toilets, septic tanks and soakaways.

6.2 Wastewater Generated

The design guidelines were adopted from the CSIR document titled:
The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, ISBN: 978-0-6399283-2-6, Version 1.1. Printed July 2019

Land Use	**No. of Erven**	**Area (Ha)**	**Water Demand**		**Sewer Return**	**Sewer Flow**	
Residential 1	98	10.8300	58.8	kℓ/d	85%	50	kℓ/d
Business 1	1	0.1500	2.4	kℓ/d	85%	2	kℓ/d
Educational (Creche)	1	0.2400	6.0	kℓ/d	85%	5	kℓ/d
Public Open Space	3	0.6100					
Streets	0	3.1100					
Totals	103	14.9400	67.2				
Sub-total Sewer ADWF						**57**	**kℓ/d**
15% Extraneous flow						8.57	kℓ/d
Gross Sewer						65.69	kℓ/d
Gross Sewer Flow						0.76	ℓ/s
Peak Factor						2.5	
Peak Sewer Flow						1.90	ℓ/s

Table 5 Sewer flow

The new development will have a sewer ADWF of 57kℓ/d a gross sewer flow of 65.69kℓ/d.

6.3 Sewer treatment

It is proposed that a combination of private domestic dry sanitation toilet systems and septic tank and soakaways be utilised to handle the township wastewater. The dry sanitation toilets used in the township must not be smelly or attract flies.

Domestic septic tanks and soakaways can be utilised provided the insitu soil percolation test results permit the use of soakaways.

There are toilets that can be bought from commercial suppliers; viz,

- Enviro-loo domestic toilets.
- Precast complete concrete structure toilets.

	
Enviro-loo domestic toilets	Precast complete concrete structure toilet

Typical pit toilet

7 Electricity

See ANNEXURE 2 Electricity, for the electricity supply needs for the township.

8 TOWNSHIP ROADS

The road infrastructure to service the township will be the standards of the Red Book, TMH, TRH books and the local municipality.

8.1 Classification of roads

Description	Class no.	Function	Reserve width	Roadway width
Access Road	5d	Access from existing bounding road	16m	7.4m
Internal Service Road	5f	Internal Road	13	6m
Internal Service Road	5f	Internal Road	10	6m

Table 6 Classification of roads

8.2 Geometric Design Standards

Design speed	60km/h
Minimum centre line radii	50m
Minimum gradient	0.5%
Favoured maximum gradient	10%
Maximum grade/grade length	12.5% over 70m
Maximum K-value : Crest	16
: Sag	16

Table 7 Class 5d – Access road

Design speed	30km/h
Minimum centre line radii	30m
Minimum gradient	0.5%
Favoured maximum gradient	12%
Maximum grade/grade length	16% over 50m
Maximum K-value : Crest	6
: Sag	8

Table 8 Class 5f – Internal roads

8.3 Pavement Design

The proposed pavement designs are based on anticipated traffic volumes and ground conditions, a detailed pavement design will require a geotechnical centreline investigation report.
The table below shows the proposed pavement design for the development.

Design	Description
Pavement	25mm Premix Asphalt / 80mm paving blocks / Concrete
Base	150mm Thick natural gravel stabilised with Cement to create C4 material compacted to 97% of Mod AASHTO
Subbase	150mm Thick natural gravel G7 material compacted to 97% of Mod AASHTO
Upper Selected Layer	150mm Thick Natural gravel G7 material compacted to 97% of Mod AASHTO Density.
Lower Selected Layer	150mm Thick Natural gravel G7 material compacted to 97% of Mod AASHTO Density.
Roadbed & Fill (where required)	150mm Thick layers compacted to 90% of Mod AASHTO Density. Minimum CBR= 3 at 90% of Mod AASHTO Density- G9

Table 9 Proposed pavement design

9 Stormwater Drainage

The stormwater will drain on according to the slope of the natural ground.

9.1 Stormwater systems

The terrain will be drained by V-drains or channelling of stormwater on the road surface to the natural low point. The stormwater will then flow over the veld to the stream. Stormwater discharge control will be applied in order to reduce the damaging effect of the increase in runoff due to densification.

9.2 Hydrology

The hydrological data used in the design of the stormwater drainage system is shown in the table below.

Hydrological Data	
a) Flood return period	1: 2 years for storm water pipe system. 1: 5 years for the combined storm water Pipe and road systems
b) Average yearly rainfall	480mm
c) Minimum time of concentration and run	As per Local Municipality Guidelines
d) Design Method	Rational method

Table 10 Hydrological data

9.3 Design Standards

The table below lists the standards to be used in the design of the stormwater drainage system:

Design Element	**Specification**
a) Minimum pipe size	600 concrete
b) Minimum pipe gradient	0.67%
c) Storm water details	Local Municipal Standard Details

Table 11 Stormwater design standard

10 SOLID WASTE

A regional landfill situated nearest the site is used to dispose solid waste. The local municipality is responsible for connecting and disposing the solid waste.
The Neighbourhood Planning and Design Guide, Creating Sustainable Human Settlements, developed by, Department of Human Settlements, Published by the South African Government, ISBN: 978-0-6399283-2-6, Version 1.1. Printed July 2019.

The solid waste generation range from 0.41 kg per capita per day in the poor areas, to 1.29 kg per capita per day.
The lower rate of 0.41kg/c/d was adopted for the township. Solid waste will be generated by the development.

Population estimate = 98 residential erf x 4 people per erf = 392 people

- Solid waste = 0.41kg/per person/day or (0.41kgx365 days)
- Waste generated per day = 0.41x 392 = 161kg = 0.16 tonne
- Waste generated per annum = 0.16x365 = 59 tonne

11 Conclusion

The proposed development will contribute towards improving the housing stock of the town and general livelihood of the residents.

Signature:

Signed by:
PR No.:
For Dalimede Projects (PTY) Ltd

ANNEXURES

ANNEXURE 1 Township Layout Plan

ANNEXURE 2 Electricity

ELECTRICAL SERVICE REPORT

FOR

PROPOSED MTITITI TOWNSHIP DEVELOPMENT

DATE: FEBRUARY 2020

1. Executive Summary 4
2. Introduction 4
Number of stands 4
Stand Density 4
Town layout 4
Classification of layout 4
3. Development Proposal (Locality) 5
4. Distribution Network Model 6
4.1 Mv Reticulation 6
5. Distribution Model 7
6. Supply Authority (Licensed) 7
7. **Reticulation Design** 8
7.1 Method of supply 8
7.2 Design Parameter 8
7.3 MV Design 9
a) Conductor 10
b) Poles 10
c) Stays 10
d) Flying Stays 10
e) Struts 10
f) Insulators, Line Clamps and Other Line Components, Pole Dressing Hardware etc. 11
g) Sags and Tensions 11
h) Surge Arrestors 11
i) Sectionalizers 11
7.3.1 Pole Mounted Transformers 11
7.4 LV Design 12
7.5 Service connection 12
8. **Material And Equipment Specification** 13
9. Earthing And Lightning Protection System 14
10. Recommendation 14
11. Cost Estimate 15

List of Tables

Table 1 Demographic information 5
Table 2 Design parameter..... 9
Table 3 Cost estimate 15

List of Figures

Figure 1 Locality..... 6
Figure 2 New township development 7
Figure 3 Consumer schematic 14

1. Executive Summary

Proposed Mtititi township development is situated at Plange village in portion farm Plange 221-LT. The area is administrated by Collins Chabane Municipality under Vhembe District Municipality.

The proposed Mtititi Township consists of 103 stands. All the stands are not electrified. There is an existing mv feeder lines that are located along the tarred road. The mv line is Mink conductor. The township is fed from two feeders: Thomo muyexe and Thomo furman. Proposed Mtititi township development will be taping from electrical pole no: TMY 252/9 and TF 243/8.

Thomo muyexe and Thomo Fumane 22kv feeder is fed from Thomo substation and the capacity is 2x10MVA, 66/22kv. The current loading from Thomo substation is 9MVA.It is recommended that the township can be connected without upgrading the network. MV feeder will be constructed within the township connecting the distribution transformer.

2. Introduction

This report outlines the design philosophy of the electrical MV and LV installation for the Proposed Mtititi township development. Proposed Mtititi township development is situated at Plange village in portion farm Plange 221-LT. The installation will be designed to ensure that the installation will comply with the South African national safety standard while meeting the objective of the development.

ITEM	DESCRIPTION	COMMENTS
1.	**DEMOGRAPHIC INFORMATION**	
Town Layout	Number of stands	103
	Stand Density	Medium -10.83 hectare
	Town layout	Relatively Structured
	Classification of layout	Medium Density
Existing Infrastructure	Type of Road	Gravel
	Existence of Telephone Services	None
	Existence of Water Services	None
	Water reticulation	None
	Sewage infrastructure	None

ITEM	DESCRIPTION	COMMENTS
	Others: Clinic	0
	Schools	1
	Churches	1
	Businesses	2
Site Conditions	Soil type	Red turf
	Climate	Temp: -5 to 30ºC
	Population	Estimated 5000 people
2	**NETWORK INFORMATION**	
2.1	Substation Source	Thomo Substation
2.2	Substation MV transformer capacity	2x10MVA 66/22kv
2.3	Feeder Name	Thomo muyexe and Thomo furmane 22Kv
2.4	MV CONDUCTOR TYRE AND SIZE	MINK
2.5	T-off point	TMY 252/9 and TF 243/8

Table 1 Demographic information

3. Development Proposal (Locality)

The township is situated at Plange village in portion farm Plange 221-LT.27.5km from malamulele to Mtititi Township. The area is administrated by Collins Chabane Municipality under Vhembe District Municipality, Limpopo province 23° 6'26.71"S 30°53'22.98"E as shown on the locality plan.

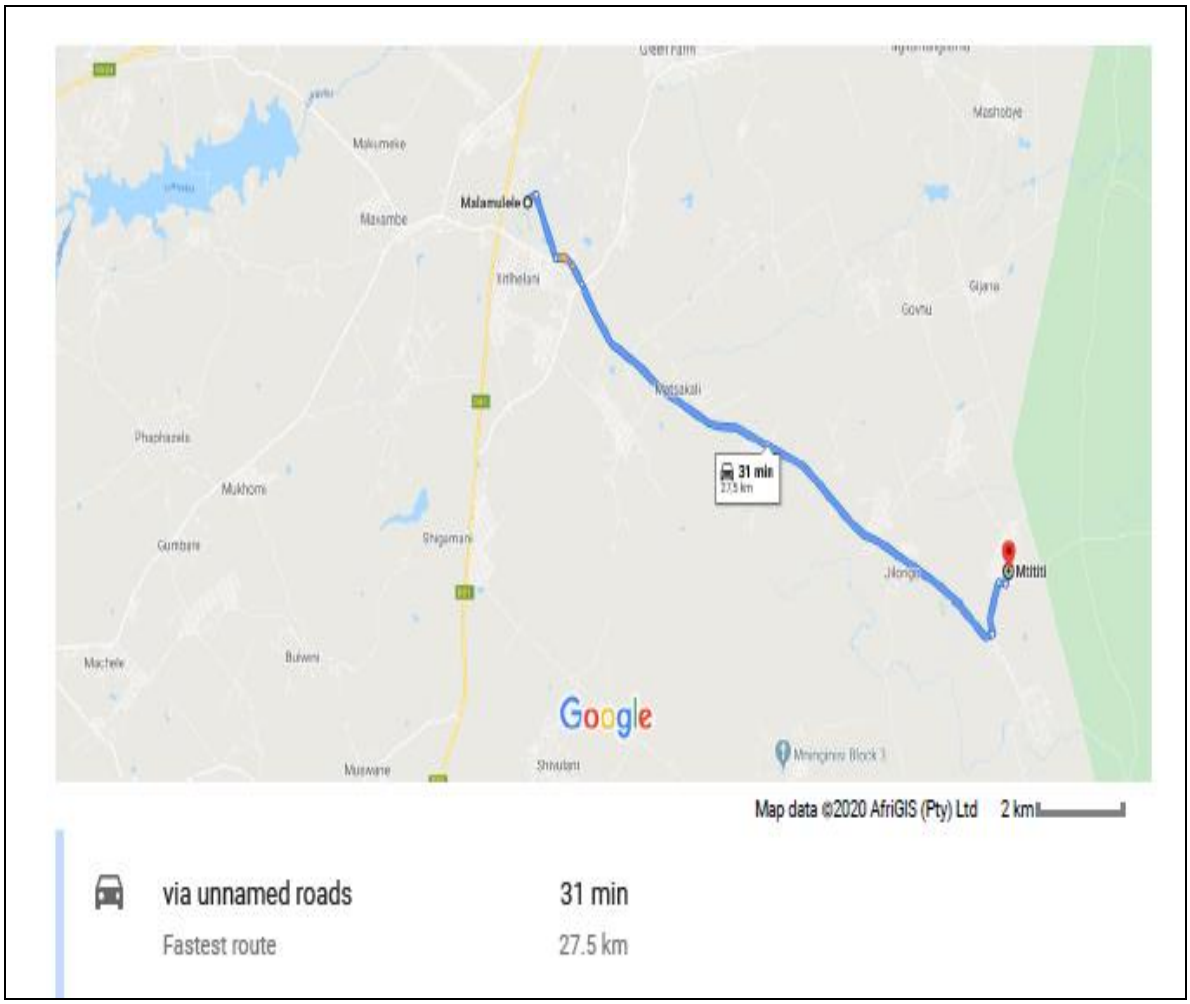

Figure 1 Locality

4. Distribution Network Model

4.1 Mv Reticulation

There is an existing mv feeder lines that are located along the tarred road. The mv line is Mink conductor. The township is fed from two feeders: Thomo muyexe and Thomo furman. Proposed Mtititi township development will be taping from electrical pole no: TMY 252/9 and TF 243/8.
Thomo muyexe and Thomo furmane 22kv feeder is fed from Thomo substation and the capacity is 2x10MVA, 66/22kv. The current loading from Thomo substation is 9MVA MV feeder will be constructed within the township connecting the distribution transformer.

5. Distribution Model

The objective of this task is to develop an adequate network model representing the entire Mtititi Township up to 22kv main feeder level. The main feeder is defined as the main feeder supply from Thomo substation.

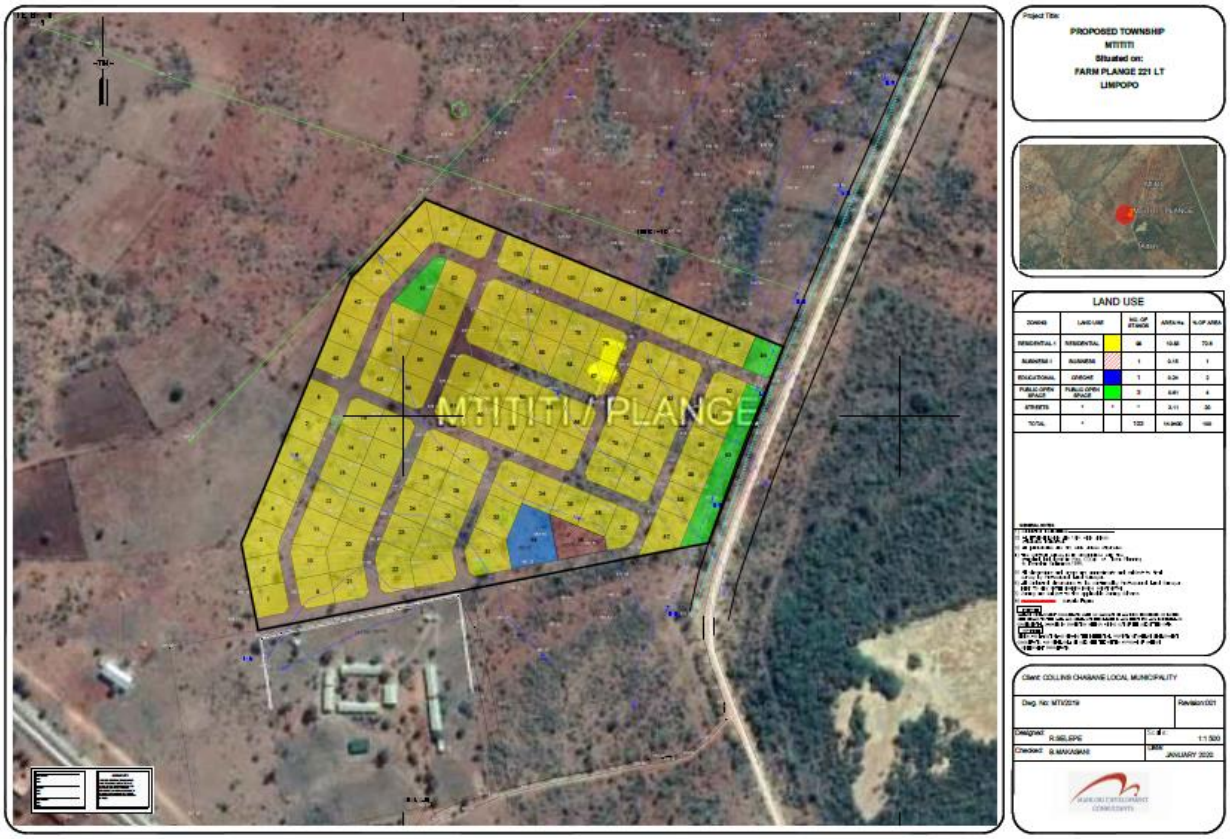

Figure 2 New township development

6. Supply Authority (Licensed)

The area is situated within the electricity licensed area and supply by Eskom.

7. Reticulation Design

7.1 Method of supply

MV feeder will be constructed within the township and connected to the distribution transformer. MV feeder (22Kv) is located along the main road which could utilize for supply the area.
This is to determine the most cost-effective supply arrangement that is used and provide details of required in feed points. The following is included regarding to bulk supply:

- The planning capacity and bulk infrastructure.
- The quality of supply.
- Metering arrangement.
- Protection arrangement.
- The loss profile due to load.

7.2 Design Parameter

The Developer shall erect the MV and LV overhead line reticulation systems in accordance with Eskom's Electrification Standards (Wood Structures). The internal MV distribution systems shall comprise of "Mink "aluminum conductor steel reinforced configuration on 11m or 9m wooden poles and shall be built to 22kV specifications.

The LV distribution systems shall comprise an aerial bundled conductor (ABC) system, of the supporting core type mounted overhead on either 7 or 9 meter wooden poles. LV distributor spurs shall extend within a radius of approximately 500m from transformer positions depending on individual voltage drop requirements. LV distributor spurs shall share pole structures with the MV system where these follow parallel routes providing clearance of LV can be achieved.

Transformers shall be of the pole mounted type suitably rated to serve anticipated individual LV distributor loads and shall be of the SABS 780 type. All materials supplied by the Developer shall conform to Eskom's Buyer's Guide (Part 9 of DT Standard).

The following design parameter is set:

Medium voltage (Final Design)	
ADMD	1.2Kva/stand
Spare capacity on feeder	0.5Kva/stand
Supply voltage	22Kv-3 phase
Supply regulation(bulk)	100% (assumed)

The projected load for the final phase (at 1.2Kva per stand) is 46. 5Kva.The transformer installed capacity is suitable for and can deliver an ADMD of 2.41kVA per stand.

Low voltage (Final Design)

ADMD	0.65Kva/erf
Supply voltage	415/240 volt
Regulation	+- 10%ase
Service connection(max)	20Amp

CART Parameters:

ADMD	Alpha	Beta
Initial	0.28	1.69
Final	0.36	1.03

Table 2 Design parameter

7.3 MV Design

The existing and proposed medium-voltage network is best described in terms of both geographic layout and electrical connection layout. The performance of the network is quantified by MV load flow studies, based on the loads described in the load forecast.

Medium Voltage supply consists of three phase Mink conductor. The conductor shall be mounted on 9m wood poles and shall run street-front. A 780 pole mounted transformer shall be used to supply the stands. The transformer must not be loaded more than 108%.

All MV structures shall be constructed in accordance with Eskom Medium Voltage Distribution Standard and specifications.

The MV overhead feeder system shall comply with the requirements of Eskom's Distribution Technology, Electrification Standards and Guidelines as and where applicable for an urban concrete pole reticulation system.

a) Conductor

Type	:	Aluminium conductor steel reinforced.
Code Name	:	Mink/Fox-see Bill of Quantities/drawings
Mass	:	85kg/km / 149kg/km
Ultimate tensile strength	:	7 900 / 13 200 Newton
Max working tension	:	@ -5oC + wind 5 240 / 8760 Newton.
Mounting	:	See structure codes on drawings.

The maximum working tension may be exceeded only during the construction stages when the conductors are to be “over-tensioned” to 1.05 x MWT for a period of not less than 8 hours nor longer than 24 hours after which the tension is to be reduced to a figure not to exceed the stated maximum working tension of the conductor concerned.

b) Poles

Pole type	-	Wood
Pole lengths	-	7m for LV distributor 9m for LV road crossing, 11m for MV Line
Planting depth	-	1.5, 1.8 and 2m respectively
Pole marker	-	painted - black on yellow background.

c) Stays

Type	-	Fiber glass for MV and Porcelain of LV
Rods	-	M20 - 2000 long
Base plate	-	380 x 380 x 6 galvanized
Stay wire	-	7/4mm, 1100 MPA - galvanized
Planting depth	-	2m

d) Flying Stays

Flying stays shall be installed in the positions indicated on the drawings by the structure codes. Anchor poles shall be as specified for the line structures and of sufficient length to ensure the required ground clearance. Overhead stay wire shall be 7/4.00mm as specified for stays.

e) Struts

Struts shall be installed in the positions indicated on the drawings by the structure codes. Strut poles shall be as specified for the line structures. Line structure poles shall be fitted with suitable ground anchors at all strut positions. Struts shall be fitted with barbed wire anti climbing devices.

f) Insulators, Line Clamps and Other Line Components, Pole Dressing Hardware etc.
All in accordance with Eskom's Distribution Reticulation Technology, Electrification Standards and Guidelines with particular reference to the detailed material take off sheets provided for the various line structures.

g) Sags and Tensions

The Developer shall provide suitable dynamometer sighting rods or other approved apparatus necessary for proper checking of the work. Dynamometers shall be calibrated in kg or kN.

h) Surge Arrestors

Surge arrestors shall be of the metal oxide outdoor hermetically sealed, vertical base mounted type, rated at 22kV, 10kA impulse current.

i) Sectionalizers

Dropout fuses shall be provided for each transformer zone.

7.3.1 Pole Mounted Transformers

Transformers shall generally comply with the following details:

Situation	:	Outdoors
Mounting	:	Suitable for single pole structure (Transformer outline)
Type	:	SABS 780
kVA rating	:	100/50 (as indicated on drawings)
No load voltage ratio	:	22000/415/231 volt
Vector group	:	Dyn 11
Parallel operation	:	Not required
MV & LV connections	:	External bushings with suitable insulated connections.

The transformers shall have connected on the MV side through the use of links/or fuses as indicated on the drawings.

7.4 LV Design

The low voltage feeders shall be three phase 4 core aerial bundle conductor with bare neutral and shall be 70 and 35mm². The LV network is to be constructed in mid block layout on 7m wood poles. The feeders shall be fused at the transformer pole**.** All LV structures shall be constructed in accordance with Eskom Low Voltage Distribution Standard and specifications.

7.5 Service connection

The majority of customers are expected to purchase a 20 Amp supply. Service connections are to be made with a 4mm² concentric cables from a 4-way and 8-way distribution pole top boxes. The service connection shall be a concentric cable in accordance with SCSSCAAC7. For a 60A supply a 10mm² concentric cables shall be used. The concentric cable used on all new services shall be installed without joints from the pole-top distribution box into the standard passive unit base, which is mounted in the customer's premises.

Where the concentric cable enters the dwelling, suitable protection shall be applied around the cable to prevent damage to the insulation. The concentric cable shall form a "drip loop" before the attachment or entry point on the customer's wall as illustrated in drawings D-DT-0360 and D-DT-0361. The concentric cable entry point into the SPU shall be watertight.

The SPU consists of a standard dispenser socket (ED base) attached to a standard 110 mm x 110 mm socket outlet box as illustrated in D-DT-0347. The SPU shall be installed in every customer’s home regardless of the type of supply required. For customers with a 60A supply the standard 110mm X 110mm socket outlet box shall be removed from the SPU. The SPU shall comply with SCSSCAAJ1.

The SPU integrates the incoming service cable with the metering, protection and household distribution. It provides the separation of the earth and neutral for the customer's installation. The wiring between the standard dispenser terminals and the socket outlet box is part of the customer’s installation. The wiring shall be done with a separate earth and neutral wire.

The SPU shall be mounted at a position that is suitable for the customer and away from sources of heat and moisture. Refer to 7.9 in SABS 0142 for the positioning of distribution boards. On brick walls, a 6mm diameter "easy-drive" with screw (D-DT-3149) will be used to mount the SPU. In all other cases, a threaded rod with washers shall be used. A non-metallic cable gland (D-DT-3070) will be provided at the service cable entry point to the standard passive unit.
All services shall be in accordance with Eskom Distribution Services Standard and specifications.

8. Material And Equipment Specification

The Developer will erect the MV and LV overhead line reticulation systems in accordance with Eskom's Electrification Standards (Wood Structures). The internal MV distribution systems shall comprise of "Fox "aluminum conductor steel reinforced configuration on 12m,11m or 9m wooden poles and shall be built to 11kV specifications.
The LV distribution systems shall comprise an aerial bundled conductor (ABC) system, of the supporting core type mounted overhead on either 7 or 9 meter wooden poles. LV distributor spurs shall extend within a radius of approximately 500m from transformer positions depending on individual voltage drop requirements. LV distributor spurs shall share pole structures with the MV system where these follow parallel routes providing clearance of LV can be achieved.

Transformers shall be of the pole mounted type suitably rated to serve anticipated individual LV distributor loads and shall be of the SABS 780 type. All materials supplied by the Developer shall conform to Eskom's Buyer's Guide (Part 9 of DT Standard).

9. Earthing And Lightning Protection System

In accordance with Eskom Distribution Standard Part 2, with particular reference to:

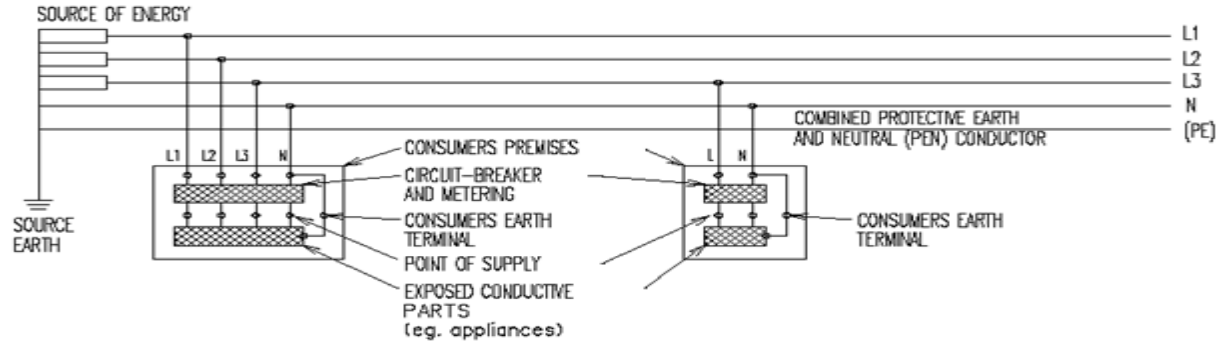

Figure 3 Consumer schematic

Results of soil resistivity survey at 2 points.
Min Cu area : 16mm² stranded
12mm² solid

- Low Voltage
  22 kV system : 70 Ohms
- Medium Voltage
  22kV system : 30 Ohms

10. Recommendation

MV feeder network that supply the township is Thomo muyexe and Thomo furmane 22kv.The substation name is Thomo substation. The capacity is 2 x 10MVA, 66/22kv and the substation is currently loading 9MVA. MV line is mink conductor. It is recommended that the township can be connected from the existing network. Implementation of the network must be installing according to Eskom distribution network standard.

11. Cost Estimate

The estimated electricity infrastructure costs for the proposed development are shown the table below.

Cost Estimate For Proposed Mtititi township development		
Item	**Description**	**Estimate Amount**
A	Preliminaries and General	R 180,000.00
B	Pegging of works	R 60,000.00
C	Digging Holes	R 100,000.00
D	Plant poles	R 110,000.00
E	HV structure	**R 50,000.00**
F	MV stays	R 30,000.00
G	LV structures	R 25,000.00
H	LV stays	R 40,000.00
I	Service Boxes	R 155,000.00
J	Stringing	R 250,000.00
K	Transformer Installation	R 195,000.00
L	Earthing Installation	R 15,000.00
M	Pole numbering	R 80,000.00
N	Commissioning	R 10,000.00
O	Other	R 30,000.00
P	House connections	R 180,000.00
Q	Excavate and plant poles	R 23,000.00
R	Conductor	R 225,000.00
S	General	R 100,000,00
	SUB-TOTAL 1	**R1,655,640.00**
	Contingency @10%	R165,564.00
	SUB-TOTAL 2	**R 1,821,204.00**
	Professional Fees @ 15%	R 273,180.60
	SUB-TOTAL 3	**R 2,094,384.60**
	VAT @ 15%	R 314,157.69
	GRAND TOTAL	**R 2,408.542.29**

Table 3 Cost estimate

APPENDIX E: PUBLIC PARTICIPATION PROCESS

PROOF OF COMMUNICATION TO IAPS

REGISTER

SITE NOTICES

NEWSPAPER ADVERT

COMMENTS FROM IAPS

APPENDIX F: ENVIRONMENTAL MANAGEMENT PLAN

APPENDIX G: ADDITIONAL INFORMATION

DECLARATIONS