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Our Ref:

19127jdX3

A PROVISIONAL REPORT

ON

A GEOTECHNICAL INVESTIGATION
FOR THE PROPOSED TOWNSHIP OF JOHN DUBE EXTENSION 3
ON PORTIONS RE/1 AND 83 OF THE FARM GROOTFONTEIN 165-IR,
EKURHULENI METRO MUNICIPALITY,
GAUTENG.

BY

RELLY, MILNER AND SHEDDEN
P R E T O R I A

DATE: June 2020

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1. INTRODUCTION

This report (19127jdX3) presents the results of a geotechnical investigation undertaken for the proposed township of John Dube Extension 3 on part of the Remaining Extent of Portion 1 and Portion 83 of the farm Grootfontein 165-IR. The proposed township will be located within the Ekurhuleni Metro Municipality (EMM) in Gauteng (see locality plan overleaf).

The purpose of the investigation was to provide information on the nature and geotechnical properties of the shallow soils encountered on the site.

This report has been prepared following a guideline published by the SABS (Reference 9) regarding the establishment of townships.

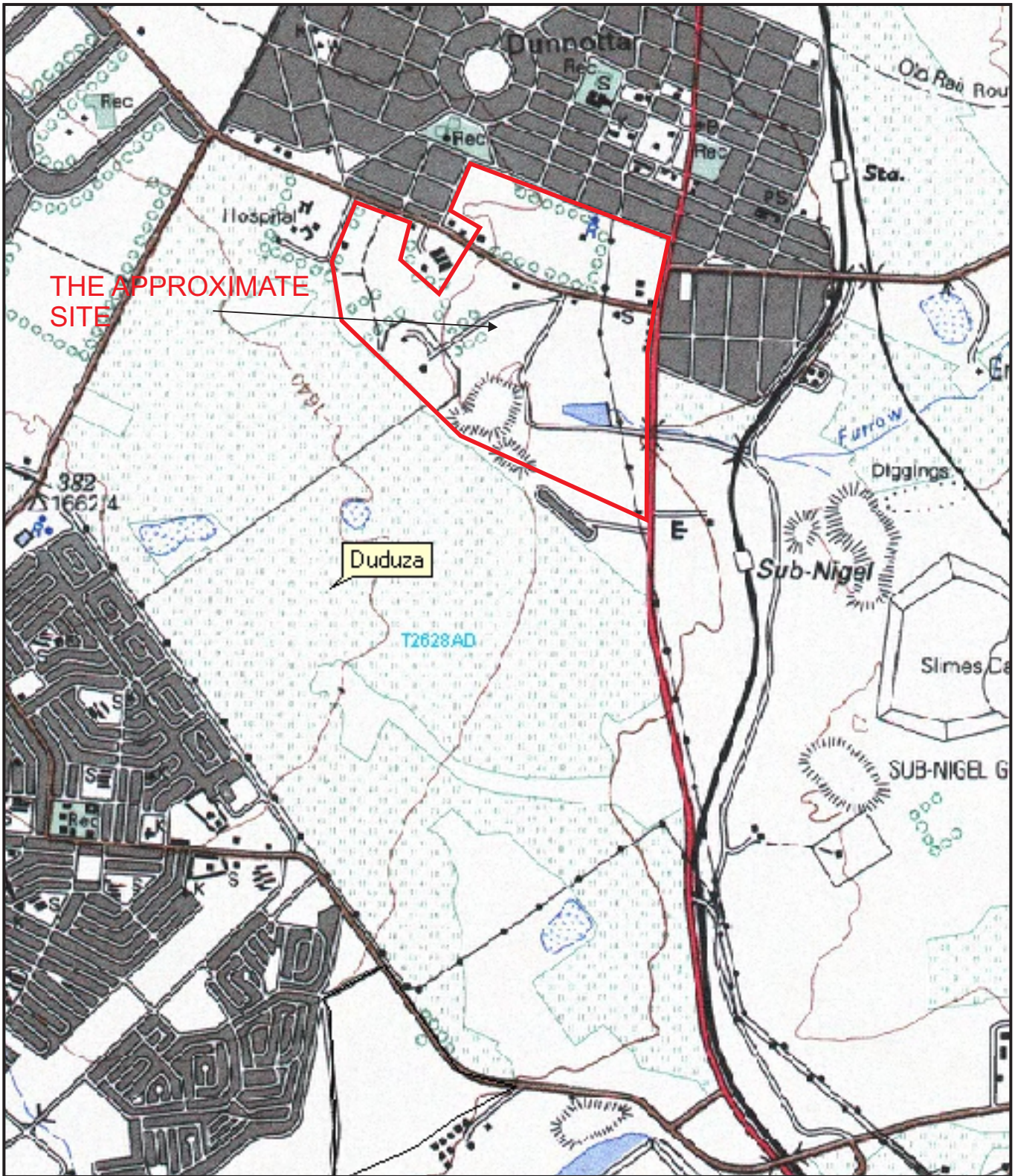
The project was commissioned at the request of Mr B Masilo of Alleyroad Construction.

The fieldwork for this investigation was undertaken in September 2019.

2. SITE DESCRIPTION

The site is an irregular-shaped area of about 113 ha located immediately south of Dunnottar on the Far East Rand. The proposed township has been divided into five areas ranging in size from about 18 ha (Area 4) to about 30 ha (Area 3). The location and size of each area are given below:

- Area 1 is located on open ground sandwiched between Vlakfontein Road (M45) in the south and Prinsep Avenue in the north. A suburban road forms the western boundary. Area 1 covers 18,66 ha.
- Area 2 surrounds a frail care centre (Zanele Mbeki) south of Vlakfontein Road (M45) and east of a health care centre (Nokhutela Ngwenya). The southern boundary is Area 5 and the eastern boundary is Area 3. Area 2 covers 27,39 ha.
- Area 3 extends from Area 2 eastwards until Nigel Road (M63). The southern boundary is an easterly flowing stream about 700 m south of the intersection of Vlakfontein and Nigel Roads. Area 3 covers 30,19 ha. A substantial portion of the area is open space that



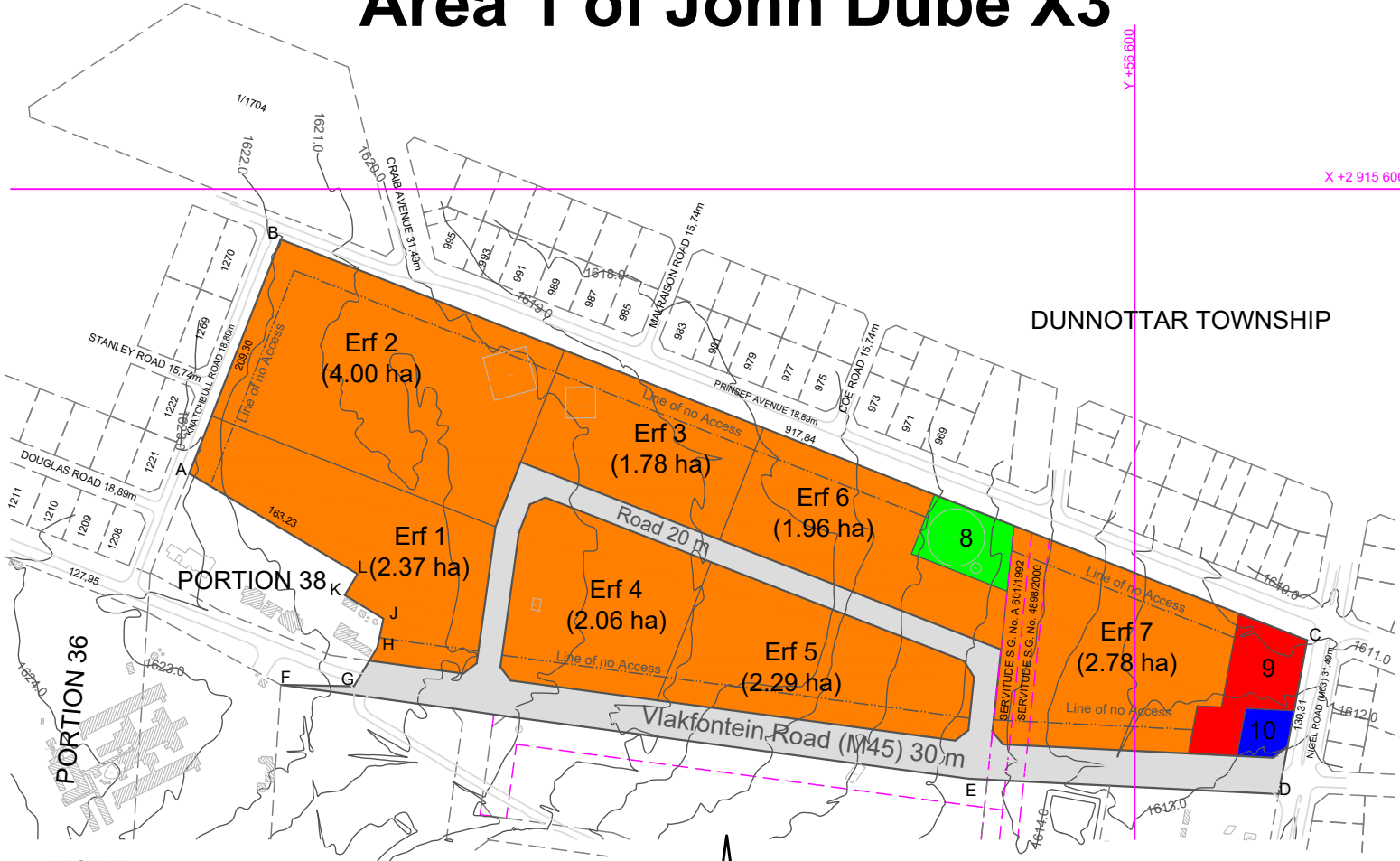
LOCALITY PLAN

JOHN DUBE EXTENSION 3,
Ekurhuleni Metro, Gauteng.

NOT TO SCALE

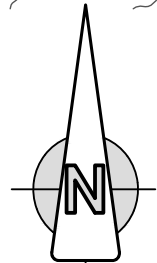
Area 1 of John Dube X3

PROPOSED TOWNSHIP
JOHN DUBE EXT. 3
 SITUATED ON A PART OF THE REMAINING EXTENT
 OF PORTION 1 AND PORTION 83 OF THE FARM
 GROOTFONTEIN 165-JR.
 EKURHULENI METROPOLITAN MUNICIPALITY
 DUDUZA CCC

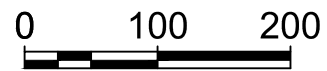


LEGEND:

- 100 meter buffer zone from Rock Dump
- Deleniated wetland area.
- Servitude areas
- Rocky outcrop
- Ruins
- Existing buildings



SCALE 1:2000 (A1)
 1:4000 (A3)
 1:5500 (A4)



ALL AREAS AND MEASUREMENTS ARE APPROXIMATE AND SUBJECT TO FINAL SURVEY

DUNNOTTAR TOWNSHIP



LAND USE	ERF NR.	NUMBER OF ERVEN	RULING SIZE OF ERVEN	MIN SIZE OF ERF
Residential 3	1 - 7	7	2.0 ha	1.78 ha
Open Space	8	1	4148.24 m ²	4148.24 m ²
Business 2	9	1	5781.56 m ²	5781.56 m ²
Petrol Station	10	1	1564.97 m ²	1564.97 m ²

Minimum Gradient of Streets	1:500
Maximum Gradient of Streets	1:11
Total Length of Streets within Township	1.3 km
Area of Streets as % of Total Area of Township	15.4%
Total Area of Parks and Open Spaces	5.3 ha
Area of Parks and Open Spaces as % of Township	28.6%

The contours on the accompanying plan were obtained from the City of Tshwane GIS Department. Contour interval is 1 meter and is based on sea level datum.

Plan No. EKH/

I hereby certify in terms of section 144 of the Water Act (Act 54 of 1956) and in terms of section 18 of the Water Amendment Act (Act 36 of 1998) that this township is not affected by the maximum level that flood water will reach in a recurrence interval of 50/100 years.

Signature:

- The figure ABCDEFGHJKLA represents Area 1 of the proposed John Dube Ext. 3 township and is 18.66 ha in extent.
- Survey: LO 29° system.

LAND USE	AREA	%
Open Space	0.41 ha	2.2 %
Business 2	0.58 ha	3.1 %
Petrol Station	0.16 ha	0.8 %
Res 3	12.89 ha	69.0 %
Roads	4.62 ha	24.9 %
TOTAL	18.66 ha	100.0 %



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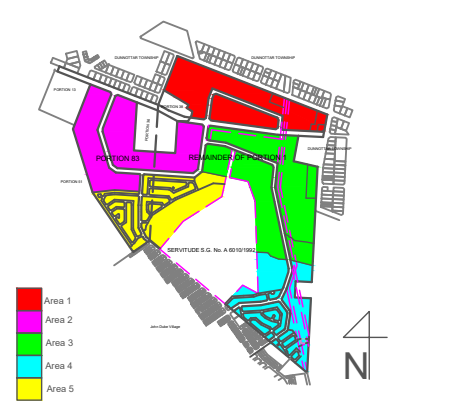
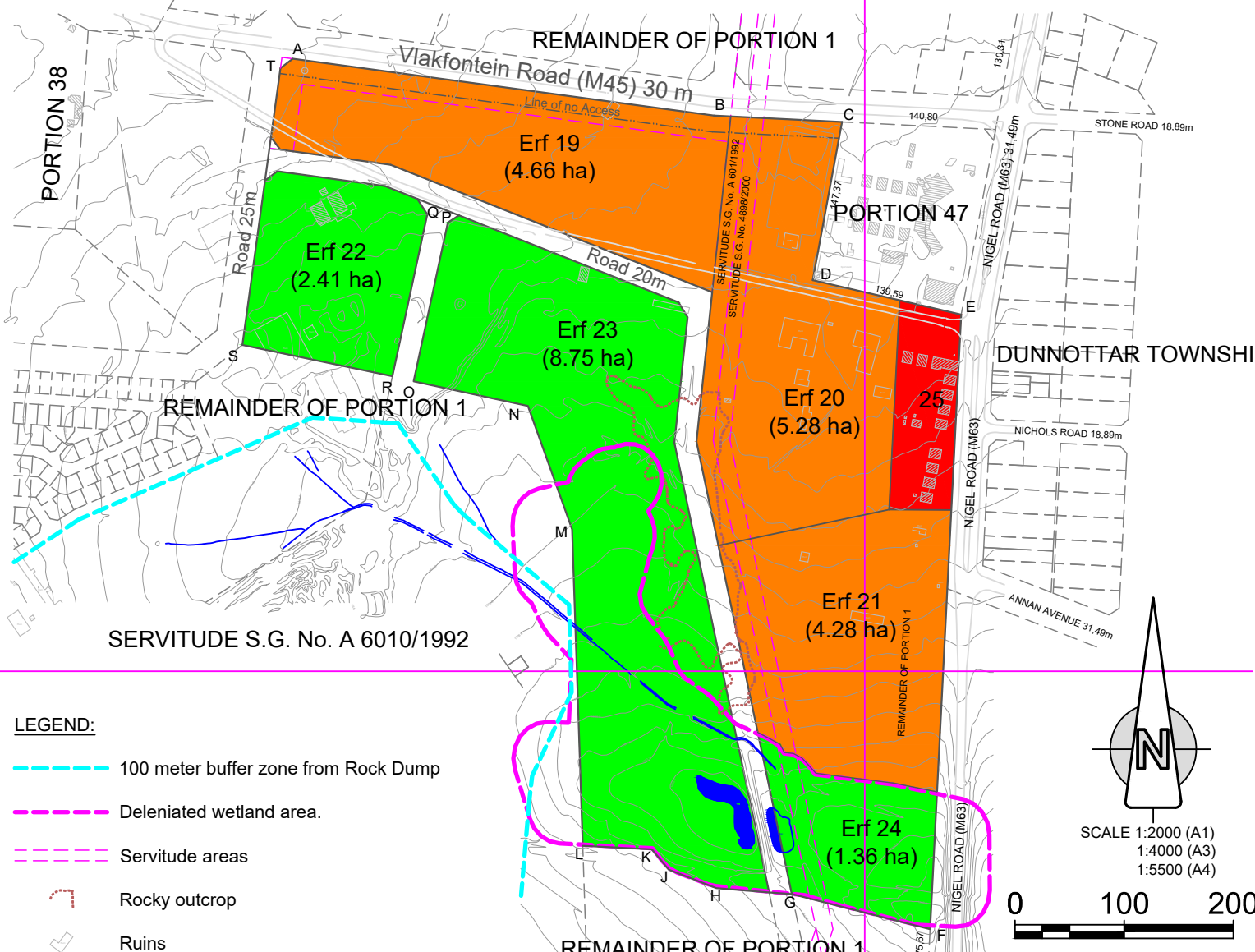
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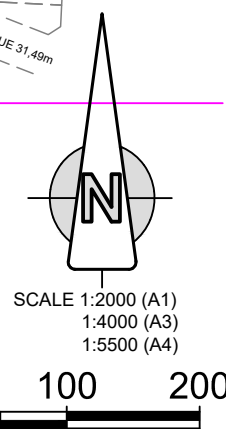
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Area 3 of John Dube X3

PROPOSED TOWNSHIP
JOHN DUBE EXT. 3
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- LEGEND:**
- 100 meter buffer zone from Rock Dump
 - Deleniated wetland area.
 - Servitude areas
 - Rocky outcrop
 - Ruins
 - Existing buildings



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LAND USE	ERF NR.	NUMBER OF ERVEN	RULING SIZE OF ERVEN	MIN SIZE OF ERF
Residential 3	19 - 21	3	4.5 ha	4.28 ha
Open Space	22 - 24	3	3.0 ha	1.36 ha
Business	25	1	1.05 ha	1.05 ha

Minimum Gradient of Streets	1:500
Maximum Gradient of Streets	1:11
Total Length of Streets within Township	1.3 km
Area of Streets as % of Total Area of Township	15.4%
Total Area of Parks and Open Spaces	5.3 ha
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- Survey: LO 29° system.

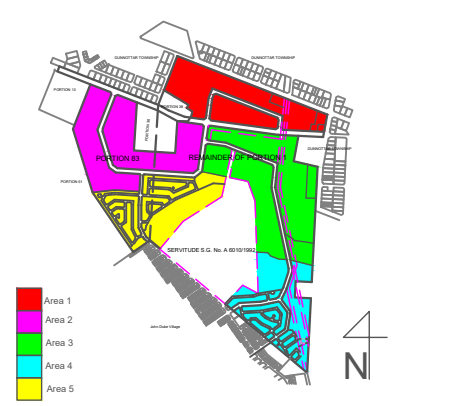
LAND USE	AREA	%
Res 3	14.22 ha	47.1 %
Open Space	12.96 ha	42.9 %
Business	1.06 ha	3.5 %
Roads	1.95 ha	6.5 %
TOTAL	30.19 ha	100.0 %

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Area 4 of John Dube X3

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LEGEND:

- - - - - 100 meter buffer zone from Rock Dump
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- - - - - Servitude areas
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- Existing buildings

LAND USE	ERF NR.	NUMBER OF ERVEN	RULING SIZE OF ERVEN	MIN SIZE OF ERF
Residential 2	26 - 32	7	1.2 ha	0.46 ha
Open Space	33	1	1947.6 m ²	1947.6 m ²
Residential 1	34 - 272	239	217 m ²	200 m ²

Minimum Gradient of Streets	1:500
Maximum Gradient of Streets	1:11
Total Length of Streets within Township	1.3 km
Area of Streets as % of Total Area of Township	15.4%
Total Area of Parks and Open Spaces	5.3 ha
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LAND USE	AREA	%
Residential 1	5.20 ha	29.1 %
Open Space	0.19 ha	1.1 %
Residential 2	9.09 ha	50.8 %
Roads	3.41 ha	19.0 %
TOTAL	17.89 ha	100.0 %



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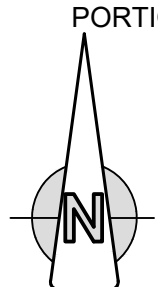
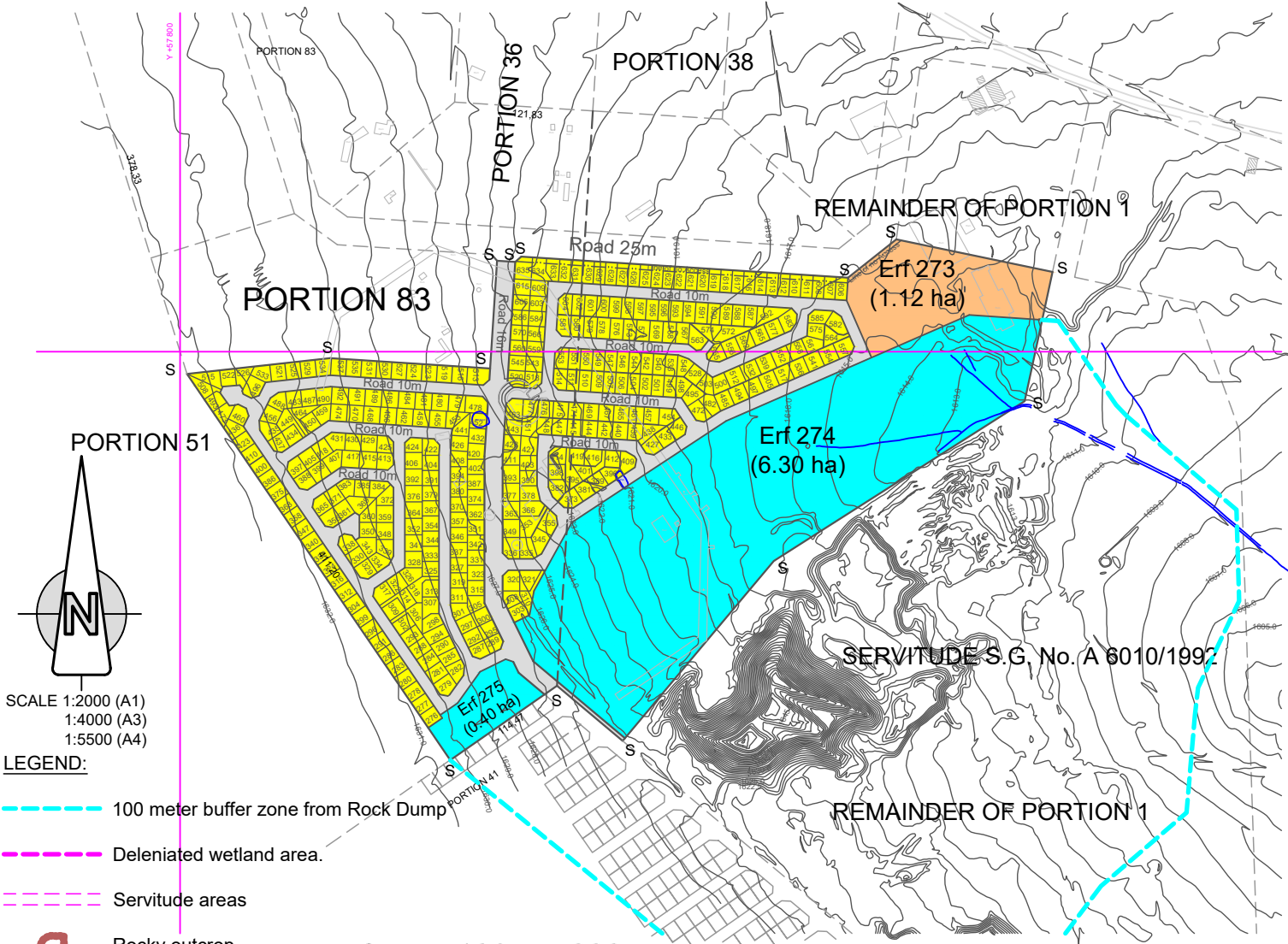
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Area 5 of John Dube X3

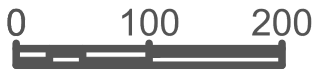
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LEGEND:

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- - - - Servitude areas
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ALL AREAS AND MEASUREMENTS ARE APPROXIMATE AND SUBJECT TO FINAL SURVEY

LAND USE	ERF NR.	NUMBER OF ERVEN	RULING SIZE OF ERVEN	MIN SIZE OF ERF
Residential 2	273	1	1.12 ha	1.12 ha
Undetermined	274 - 275	2	3.0 ha	0.4 ha
Residential 1	276 - 635	359	217 m ²	200 m ²

Minimum Gradient of Streets	1:500
Maximum Gradient of Streets	1:11
Total Length of Streets within Township	1.3 km
Area of Streets as % of Total Area of Township	15.4%
Total Area of Parks and Open Spaces	5.3 ha
Area of Parks and Open Spaces as % of Township	28.6%

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Signature:

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- Survey: LO 29° system.

LAND USE	AREA	%
Residential 1	7.61 ha	40.5 %
Undetermined	6.70 ha	35.6 %
Residential 2	1.12 ha	6.0 %
Roads	3.37 ha	17.9 %
TOTAL	18.80 ha	100.0 %



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includes a wetland.

- Area 4 extends south from the stream to the north-eastern corner of the John Dube Village. Nigel Road (M63) forms the eastern boundary except for a small block of land on Nigel Road a short distance south of the stream. The north-western boundary is an arbitrary line around existing mine waste. Area 4 covers 17,89 ha.
- Area 5 lies forms part of the south-western edge of John Dube Extension 3 and is bounded by Area 2 in the north, by a buffer zone around the mine dumps in the east and south and by a cemetery in the west. Area 5 covers 18,8 ha.

The main access to John Dube Extension 3 is to be from Vlakfontein Road (M45) near the northern end of the township. Subordinate access will from roads within the existing John Dube Village. No access will be possible from Nigel Road (M63). Vlakfontein Road is a busy arterial route. Access within the proposed township is presently limited to occasional tracks in the field.

Little structural development is present on the site. A Rand Water servitude parallel to Nigel Road crosses the site from south to north and feeds into a reservoir on Prinsep Avenue. A powerline follows the water pipeline route from south to north. Powerlines also feed an existing substation in the vicinity of a closed mine shaft south of TP 28. The presence of illegal miners in the area precluded any closer inspection. A new electrical cable was being installed along the pipeline route at the time of the fieldwork in September 2019. Existing buildings are present at the eastern end of Area 3 and their presence prevented the excavation of TP 33. Numerous structures associated with mining in the area have been demolished in Area 5 and in parts of Areas 2 and 3. The area south of the substation is highly disturbed and vehicular access is not possible. Numerous sewer manholes indicate the sewer line route from the health centre in the north-western corner across the site to where the line exits the site alongside the stream. One of the manholes south-east of the frail care centre appeared to have been leaking for some time because of the surrounding luxuriant growth and the volume of polluted water flowing across an otherwise dry site.

Pockets of waste material consisting mostly of construction and demolition waste are found next to tracks that allow vehicle access to secluded areas. Areas between TP's 23 and 54 are covered

in scattered waste from the demolition of mining infrastructure. Demolition waste is also present along Prinsep Avenue near TP 6 and in the vicinity of TP 32 in the east.

The health facility (Nokhutela Ngwenya) on Vlaktefontein Road (M45) has its eastern boundary encroaching onto Area 2. The boundary to the cemetery also appears to be incorrect at its northern end.

Vegetation over the site is extremely varied. The northern part (Area 1) against Dunnottar is a large "lawned" area consisting of two or three separate terraces possibly old sports fields. Avenues of trees exist throughout the site where early mining infrastructure existed. Large mature bluegum trees are present at the eastern end of Area 3 along Nigel Road. Veld grass is predominant in this south-eastern area where no infrastructure existed. A mixture of veld grass, exotic trees and shrubs characterise the western part of the proposed township.

The relief of site is low with a crossfall of about 34 m from west to east for the area south of Vlaktefontein Road. The lowest elevation is where a stream flows under the Nigel Road at the southern end of Area 3. The area north of Vlaktefontein Road has a crossfall of about 12 m from west to east with a small part of the eastern end draining towards the north-east.

3. GEOLOGY

According to the 1:250 000 Geological Series, Sheet No. 2628 East Rand (1986), the area is underlain partly by sediments Dwyka and Ecca Groups of the Karoo Supergroup and partly by sediments of the Turffontein Subgroup (Central Rand Group) of the Witwatersrand Supergroup. The Karoo-age sediments comprise diamictite (Dwyka Group), mudrock and sandstone (Ecca Group). The Turffontein Subgroup consists mostly of quartzite with some conglomerate.

A cover of colluvial soil and ferricrete blanket the hard rock geology of the Karoo Supergroup. No residual Karoo soils were positively confirmed in any test pit as most test pits were terminated in ferricrete. Hard rock quartzite and residual quartzite were seen in several test pits excavated on the eastern side of the site. Intermittent outcrops of hard rock quartzite occur throughout

the site between Vlakfontein Road and the easterly flowing stream at the southern end of Area 3.

4. EXISTING INFORMATION

No geotechnical information could be sourced from the Council for Geoscience databank for this site.

5. SITE INVESTIGATION

The subsoil conditions for this project were investigated by fifty shallow test pits. The test pits were excavated to depths of between 0,3 m and 2,7 m using a CAT 428F TLB supplied by Alleyroad Construction.

Detailed soil profiles were drawn up from an examination of the material seen in the test pits by an engineering geologist according to recommended standard procedures (Reference 4).

Individual soil profile descriptions are given in the Soil Profiles in Appendix B and the position of the test pits is shown on the map in Appendix E. Access problems prevented the excavation of TP's 14, 15, 17, 33 and 55.

6. LABORATORY TESTING

Twenty-two disturbed soil samples have been submitted to a soil's laboratory for sieve analyses and Atterberg limit determinations. The soils are to be classified according to Unified Soil and T R B classification systems and the results will be provided once available.

Chemical tests to determine the pH and conductivity of the shallow soils will be conducted on eleven soil samples. The results will be presented when available.

Undisturbed samples were cut from the sidewalls of TP 20, 43 and 51 and were submitted for a Collapse Potential tests. The results are presented graphically in Appendix C.

Two bulk samples of material were taken from the spoil heaps of TP 19 and TP 42 to assess the compaction characteristics of the average colluvial cover. The results will be presented graphically when available.

7. SOILS

Most of the site is characterised by a similar soil profile in the form of a layer of silty or sandy colluvium between 1,0 m and 2,0 m thick usually overlying ferricrete gravel or hardpan ferricrete. The degree of pedogenesis varies across the site from hardpan ferricrete to very slightly to slightly ferruginised gravel. The ferruginised layer was penetrated in only one or two localities because of difficult excavation conditions. The ferricrete gravel is interpreted as the pebble marker horizon at the base of the colluvium. A generalised soil profile may be described as:

0,0-0,5 m Slightly moist, grey to light grey, medium dense, intact, silty sand (colluvium) overlying

0,5-1,5 m slightly moist, light yellowish khaki mottled light orange in places, firm, intact, sandy silt with occasional soft silt kernels (colluvium) overlying

1,5-2,0 m medium and fine, subangular, matrix-supported gravel of hard and soft ferruginous concretions in a minor matrix of slightly moist to moist in places, light yellowish khaki speckled brown to light grey blotched light orange, sandy silt; overall consistency is medium dense to dense (ferruginised colluvium).

Variations in the thickness and consistency of each horizon occur across the site. Possible evidence of residual soils was observed in a few test pits excavated in the area characterised by the above soil profile. Clayey colluvium from the surface is encountered in an area south-east of the frail care centre. These areas are believed to be underlain by Karoo-age sediments which pinch out towards the east and older sediments of the Witwatersrand Supergroup are exposed.

The old sediments on the eastern side of the site consist entirely of quartzite. Outcrops of quartzite are evident throughout the central part of this eastern area. A generalised soil profile consists of a thin cover of sandy colluvium between 0,3 m and 0,8m thick overlying slightly

ferruginised quartzite gravel followed by hard rock quartzite. The quartzite is covered by Karoo-age sediments south of the stream that exits the site under Nigel Road.

8. BEDROCK

Quartzite bedrock is encountered in several test pits excavated on the eastern side of the site. Depth to fractured hard rock varies from about 0,3 m to about 0,8 m. Hard rock quartzite crops out in the middle portion of the eastern side of the proposed township as indicated on the map in Appendix E.

9. HYDROLOGY

Groundwater seepage was encountered in two widely separated areas on the site. The largest volume of seepage was intersected in the most southerly excavated test pits (TP's 46, 47 and 48). The source of the groundwater is believed to be stormwater discharge from the existing John Dube Village to the west of where the test pits were excavated. Prominent, unlined stormwater ditches discharge onto open ground in the vicinity of these three test pits. The sandy colluvium acts as a reservoir for the infiltrating run-off. Similarly, for the test pits on the western side of the property (TP's 52 and 53 and to a lesser extent TP's 49 and 51). The thick cover of sandy to silty colluvium that has been cultivated acts as a sponge and a reservoir for stormwater run-off. The water infiltrates into the permeable colluvium then flows under gravity downslope on an impermeable horizon such as a ferruginised layer. The absence of groundwater anywhere else on the site suggests the groundwater represents man-made perched water tables. The installation of appropriate lined stormwater drains and pipes should see an end to these perched water tables. A large volume of groundwater was encountered in TP 31 that was excavated on an old bowling rink. The specialised construction of the bowling rink has led to surface water easily infiltrating the soil profile. The top 1,3 m of the ground profile consists of imported sand, cinder ash and dump rock. A strong flow of groundwater was observed from below the layer of dump rock.

Surface water was observed a short distance east of TP 25. The source of the water was a blocked

sewer line. The luxuriant growth of vegetation suggests that the leak has continued for some time. Illegal miners make use of the polluted water for their mining activities. This highly polluted water eventually joins the stream that exits the site under Nigel Road. Two earth embankment dams have been built close to where the stream exits the site. The stream is the only natural drainage feature on the site and drains the gulley-head on which most of the site is located. Several drainage ditches have been excavated to facilitate the flow of run-off from the site. A single ditch in the north-eastern corner drains the site towards the north-east.

10. GEOTECHNICAL DISCUSSION

The following observations are based upon our interpretation of the conditions observed on the site. The results of the tests on the soil samples are not yet available.

The NHBRC (Reference 7) has proposed a classification into which a site should be subdivided according to the type and severity of geotechnical problems and the founding solutions required to solve the problems. The NHBRC classification has been adopted because of its relevance to township development.

10.1 Collapsible Soil: Field evidence suggested the colluvial layer to be potentially collapsible. The thickness of the potential collapsible layer ranges from 0,3 m over the shallow quartzite to 2,3 m in the deeply weathered Karoo-age sediments at the western edge of the property. The bottom limit of a collapsible layer is assumed to be the top of the gravel horizon containing ferruginous concretions. Three consolidometer test results confirm the field observations and yield Collapse Potential (CP) values of between 2,49 % (TP 51) and 8,89% (TP20). The tests were saturated at a pressure of 100 kPa.

According to Reference 5, the following degrees of "trouble" may be expected for light structures founded in or on a potentially collapsible layer. The details are given in Table 1 on the next page.

The test result indicates that "moderate trouble" to "trouble" may be expected for the layer of colluvium. The possibility that "severe trouble" can be expected cannot be

excluded as the samples were soaked at a lower pressure (100 kPa) than advocated (200 kPa) in Reference 5.

TABLE 1
Severity of Problem

Collapse Potential CP (soaked @ 200 kPa)⁹	Severity of Problem
0 - 1%	No Trouble
1 - 5%	Moderate Trouble
5 - 10%	Trouble
10 - 20%	Severe Trouble
>20%	Very Severe Trouble

Differential movement = 75% of total settlement.

Using the method set out in Reference 10, the total settlement that may be expected for a single storey house founded on normal strip footings at a depth of 0,5 m below the surface in a layer of collapsible soil, exhibiting the properties measured in TP's 20, 43 and 51, is given below in Table 2.

TABLE 2
TOTAL SETTLEMENT

TP No.	Sample Depth (m)	Collapse Potential (%) (soaked at 100kPa)	Total Settlement (mm) Ts(ns+cs)
TP 20	0,9-1,1	8,89	121(14+107)[wcs 1200mm] 50(6+44)[500mm]
TP 43	0,9-1,1	7,94	103(8+95)[wcs 1200mm] 43(3+40)[500mm]
TP 51	0,9-1,2	2,49	56(26+30)[wcs 1200mm] 23(11+12)[500mm]

It should be noted that the total settlement value (Ts) represents both normal settlement (ns) and collapse settlement (cs) values to a depth of 1,2 m below founding depth (i.e. 1,7 m from the existing ground surface). This thickness of colluvium represents a "worst-case scenario" (wcs). The limit of collapse is regarded as the top of the ferricrete gravel. The value in the second line represents the amount of total settlement for a 500 mm thick layer

of colluvium below the foundation (i.e. a layer at least 1,0 m thick).

The classification of the site follows those proposed by the NHBRC guideline as set out below in Table 3.

TABLE 3
CLASSIFICATION OF SOILS SUBJECT TO COLLAPSE SETTLEMENT

NHBRC Profile Classification	Estimated Total Collapse Settlement (mm)
C	<5
C 1	>5 - <10
C 2	>10

(Differential movement = 75% of total settlement).

The site has been delineated into three classes namely, **Classes C, C1 and C2.**

10.2 Seepage: Groundwater seepage should be expected in excavations deeper than 2,5 m along part of the western boundary as well at the south-eastern end of the site between John Dube Village and Nigel Road. The groundwater encountered in these areas represents “man-made” perched water tables caused by poor control of surface run-off. No seepage should be expected elsewhere on the site unless excavations are undertaken shortly after an extended period heavy rainfall.

10.3 Potentially Expansive Soil (Active Soil): Field observations suggested the colluvium to be non-expansive except in a limited area underlain by clay south of the frail care centre (TP’s 25, 53 and 54).

Laboratory test results should confirm the field observations and indicate the clay to exhibit medium expansiveness.

Soil profiles may be classified according to the total potential heave as detailed below in

Table 4.

TABLE 4.
NHBRC CLASSIFICATION OF EXPANSIVE SOILS

CLASS	ESTIMATED TOTAL HEAVE (mm)
H	<7,5
H 1	>7,5 – 15
H 2	>15 – 30
H 3	>30

Differential movement = 50% total heave.

The site has been provisionally delineated into two classes namely, **Classes H and H1**.

- 10.4 Normal (Compressible) Settlement: Normal strip footings for structures should not be considered for use on this site because of the compressible nature of the colluvium when moist. The consolidometer curves (Appendix C) indicate that up to 26 mm of normal settlement can be expected for the colluvium for loads of 100 kPa when the in-situ degree of saturation exceeds about 50%. This value applies to fine silty sand (Reference 5).

The classification of the site follows those proposed by the NHBRC guideline as set out below in Table 5.

TABLE 5
CLASSIFICATION OF SOILS SUBJECT TO CONSOLIDATION SETTLEMENT

NHBRC Profile Classification	Estimated Total Settlement (mm)
S	<10
S 1	>10 - <20
S 2	>20

(Differential movement = 50% of total settlement).

The entire site has been delineated into three classes namely, **Classes S; S1 and S2**.

Individual investigations should be undertaken for large/heavy structures.

10.5 Erodibility of Soil: No evidence of erosion features such as gulleys, dongas or erosion channels was observed on the site. Drainage ditches are evident, but these have been man-made.

10.6 Excavation Properties: Test pits were excavated using a CAT 428F TLB and were terminated at depths ranging from 0,3 m to 2,7 m. Difficult excavation conditions were experienced mostly on shallow hardpan ferricrete or hard rock quartzite in the eastern half of the site. Excavations of up 2,0 m deep should be possible for TLB over a substantial part of the site. Difficult excavation conditions can be expected in the east. A large excavator (20 ton) should be capable of excavating service trenches to depths greater than 2,0 m except where quartzite is present.

The use of pneumatic equipment and/or blasting is may be required if deep excavations (>2,0 m) are required in the eastern part of the site.

10.7 Undermining: Mining has taken place on the site as a sealed shaft is located about 130 m south of TP 28. No information is available as to the depth of mining but the presence of buildings such as the frail care centre and health facility suggests that shallow undermining does not extend north of the shaft. The extent and depth of undermining south of the shaft are uncertain.

10.8 Soluble Rocks: Soluble rocks (dolomite) do not underlie the property.

10.9 Steep Slopes: No steep slopes are present on the site.

10.10 Unstable Natural Slopes: Unstable natural slopes are not present.

10.11 Seismic Activity: The site is located within an area classified as having a seismic intensity of between V and VI on the modified Mercalli scale (MMS) with a 90% probability of an event not being exceeded during a 100-year occurrence period. Expected peak ground acceleration values associated with these magnitudes are given below:

- Magnitude V:Horizontal 34cm/s²Vertical17cm/s²
- Magnitude VI:Horizontal66cm/s²Vertical45cm/s²

Southern Africa is regarded as an area of low seismicity (Reference 3).

10.12 Flooding: Flooding of the property should not be expected although the presence of drainage ditches in certain areas suggest that stormwater does pose a problem during heavy downpours. Development must be excluded from below the 1 in a 50-year floodline associated with the stream in the east. Development is also excluded from the buffer zone surrounding the wetland associated with the stream.

Surface drainage should take place as sheetwash towards the headwaters of the easterly flowing stream. A small portion of the eastern part drains towards the north-east.

10.13 Sidewall Stability: All the test pits exhibited stable sidewalls to depths of up to 2,7m except for TP 31. The collapse of the saturated sidewall in TP 31 occurred below the dump-rock layer.

The moisture content of the colluvium at the time of fieldwork was at a level that favoured stable sidewalls except in TP 31.

10.14 Construction Material: The colluvium is too fine grained to be regarded as quality construction material. Pockets of suitable construction material may occur in the east where shallow ferricrete gravel or residual quartzite are present although volumes are likely to be small. The presence of a large source of mine waste including dump-rock should provide a more favourable source of construction material than creating a new borrow source within the proposed township.

Detailed bulk testing would be required before any potential source of construction material could be considered for exploitation.

10.15 Road Subgrade: The layer of compressible colluvium from the surface covering most of

the site may hamper road construction. Some form of ground improvement may be required before a suitable road subgrade can be achieved. Outcrops of hard rock quartzite are also likely to pose problems for road construction in the eastern half of the site.

10.16 Soil Chemistry: Certain conditions in the soil favour electro-chemical mechanisms which increase the rate of corrosion. These conditions include the presence of acidic soil, corrosive bacteria and electrolytes (chlorides and sulphates) which increase the soil conductivity and decrease resistivity.

No test results are presently available.

11. CONCLUSIONS AND RECOMMENDATIONS

The potential for collapse settlement represents the geotechnical condition that needs to be addressed in the development of this site. The site also has been classified according to the table of geotechnical constraints published in Reference 8 (see Appendix D).

11.1 Collapsible Soils: The site has been classified as **Classes C; C1** and **Class C2** because of the variable thickness of the potentially collapsible colluvium.

The founding solutions for light structures in the various classes as recommended by the NHBRC are given in Table 6 on the next page.

The founding solutions recommended for light structures erected on **Class C1** land are given below.

- **Modified Normal:** Reinforced strip footings with articulation joints at some internal and all external doors. The masonry should be lightly reinforced. Foundation pressures should not exceed 50 kPa.
- **In Situ Soil Compaction below Footings:** Remove in situ soil to a depth and width of 1,5 times the foundation width or a competent horizon. Replace with suitable material compacted to 93 % MOD. AASHTO density at -1 % and +2 % of optimum

moisture content (OMC). The removed material is often suitable for replacement. Normal construction with lightly reinforced strip foundations and masonry may then be utilised.

TABLE 6
RECOMMENDED CONSTRUCTION METHODS

NHBRC Profile Classification	Estimated Total Settlement (mm)	Recommended Construction Method
C	<5	Normal Construction.
C 1	>5 – 10	Modified Normal; Compaction of in situ Soil; Deep Strip Foundations or Soil Raft
C 2	>10	Stiffened or Cellular Raft; Deep Strip Foundations; Compaction of in situ Soil; Piled Construction or Soil Raft

(Differential movement = 75% of total settlement).

- **Deep Strip Footings:** Found on a competent horizon below the problem layer using normal construction but with the use of fabric reinforcement in floor slabs. The site should be adequately drained.
- **Soil Raft:** Remove in situ material to 1,0 m beyond the perimeter of the structure to a depth of 1,5 times widest foundation or a competent horizon and replace with inert backfill compacted at 93 % Mod. AASHTO density at +2 % to -1 % of OMC. Normal construction methods with lightly reinforced strip footings and light reinforcement in masonry.

The founding solutions recommended for light structures erected on **Class C2** land are given below.

- **Stiffened Strip Footings, Stiffened or Cellular (waffle) Raft:** Stiffened strip footings or stiffened or cellular raft with articulation joints or lightly reinforced masonry. Bearing pressure should not exceed 50 kPa. Mesh reinforcement in floor slabs. The site should be properly drained and adequate plumbing and service precautions should be taken to prevent leaks.

- **Piled or Pier Foundations:** Reinforced concrete ground beams or solid slabs on piled or pier foundations. Ground slabs with fabric reinforcement. The site should be properly drained and adequate plumbing and service precautions should be taken to prevent leaks.
- **In Situ Soil Compaction below Footings:** See **C1** recommendations above.
- **Deep Strip Footings:** See **C1** recommendations above.
- **Soil Raft:** See **C1** recommendations above.

NHBRC Classification: C1 and C2. Geotechnical Constraint: 2A.

11.2 **Seepage:** Seepage from below a depth of 2,0 m should be expected in excavations at the south-eastern corner of the site and on the western side in the vicinity of TP's 52 and 53. Extensive perched water tables and flooding of shallow service trenches are unlikely to be a problem elsewhere on this site. *Geotechnical Constraint: 1B.*

11.3 **Potentially Expansive Soils (Active Soil):** No test results are available but the soils in the vicinity of TP's 25, 53 and 54 appear to exhibit medium expansiveness. The site has been provisionally classified as **Class H** and **Class H1**.

Table 7 on the next page sets out the various foundation solutions according to the profile classification in Table 2.

Although normal construction is permissible on **Class H** land, other geotechnical constraints need to be considered. These include collapsible and compressible soils.

The founding solutions recommended for light structures erected on **Class H1** land are given below.

- **Modified Normal:** Lightly reinforced strip footings with articulation at all internal/external doors and openings. Light reinforcement in masonry. The site should be properly drained and adequate plumbing and service precautions should be taken to prevent leaks.

TABLE 7
RECOMMENDED CONSTRUCTION METHODS

NHBRC Profile Classification	Estimated Total Heave (mm)	Recommended Construction Method
H	<7,5	Normal Construction below the colluvium
H1	>7,5 – 15	Modified Normal or Soil Raft
H2	>15 – 30	Stiffened or Cellular Raft, Piled Construction, Split Construction or Soil Raft
H3	>30	Stiffened or Cellular Raft, Piled Construction or Soil Raft.

- Soil Raft:** Remove all or part of the expansive horizon to 1,0m beyond the perimeter of the structure to a depth of 1,5 times the widest foundation or a competent horizon and replace with inert backfill compacted at 93% Mod. AASHTO density at +2% to -1% of OMC. Normal construction methods with lightly reinforced strip footings and light reinforcement in masonry if residual movements are <7,5mm or the appropriate construction method to accommodate residual movements.

NHBRC Classification: H and H1. Geotechnical Constraint: 2C.

11.4 Normal (Compressible) Settlement: The site has been delineated into **Classes S; S1 and S2.**

The recommended founding solutions for light structures for the various classes of normal settlement are given in Table 8 on the next page.

The founding solutions recommended for light, single-storey structures erected on **Classes S1 and S2** land are the same as those given for Classes C1 and C2 in 11.1 above.

TABLE 8
RECOMMENDED CONSTRUCTION METHODS

NHBC Profile Classification	Estimated Total Settlement (mm)	Recommended Construction Method
S	<10	Normal Construction foundations placed below the topsoil.
S 1	>10 - <20	Modified Normal; Compaction of in situ Soil; Deep Strip Foundations or Soil Raft
S 2	>20	Stiffened or Cellular Raft; Deep Strip Foundations; Compaction of in situ Soil; Piled Construction or Soil Raft

All waste material should be removed from any land before development is considered.

NHBC Classification: S1 and S2. Geotechnical Constraint: 2D.

11.5 Erodibility of Soil: Field evidence does not indicate easily erodible soils. Soils should be nevertheless protected from erosion where necessary. *Geotechnical Constraint: 1E.*

11.6 Excavation Properties: A mechanically sound TLB should be capable of excavating trenches to a depth of about 2,0 m without difficulty except in the eastern half of the site where shallow ferricrete or quartzite poses a problem.

Pneumatic tools and/or blasting are likely to be required on the eastern side of the site. An excavation classification (SABS 1200) would see the western half of the site being classified as soft excavation for the top 1,5 m of the ground profile. The eastern half is likely to be classified as hard excavation. *Geotechnical Constraint: 1/2F.*

11.7 Undermining: A sealed mine shaft is present south of TP 28. No information is available regarding the depth of undermining. A separate investigation would be needed to assess the depth of undermining in the area. *Geotechnical Constraint: 2G.*

11.8 Soluble Rocks: Soluble rocks (dolomite) are not present beneath the site. *Geotechnical Constraint: 1H.*

11.9 Steep Slopes: Steep slopes are not present. *Geotechnical Constraint: 1I.*

11.10 Unstable Natural Slopes: No unstable natural slopes occur on the site. *Geotechnical Constraint: 1J.*

11.11 Seismic Activity: The potential for natural seismic activity is low. The site lies within an area classified as having a natural seismic intensity of between V and VI on the modified Mercalli scale (Reference 3). *Geotechnical Constraint: 1K.*

11.12 Flooding: Flooding is not expected on this site. Development should be excluded below the 1 in a 100-year floodline and the buffer strip around the wetland.

Surface drainage over most of the site should occur as sheetwash towards the headwaters of the stream. A small part of the eastern portion drains towards the north-east.

11.13 Sidewall Stability: Stable sidewalls should be expected in excavations shallower than 1,5 m. Competent personnel must inspect all excavations deeper than 1,5 m.

The presence of groundwater in any excavation is indicative of potentially unstable conditions and must be treated with caution.

11.14 Construction Material: The shallow soils are too fine grained to be of use as a quality construction material. Some of the colluvium may be suitable for fill. Detailed testing of any potential source will be required before exploitation is possible.

The large volume of mine waste should be properly assessed before any exploitation of township land is considered because of the potential loss of valuable developable land.

11.15 Road Subgrade: The potentially compressible colluvium requires some form of ground improvement before use as a road subgrade. The colluvium should be compacted to achieve 90 % Mod AASHTO for 0,0-0,5 m and 85 % Mod AASHTO for 0,5-1,0 m.

11.16 Soil Chemistry: No chemical test results are available.

12. GENERAL

It must be borne in mind that an investigation of this nature is aimed at delineating broad areas in which problems may occur. Consequently, certain generalisations must be made to avoid the necessity of a costly investigation at every stand.

It may be found that soil conditions at variance with those discussed in this report do occur locally. Competent personnel should inspect the variant conditions to ensure that these conditions do not pose a problem for a specific development

The NHBRC requires a stand list indicating the soil classification for each stand as part of a Phase 2 investigation to facilitate NHBRC enrolment. It is strongly recommended that this investigation (Phase 2) should run concurrently with the installation of services. A refinement of the soil boundaries will then be possible.



E Shedden (Pr Sci Nat)

RELLY MILNER AND SHEDDEN

JUNE 2020

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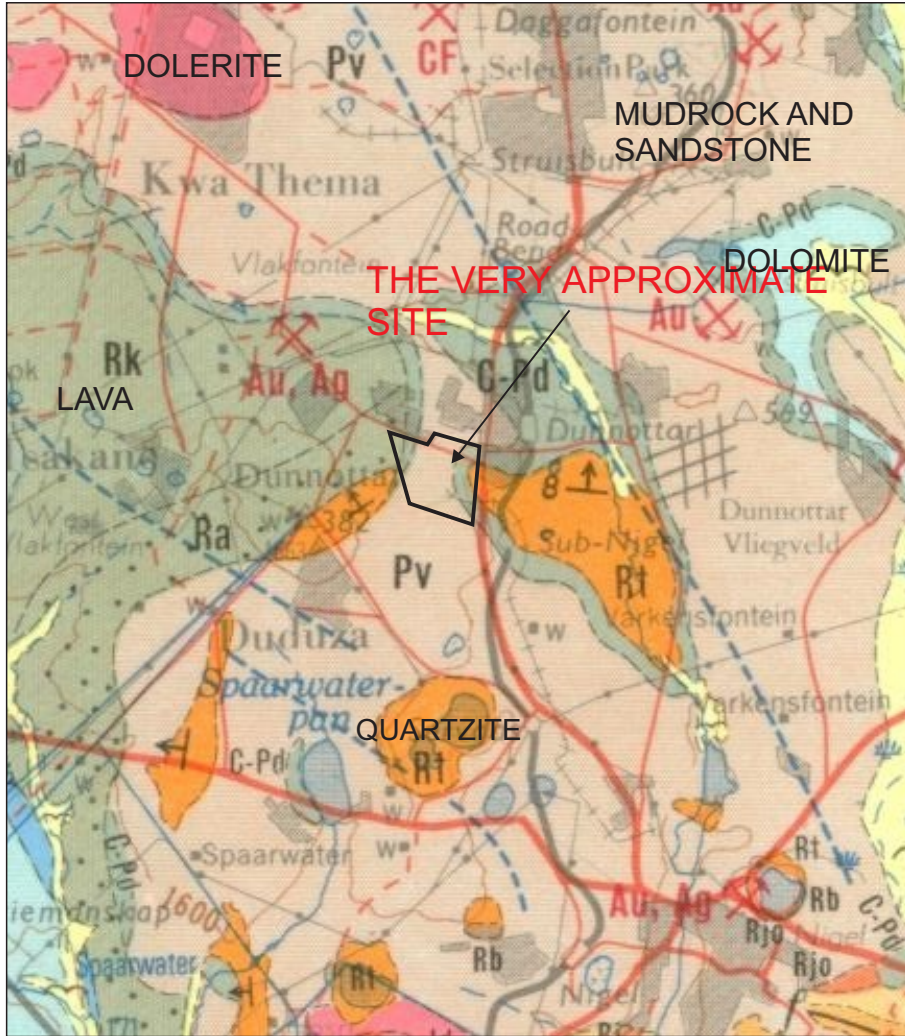
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APPENDIX A

REGIONAL GEOLOGY

REGIONAL GEOLOGY

JOHN DUBE EXTENSION 3, Ekurhuleni Metro, Gauteng.



Excerpt from 1:250 000 Geological Series,
Sheet No: 2628 East Rand.
[Not to scale]

LEGEND

Pv = Sandstone, shale and
coal beds
C-Pd = Diamictite and shale

Vryheid
Formation

Ecca
Group
Dwyka
Group

Karoo
Supergroup

Rk = Basaltic lava, agglomerate
and tuff

Klipriviersberg
Group

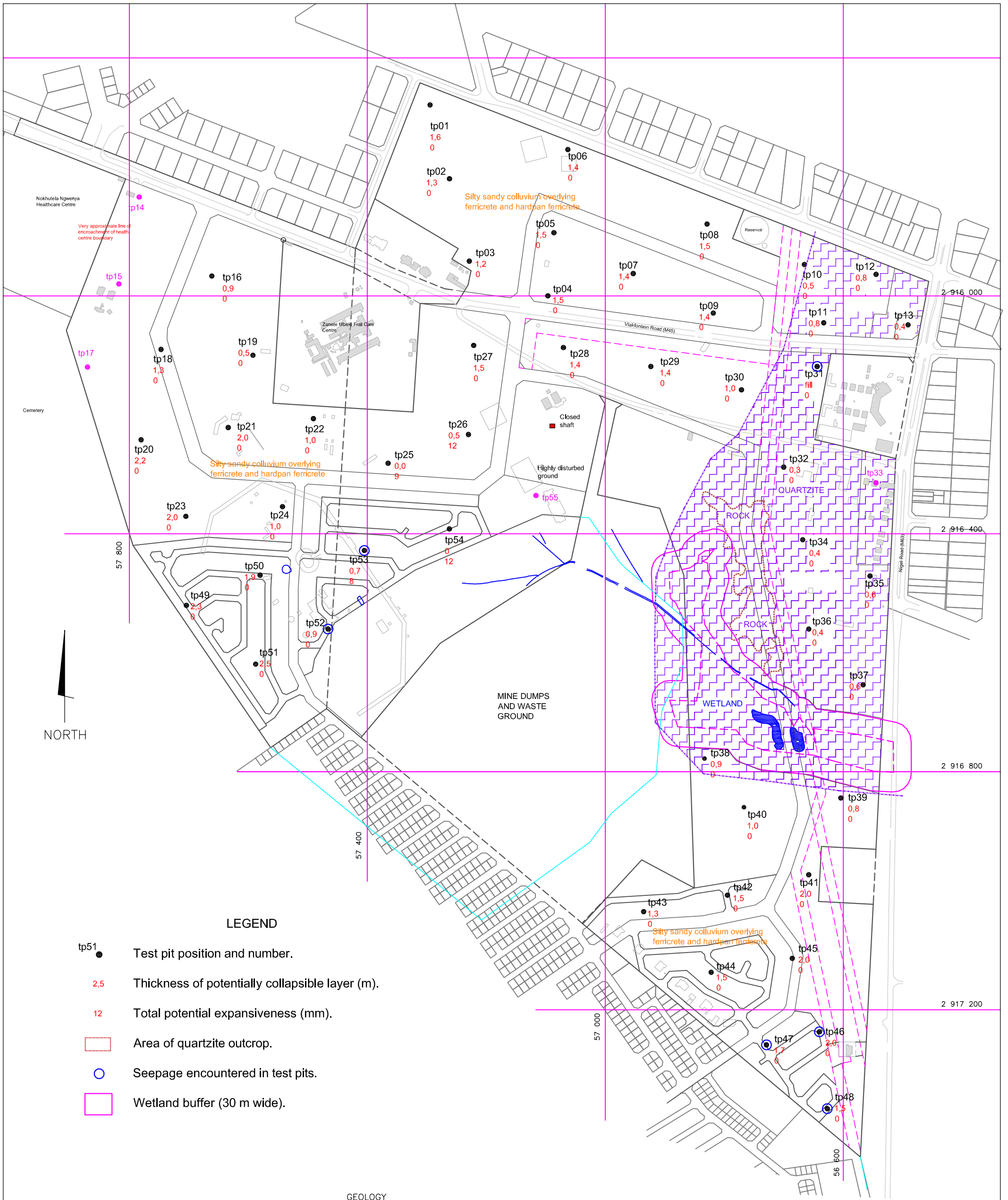
Ventersdorp
Supergroup

Rt = Quartzite, conglomerate
and sandy shale

Turffontein
Subgroup

Central Rand
Group

Witwatersrand
Supergroup



LEGEND

- tp51 Test pit position and number.
- 2.5 Thickness of potentially collapsible layer (m).
- 12 Total potential expansiveness (mm).
- Area of quartzite outcrop.
- Seepage encountered in test pits.
- Wetland buffer (30 m wide).

GEOLOGY

- Dwyka and Ecca Group sediments (mudrock and sandstone) Karoo Supergroup.
- Turffontein Subgroup – Central Rand Group (quartzite and conglomerate) Witwatersrand Supergroup

LOCALITY:		
JOHN DUBE EXTENSION 3		
TITLE:		
GEOLOGY.		
PREPARED BY:	SCALE	DATE
RELLY MILNER AND SHEDDEN	1: 6 000	June 2020
P O BOX 32107	JOB No.	FILE No.
GLENSTANTIA 0010	19127jdX3	ac\19\johndX3
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APPENDIX B

SOIL PROFILES

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 1
Recorded by: es **Date:** 10/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57295 **X:** 2915679

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Dotted pattern]	0,0-0,6 m: Slightly moist, grey, medium dense, fractured, slightly clayey, silty SAND; colluvium.			
-0.5	[Dotted pattern]	0,6-1,6 m: Slightly moist becoming moist with depth, firm, intact, sandy SILT with scattered soft and some hard, slightly ferruginised, silt kernels; colluvium. Some orange blotching below 1,3m.			
-1.0	[Dotted pattern]				
-1.5	[Dotted pattern]				
-2.0	[Gravel pattern]	1,6-2,0 m: Medium and fine, subangular, matrix-supported GRAVEL of hard and soft, ferruginous concretions in a minor matrix of moist, light grey mottled khaki, very slightly ferruginised, sandy silt; overall consistency is dense; pebble marker horizon(?). Becoming dense, ferruginised, sandy silt at bottom of test pit.			
-2.0	[Gravel pattern]	EOH @ 2,0m.			
-2.5	[Gravel pattern]				
-3.0	[Gravel pattern]				
-3.5	[Gravel pattern]				

Total depth: 2,0 m

Page 1 of 1



- NOTES:**
- 1) Slow excavation at 2,0m in slightly ferruginised residuum(?).
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 0,9m.
 - 4) Founding depth at 1,6 m at 150 kPa. 50 kPa above.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 1

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 2

Recorded by: es **Date:** 10/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57262 **X:** 2915803

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,7 m: Slightly moist, light grey, medium dense, silty SAND; colluvium.			
-0.5					
-1.0		0,7-1,3 m: Slightly moist, light orange mottled dark brown, stiff, intact, slightly ferruginised, sandy SILT with traces of subangular gravel (ferruginised concretions and some quartz)in places below 1,0m suggests pebble marker.			
-1.5		1,3-2,1 m: Moist, light grey mottled and blotched orange, black and reddish brown, stiff, very slightly ferruginised, sandy SILT with scattered, fine gravel of quartzite and ferruginous concretions; residual diamictite(?).			
-2.0		Becoming clayey silt at the bottom of the test pit.			
-2.0		EOH @ 2,1m.			
-2.5					
-3.0					
-3.5					

Total depth: 2,1 m

Page 1 of 1



- NOTES:**
- 1) Hole stopped at 2,1m in clayey silt. No refusal.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 0,7m.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 2

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 3

Recorded by: es **Date:** 10/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57229 **X:** 2915942

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Symbol]	0,0-0,5 m: Slightly moist, light grey, medium dense to dense, intact, slightly clayey, silty SAND; colluvium.			
-0.5	[Symbol]	0,5-1,2 m: Slightly moist, light yellow khaki mottled light orange, stiff, intact, very slightly ferruginised, sandy SILT with minor, hard and soft, ferruginous, silt kernels; colluvium.			
-1.0	[Symbol]	1,2-1,5 m: Slightly moist, khaki blotched dark brown, grey and orange, dense, intact, slightly ferruginised, sandy SILT with abundant, hard and soft, ferruginous concretions; colluvium (including pebble marker horizon).			
-1.5	[Symbol]	EOH @ 1,5m.			
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,5 m

Page 1 of 1



- NOTES:**
- 1) Slow excavation at 1,5 m on slightly ferruginised colluvium.
 - 2) Groundwater not encountered. Next to large, mature blue gums.
 - 3) Roots in top 0,4m.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 3

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 4
Recorded by: es **Date:** 9/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57097 **X:** 2916000

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,4 m: Slightly moist, light grey, medium dense to dense, intact, slightly clayey, silty SAND; colluvium.			
-0.5		0,4-1,0 m: Slightly moist to moist, light yellowish khaki, firm, intact, sandy SILT; colluvium.			
-1.0		1,0-1,5 m: Moist, light yellowish khaki widely speckled orange, firm, intact, very slightly ferruginised, sandy SILT with scattered soft, silt kernels; colluvium.			
-1.5		1,5-1,7 m: Moist, light grey blotched yellowish khaki mottled orange-brown, stiff, intact, slightly ferruginised, sandy SILT with traces of hard and soft, ferruginous concretions; pebble marker.			
-1.8		1,7-1,8 m: Becoming ferruginised quartzite at the bottom of the test pit.			
-2.0		EOH @ 1,8m.			
-2.5					
-3.0					
-3.5					

Total depth: 1,8 m

Page 1 of 1



NOTES:

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 4

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 5

Recorded by: es **Date:** 10/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57086 **X:** 2915895

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Symbol]	0,0-0,7m: Slightly moist, light grey, medium dense, intact, silty SAND; colluvium.			
-0.5	[Symbol]	Thin horizon of ferricrete gravel at 0,6 m.			
-1.0	[Symbol]	0,7-1,5 m: Slightly moist, light yellowish khaki, firm, intact, sandy SILT with occasional soft, silt kernels; colluvium.			
-1.5	[Symbol]	1,5-1,9 m: Slightly moist, light yellow khaki mottled dark brown, stiff, slightly ferruginised, sandy SILT with abundant hard and soft, ferruginous concretions; pebble marker(?). Becoming very stiff at the bottom of the test pit.			
-2.0	[Symbol]	EOH @ 1,9m.			
-2.5	[Symbol]				
-3.0	[Symbol]				
-3.5	[Symbol]				

Total depth: 1,9 m

Page 1 of 1



- NOTES:**
- 1) Hole stopped at 1,9 m in slightly ferruginised residuum. Slow excavation.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 1,2 m.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 5

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 6
Recorded by: es **Date:** 9/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57063 **X:** 2915754

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Symbol]	0,0-0,6 m: Slightly moist, light grey, medium dense, intact, slightly clayey, silty SAND; colluvium.			
-0.5	[Symbol]	0,6-1,4 m: Moist, light yellow khaki mottled light orange below 1,1 m, firm, intact, sandy SILT with traces of soft silt kernels below 1,2 m; colluvium.			
-1.0	[Symbol]				
-1.5	[Symbol]	1,4-1,6 m: Medium and fine, angular to subangular, matrix-supported GRAVEL of hard and soft, ferruginous concretions in a trace matrix of slightly moist, light greyish khaki mottled orange, sandy silt; overall consistency is medium dense to dense with depth; pebble marker.			
-1.7	[Symbol]	1,6-1,7 m: Becoming orange-brown mottled grey, dense, hardpan and honeycomb FERRICRETE (ferruginised quartzite?) EOH @ 1,7m.			
-2.0	[Symbol]				
-2.5	[Symbol]				
-3.0	[Symbol]				
-3.5	[Symbol]				

Total depth: 1,7 m

Page 1 of 1



- NOTES:**
- 1) Machine refusal at 1,7m on hardpan ferricrete.
 - 2) Groundwater not encountered.
 - 3) Roots in top 0,3m. Fine roots in top 1,2m.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 6

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 7
Recorded by: es **Date:** 9/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56953 **X:** 2915963

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Symbol]	0,0-0,6 m: Slightly moist, light grey, medium dense to dense, intact, slightly clayey, silty SAND; colluvium.			
-0.5	[Symbol]	0,6-1,4 m: Moist, light yellow khaki blotched pale orange in places, firm, intact, sandy SILT with occasional soft, silt kernels; colluvium.			
-1.0	[Symbol]	1,4-1,8 m: Moist, light khaki widely speckled dark brown, stiff, intact, very slightly ferruginised, sandy SILT with abundant, hard and some soft, ferruginous concretions; colluvium (very slightly ferruginised).			
-1.5	[Symbol]	EOH @ 1,8m.			
-2.0	[Symbol]				
-2.5	[Symbol]				
-3.0	[Symbol]				
-3.5	[Symbol]				

Total depth: 1,8 m



- NOTES:**
- 1) Slow excavation at 1,8m in slightly ferruginised residuum.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 1,4m.
 - 4) Excavation level platform.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 7

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 8
Recorded by: es **Date:** 9/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56829 **X:** 2915879

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,7 m: Slightly moist, light grey, medium dense, intact, silty, fine SAND; colluvium.			
-0.5					
-1.0		0,7-1,5 m: Slightly moist to moist, light khaki, firm, intact, sandy SILT with widely scattered hard, ferruginous concretions; colluvium.			
-1.5		1,5-1,7 m: Medium and fine, subangular to angular, matrix-supported, friable GRAVEL of hard ferruginous concretions and scattered quartzite in minor of slightly moist, khaki blotched brown, sandy silt; overall consistency is medium dense to dense; pebble marker horizon.			
-1.7		EOH @ 1,7m.			
-2.0		>1,7 m: Hardpan FERRICRETE at the bottom of the test pit.			
-2.5					
-3.0					
-3.5					

Total depth: 1,7 m

Page 1 of 1



- NOTES:**
- 1) Machine refusal at 1,7 m on hardpan ferricrete.
 - 2) Groundwater not encountered.
 - 3) Roots top 0,8 m. Fine roots in top 1,4 m.
 - 4) Excavated on edge of a shallow platform.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 8

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 9

Recorded by: es **Date:** 9/9/2019

Elevation: mamsl

Coordinates Wgs: 29 Y: 56819 X: 2916029

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,7 m: Slightly moist, light grey, medium dense to dense, intact, silty SAND; colluvium.			
-0.5					
-1.0		0,7-1,4 m: Slightly moist, light khaki blotched orange with depth, firm to stiff, very slightly ferruginised, sandy SILT with scattered light orange, soft, silt kernels below 1,0m; colluvium.			
-1.5		1,4-1,5 m: Light khaki mottled and blotched orange-brown, dense, intact, hardpan FERRICRETE with lenses of gravel above 1,5m.			
-1.5		EOH @ 1,5m.			
-1.5		>1,5 m: Hardpan FERRICRETE.			
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,5 m

Page 1 of 1



- NOTES:**
- 1) Difficult excavation at 1,5m on ferruginised quartzite(?).
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 1,1m.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 9

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 10
Recorded by: es **Date:** 9/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56665 **X:** 2915947

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Dotted pattern]	0,0-0,5 m: Slightly moist, light grey, medium dense, intact, silty SAND; colluvium.			
-0.5	[Diagonal hatching]	0,5-1,2 m: Fine with some medium, angular, matrix-supported GRAVEL of hard ferruginous concretions, scattered quartz and some quartzite in a minor matrix of moist, khaki, sandy silt; overall consistency is medium dense becoming dense with depth; pebble marker.			
-1.0	[Diagonal hatching]				
-1.5	[Purple wavy pattern]	1,2-1,6 m: Orange-brown mottled khaki, highly weathered, widely bedded, ferruginised, very soft rock QUARTZITE with abundant milky white, vein quartz. Tends to honeycomb ferricrete in places.			
-1.6	[Arrow pointing to 1.6m depth]	EOH @ 1,6m.			
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,5 m



- NOTES:**
- 1) Machine refusal at 1,6 m on ferruginised, completely weathered quartzite.
 - 2) Groundwater not encountered but moisture visible on some fractures at the bottom of the test pit.
 - 3) Fine roots in top 600 mm.
 - 4) Ferruginised quartzite represents Witwatersrand

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 10

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 11
Recorded by: es **Date:** 9/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56633 **X:** 2916045

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,3 m: Slightly moist, light grey, medium dense, intact, silty SAND with scattered, fine gravel of quartzite; colluvium.			
-0.5		0,3-0,8 m: Moist, grey mottled light orange, firm, fractured, slightly sandy, clayey SILT; colluvium.			
-1.0		0,8-1,0 m: Orange-brown, dense to very dense, hardpan FERRICRETE. EOH @ 1,0m.			
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,5 m



- NOTES:**
- 1) Machine refusal at 1,0m on hardpan ferricrete.
 - 2) Groundwater not encountered but signs of moisture in the soil at the bottom of the test pit.
 - 3) Fine roots in top 300mm (mainly grass roots).
 - 4) Adequate damp proofing required.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 11

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 12
Recorded by: es **Date:** 9/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56545 **X:** 2915964

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Symbol]	0,0-0,4 m: Slightly moist to moist, dark grey, loose to medium dense, intact, silty SAND; colluvium.			
-0.5	[Symbol]	0,4-0,8 m: Moist to very moist, khaki mottled light orange, firm, intact, slightly clayey, sandy SILT; colluvium.			
-1.0	[Symbol]	0,8-1,1 m: Very moist, light khaki grey blotched orange, firm, intact, slightly clayey, sandy SILT with abundant, hard and soft, ferruginous concretions; colluvium.			
-1.1	[Symbol]	1,1-1,2 m: Becoming hardpan FERRICRETE at the bottom of the test pit.			
-1.2	[Symbol]	EOH @ 1,2m.			
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,2 m

Page 1 of 1



- NOTES:**
- 1) Machine refusal at 1,6m on hardpan ferricrete.
 - 2) No visible groundwater but soil very moist immediately above hardpan.
 - 3) Fine roots in top 300mm.

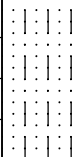
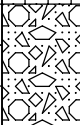

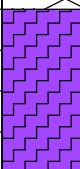
Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 12

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 13
Recorded by: es **Date:** 9/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56491 **X:** 2916049

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,4 m: Slightly moist, light brown, medium dense, intact, silty SAND; colluvium.			
-0.5		0,4-0,7 m: Fine with scattered medium, subangular, matrix-supported, friable GRAVEL of highly weathered quartzite and quartz in a minor matrix of slightly moist, light khaki, silty sand; overall consistency is medium dense; pebble marker.			
-1.0		0,7-1,1 m: Medium and fine, angular, clast-supported GRAVEL of hard, ferruginised quartzite in trace matrix of slightly moist, khaki blotched orange-brown, silty sand; overall consistency is dense; residual quartzite.			
-1.5		1,1-1,5 m: Beige streaked khaki and orange-brown, highly weathered, closely bedded, slightly ferruginised to ferruginised, very soft rock QUARTZITE.			
-1.5	EOH @ 1,5m.				
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,5 m

Page 1 of 1



- NOTES:**
- 1) Machine refusal at 1,5m on very soft rock quartzite.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 300mm (mainly grass roots).

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 13

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 16
Recorded by: es **Date:** 10/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57661 **X:** 2915967

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,4 m: Slightly moist, light grey, medium dense to dense, intact, silty SAND; colluvium.			
-0.5		0-4-0,9 m: Slightly moist, light grey mottled light orange blotched khaki, stiff, intact, slightly ferruginised, sandy SILT with traces of hard and soft, silt kernels; colluvium (very slightly ferruginised).			
-1.0	◇ ◇ ◇ ◇ ◇ ◇	0,9-1,2 m: Orange-brown mottled light orange, dense, honeycomb and hardpan FERRICRETE. EOH @ 1,2m.			
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,2 m



- NOTES:**
- 1) Slow excavation at 1,2m in ferruginised colluvium(?).
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 0,8m.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 16

SOIL PROFILE

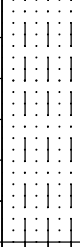


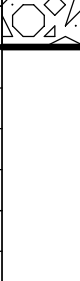
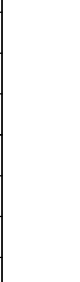
Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 18

Recorded by: es **Date:** 10/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57747 **X:** 2916090

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,6 m: Slightly moist, light brownish grey, medium dense, intact, silty SAND; colluvium.			
-0.5		0,6-1,3 m: Moist, khaki, firm, intact, sandy SILT with scattered, fine gravel of ferricrete nodules and quartz; colluvium.			
-1.0		1,3-2,1 m: Medium and fine, subangular to subrounded, matrix-supported GRAVEL of hard and soft, ferruginous concretions in a trace matrix of moist, light khaki to light grey mottled orange, slightly clayey, sandy silt; overall consistency is medium dense with scattered dense pockets; slightly ferruginised pebble marker(?).			
-1.5		Becoming dense and very moist at the bottom of the test pit			
-2.0		EOH @ 2,1m.			
-2.5					
-3.0					
-3.5					

Total depth: 2,1 m

Page 1 of 1



- NOTES:**
- 1) Hole stopped at 2,1m in slightly ferruginised pebble marker(?). No refusal.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 1,1m.
 - 4) Disturbed ground between TP's 19 and 18.

Contractor: Alleyroad Construction

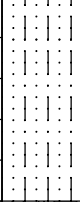


Machine: CAT 428F

Test Pit No: 18

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 19
Recorded by: es **Date:** 10/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57592 **X:** 2916100

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,5 m: Slightly moist, light grey, medium dense, fractured silty SAND with abundant roots; colluvium.			
-0.5		0,5-1,2 m: Medium and fine, subangular, matrix-supported GRAVEL of hard and soft, ferruginous concretions in a trace matrix of slightly moist, light orange khaki mottled orange, sandy silt; overall consistency is dense to very dense; colluvium (ferruginised).			
-1.0		EOH @ 1,2m.			
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,2 m

Page 1 of 1



- NOTES:**
- 1) Difficult excavation at 1,2m in ferruginised colluvium.
 - 2) Groundwater not encountered.
 - 3) Roots in top 0,3m. Close to mature bluegum trees.
 - 4) Bulk sample for compaction test (CBR).

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 19

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 20

Recorded by: es **Date:** 10/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57781 **X:** 2916243

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,8 m: Slightly moist, light brownish grey, medium dense, fractured in top 0,2m, silty SAND; colluvium.			
-0.5					
-1.0		0,8-2,2 m: Slightly moist to moist, light yellow khaki, firm with stiff pockets, intact, sandy SILT; colluvium.	UD		
-1.5					
-2.0					
-2.5		2,2-2,4 m: Moist, light khaki blotched reddish orange, stiff, intact, sandy SILT with minor soft and occasional hard, silt kernels; colluvium(?). EOH @ 2,4m.			
-3.0					
-3.5					

Total depth: 2,4 m

Page 1 of 1



- NOTES:**
- 1) Hole stopped at 2,4 m in colluvium. No refusal.
 - 2) Groundwater not encountered.
 - 3) Roots in top 0,3 m. Fine roots in top 1,4 m.
 - 4) Undisturbed sample at 0,9-1,1 m. CP=8,89%

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 20

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 21

Recorded by: es **Date:** 10/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57634 **X:** 2916221

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,5 m: Moist, light brownish grey, medium dense, intact, silty, fine SAND; colluvium.			
-0.5		0,5-1,5 m: Moist, light brownish orange, firm, intact, sandy SILT; colluvium.			
-1.0					
-1.5		1,5-2,0 m: Moist, light brownish orange mottled reddish brown, firm, intact, sandy SILT; with traces of soft, silt kernels; colluvium.			
-2.0		2,0-2,2 m: Moist, light grey mottled orange, stiff, intact, very slightly ferruginised, slightly clayey, sandy SILT with abundant hard and soft, ferruginous nodules; colluvium(?).			
-2.2		EOH @ 2,2m.			
-2.5					
-3.0					
-3.5					

Total depth: 2,2 m

Page 1 of 1



- NOTES:**
- 1) Hole stopped at 2,2m.
 - 2) Groundwater not encountered.
 - 3) Fine roots in 1,3m.

Contractor: Alleyroad Construction

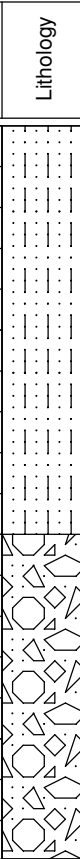
Machine: CAT 428F

Test Pit No: 21

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 22
Recorded by: es **Date:** 10/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57491 **X:** 2916206

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0 -0.5 -1.0 -1.5 -2.0 -2.5 -3.0 -3.5		<p>0,0-1,0 m: Slightly moist, light grey, medium dense, fractured above 0,2m, silty SAND; colluvium.</p> <p>Becoming slightly clayey below 0,8m.</p> <p>1,1-1,8 m: Medium and fine, subangular, matrix-supported GRAVEL of hard and soft, ferruginous concretions in a minor matrix of moist, light grey mottled orange, slightly clayey, sandy silt; overall consistency is medium dense becoming dense below 1,7m; pebble marker(?).</p> <p>EOH @ 1,8m.</p>			

Total depth: 1,8 m



- NOTES:**
- 1) Difficult excavation at 1,8m in ferruginised colluvium.
 - 2) Groundwater not encountered but soil moist at the bottom of the test pit.
 - 3) Fine roots in top 1,1m.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 22

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 23

Recorded by: es **Date:** 10/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57705 **X:** 2916371

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Symbol]	0,0-0,6 m: Slightly moist, light brownish grey, medium dense to dense, fractured above 0,4m, silty SAND; colluvium.			
-0.5	[Symbol]	0,6-2,0 m: Slightly moist to moist, light yellow khaki, firm, intact, sandy SILT with scattered, decomposed roots; colluvium.			
-1.0	[Symbol]				
-1.5	[Symbol]				
-2.0	[Symbol]	2,0-2,3 m: Moist, light khaki grey mottled light orange and dark khaki, stiff, intact, very slightly ferruginised, sandy SILT with abundant, fine and medium gravel of hard and soft silt kernels and ferricrete nodules; colluvium (very slightly ferruginised).			
-2.5	[Symbol]	EOH @ 2,3m.			
-3.0	[Symbol]				
-3.5	[Symbol]				

Total depth: 2,3 m

Page 1 of 1



- NOTES:**
- 1) Hole stopped at 2,3m in very slightly ferruginised colluvium(?). No refusal.
 - 2) Groundwater not encountered.
 - 3) Roots to 1,8m. Excavated amongst both mature and young blue gum trees. Ruins in the vicinity.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 23

SOIL PROFILE

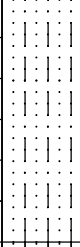



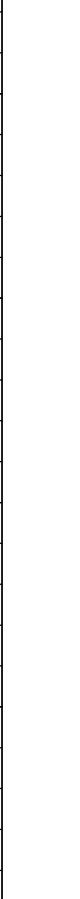
Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 24

Recorded by: es **Date:** 17/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57543 **X:** 2916354

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,6 m: Moist, light grey, medium dense to dense, intact, slightly clayey SAND; colluvium.			
-0.5		0,6-1,0 m: Slightly moist, light khaki mottled orange, stiff (after exposure), intact, sandy SILT with widely scattered, soft silt kernels; colluvium.			
-1.0		1,0-1,2 m: Medium and fine, subangular, matrix-supported GRAVEL of hard and soft, ferruginous concretions in a trace matrix of slightly moist, light khaki mottled orange, sandy silt; overall consistency is medium dense; pebble marker(?). Tends to honeycomb ferricrete at the bottom of the test pit.			
-1.2		EOH @ 1,2m.			
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,2 m

Page 1 of 1



- NOTES:**
- 1) Difficult excavation at 1,2 m in ferruginised colluvium.
 - 2) Groundwater not encountered.
 - 3) Roots in top 0,4m. Fine roots in top 1,0m. Excavated next to ruins.
 - 4) Profiled 2 days after excavation.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 24

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein -IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 25

Recorded by: es **Date:** 10/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57365 **X:** 2916281

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Diagonal hatching symbol]	0,0-0,8 m: Slightly moist, dark grey, stiff, fissured, slightly sandy, silty CLAY; colluvium.			
-0.5	[Diagonal hatching symbol]	0,8-0,9 m: Coarse, medium and fine, angular, clast-supported GRAVEL of hard ferruginous concretions in a trace matrix of very moist, grey, silty clay; overall consistency is dense; honeycomb ferricrete.			
-1.0	[Diamond symbol]	0,9-1,0 m: Becomes orange-brown mottled orange, very dense, hardpan FERRICRETE at the bottom of the test pit. EOH @ 1,0 m.			
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,0 m

Page 1 of 1



- NOTES:**
- 1) Machine refusal at 1,0 m on hardpan ferricrete.
 - 2) Groundwater not encountered.
 - 3) Large roots in top 400mm. Surrounded by mature blue gums.
 - 4) Badly overflowing sewer line 75 m east of TP25.

Contractor: Alleyroad Construction

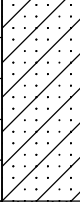
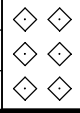
Machine: CAT 428F

Test Pit No: 25

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 26
Recorded by: es **Date:** 11/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57230 **X:** 2916233

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,5 m: Slightly moist, dark grey, stiff, intact, sandy CLAY; colluvium.			
-0.5		0,5-0,8 m: Orange-brown, dense to very dense, honeycomb and hardpan FERRICRETE becoming very dense hardpan at the bottom of the test pit. EOH @ 0,8m.			
-1.0					
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 0,8 m

Page 1 of 1



- NOTES:**
- 1) Machine refusal at 0,8m on hardpan ferricrete.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 500mm.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 26

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 27

Recorded by: es **Date:** 11/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57227 **X:** 2916080

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Symbol]	0,0-0,7 m: Slightly moist, light grey, dense, intact, silty SAND; colluvium.			
-0.5	[Symbol]	Irregular horizon of ferricrete concretions at 0,7m.			
-1.0	[Symbol]	0,7-1,5 m: Slightly moist, light yellowish orange mottled and blotched pale khaki, stiff, intact, sandy SILT with widely scattered soft, silt kernels; colluvium.			
-1.5	[Symbol]	1,5-1,8 m: Moist, light grey mottled and blotched light yellowish khaki, stiff, very slightly ferruginised, sandy SILT with minor, hard and soft, ferruginous concretions and silt kernels; colluvium (?). Subrounded cobble at 1,6m (quartzite - 110x80).			
-2.0	[Symbol]	EOH @ 1,8m.			
-2.5	[Symbol]				
-3.0	[Symbol]				
-3.5	[Symbol]				

Total depth: 1,8 m

Page 1 of 1



- NOTES:**
- 1) Hole stopped at 1,8m in colluvium. No refusal.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 0,9m.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 27

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 28
Recorded by: es **Date:** 11/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57070 **X:** 2916087

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,5 m: Slightly moist, light grey, medium dense, intact, silty SAND; colluvium.			
-0.5		0,5-1,4 m: Slightly moist, light yellow khaki mottled light orange, stiff, intact, sandy SILT with traces of soft. silt kernels; colluvium.			
-1.5		1,4-1,6 m: Slightly moist, light yellowish khaki mottled light orange, stiff, intact, sandy SILT with abundant hard and soft, very slightly ferruginised, silt kernels; colluvium(?). Becoming very stiff, slightly ferruginised at the bottom of the test pit.			
		EOH @ 1,6m.			
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,6 m



NOTES:

- 1) Slow excavation at 1,6 m in very slightly ferruginised colluvium.
- 2) Groundwater not encountered.
- 3) Roots in top 1,3 m. Not far from an avenue of trees.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 28

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 29

Recorded by: es **Date:** 11/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 56923 **X:** 2916119

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Symbol]	0,0-0,5 m: Slightly moist, light grey, medium dense, fractured to intact with depth, silty SAND; colluvium.			
-0.5	[Symbol]	0,5-1,4 m: Slightly moist, light khaki mottled and blotched light orange, stiff, intact, very slightly ferruginised, sandy SILT with traces of soft and some hard, silt kernels; colluvium (very slightly ferruginised).			
-1.0	[Symbol]				
-1.5	[Symbol]	1,4-2,0 m: Slightly moist to moist, light grey mottled orange blotched dark brown in places, stiff to very stiff, slightly ferruginised, sandy SILT with abundant hard and soft, ferruginous concretions and nodules; colluvium (slightly ferruginised).			
-2.0	[Symbol]	Very stiff at the bottom of the test pit. EOH @ 2,0m.			
-2.5	[Symbol]				
-3.0	[Symbol]				
-3.5	[Symbol]				

Total depth: 2,0 m

Page 1 of 1



- NOTES:**
- 1) Slow excavation at 2,0 m in slightly ferruginised colluvium.
 - 2) Groundwater not encountered.
 - 3) Roots in top 1,4 m.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 29

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 30
Recorded by: es **Date:** 11/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56771 **X:** 2916158

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Dotted pattern]	0,0-0,5 m: Slightly moist, light grey medium to dense, intact, silty, fine SAND; colluvium.			
-0.5	[Dotted pattern]	0,5-1,0 m: Slightly moist, light khaki mottled orange, stiff, slightly ferruginised, sandy SILT with traces of hard and soft, ferruginous concretions; colluvium.			
-1.0	[Dotted pattern]	1,0-1,2 m: Medium and fine, subrounded, clast-supported GRAVEL of hard, ferricrete nodules in a trace matrix of slightly moist, light grey, sandy silt; overall consistency is dense; ferruginised pebble marker(?).			
-1.2	[Diamond pattern]	EOH @ 1,2m.			
-1.5	[Diamond pattern]	>1,2 m: Becoming hardpan FERRICRETE at the bottom of the test pit.			
-2.0	[Diamond pattern]				
-2.5	[Diamond pattern]				
-3.0	[Diamond pattern]				
-3.5	[Diamond pattern]				

Total depth: 1,2 m



- NOTES:**
- 1) Almost machine refusal at 1,2 m in ferruginised colluvium.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 0,9 m.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 30

SOIL PROFILE

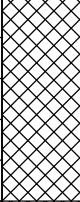
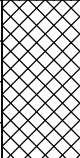



Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 31

Recorded by: es **Date:** 11/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 56644 **X:** 2916118

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,5 m: Moist, dark grey, medium dense to loose, intact, silty SAND; imported topsoil (for bowling green).			
-0.5		0,5-0,9 m: Very moist, grey speckled white, loose, intact CINDER ASH; imported layer for the bowling green.			
-1.0		0,9-1,3 m: Coarse, angular, clast-supported BOULDERS (DUMP ROCK) of slightly weathered, pale green and brown, hard rock quartzite in a trace matrix of wet, cinder ash; overall consistency is loose, dump rock layer (end tipped).			
-1.5		1,3-1,9 m: Wet, brown, loose, intact, silty SAND; colluvium (saturated).			
-2.0		1,9-2,0 m: Becoming fine, subangular GRAVEL of hard ferruginous concretions and nodules at the bottom of the test pit.			
		EOH @ 2,0m.			
-2.5					
-3.0					
-3.5					

Total depth: 2,0 m

Page 1 of 1



- NOTES:**
- 1) Hole stopped at 2,0 m in saturated colluvium. No refusal.
 - 2) Seepage water from below 1,2 m at bottom of dump rock layer.
 - 3) Fine roots in top 0,9 m.
 - 4) Excavated in middle of old bowling green.
 - 5) Sidewalls unstable. No deeper excavation

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 31

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 32
Recorded by: es **Date:** 11/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57000 **X:** 2916288

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,3 m: Slightly moist, light greyish, loose, intact, silty SAND; colluvium.			
		EOH @ 0,3m.			
-0.5		>0,3 m: Pink and beige, weathered to slightly weathered, fractured, hard rock QUARTZITE. Witwatersrand Supergroup.			
-1.0					
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 0,3 m



- NOTES:**
- 1) Machine refusal at 0,3 m on hard rock quartzite.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 300 mm.
 - 4) Rock almost at the surface.
 - 5) Quartzite crops out to the west.

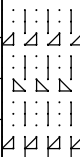

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 32

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 34
Recorded by: es **Date:** 11/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56668 **X:** 2916410

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,4 m: Slightly moist, light greyish brown, loose, intact, silty SAND with some medium, quartzite gravel immediately above bedrock; collivium.			
-0.5		0,4-0,6 m: Beige weathered pink, weathered to slightly weathered, fractured, well-bedded, hard rock QUARTZITE with lenses of very soft rock and soft rock. EOH @ 0,4-0,6 m			
-1.0					
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 0,4 m

Page 1 of 1



- NOTES:**
- 1) Machine refusal at 0,4-0,6 m on hard rock quartzite.
 - 2) Groundwater not encountered.
 - 3) No roots.

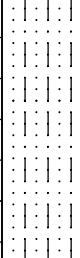

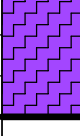
Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 34

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 35
Recorded by: es **Date:** 11/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56555 **X:** 2916471

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,65 m: Slightly moist, light grey becoming khaki below 0,4m, medium dense, intact, silty SAND; colluvium.			
-0.5					
-1.0		0,65-1,2 m: Medium and fine with occasional coarse, angular, clast-supported, friable GRAVEL of coarse-grained quartzite in a trace matrix of slightly moist, pale khaki, silty sand; overall consistency is medium dense; residual quartzite (includes pebble marker horizon).			
-1.5		1,2-1,5 m: Beige mottled reddish orange speckled grey, highly weathered, well-bedded, soft rock QUARTZITE. Tends to medium hard rock at the bottom of the test pit.			
-1.5		EOH @ 1,5m.			
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,5 m

Page 1 of 1



- NOTES:**
- 1) Almost machine refusal at 1,5 m on soft rock quartzite.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 1,2 m

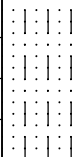

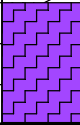
Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 35

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 36
Recorded by: es **Date:** 11/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56658 **X:** 2916560

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,4 m: Slightly moist, light greyish brown to khaki brown, loose, intact, silty SAND; colluvium.			
-0.5		0,4-0,7 m: Medium and fine, subangular, clast-supported, friable GRAVEL of highly weathered quartzite in a trace matrix of slightly moist, brownish khaki mottled orange, silty sand; overall consistency is medium dense; residual quartzite.			
-1.0		0,7-1,0 m: Pink speckled grey and white, highly weathered to weathered, closely fractured, closely bedded, soft rock QUARTZITE. EOH @ 1,0 m			
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,0 m



- NOTES:**
- 1) Machine refusal at 1,0 m on soft rock quartzite.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 0,8m.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 36

SOIL PROFILE

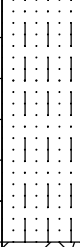


Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 37

Recorded by: es **Date:** 11/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 56566 **X:** 2916654

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,6 m: Slightly moist, light greyish brown, medium dense to loose, intact, silty SAND with abundant roots in top 0,5m; colluvium.			
-0.5		0,6-0,9 m: Medium and fine, angular, clast-supported, friable GRAVEL of highly weathered, very soft rock quartzite in a minor matrix of slightly moist, brownish khaki mottled beige, silty sand; overall consistency is medium dense; residual quartzite (plus pebble marker).			
-1.0		0,9-1,1 m: Beige weathered orange and reddish brown, highly weathered, widely fractured, well-bedded, soft rock QUARTZITE.			
		EOH @ 1,1m			
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,1 m

Page 1 of 1



- NOTES:**
- 1) Machine refusal at 1,1 m on soft rock quartzite.
 - 2) Groundwater not encountered.
 - 3) Abundant roots in top 0,6 m. Excavated amongst mature bluegum trees.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 37

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 38
Recorded by: es **Date:** 16/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57833 **X:** 2916778

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,5 m: Slightly moist becoming moist, light grey, medium dense, intact, silty, fine SAND; colluvium.			
-0.5		0,5-0,9 m: Moist, brownish khaki, firm, intact, sandy SILT; colluvium.			
-1.0		0,9-1,0 m: Medium and fine, subangular, matrix-supported GRAVEL of hard and soft, ferruginous concretions in a minor matrix of moist, light khaki mottled orange, sandy silt; overall consistency is medium dense; residual quartzite(?).			
-1.0		1,0-1,1 m: Becoming beige, weathered, hard rock QUARTZITE. EOH @ 1,1 m.			
-1.5					
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,1 m



- NOTES:**
- 1) Machine refusal at 1,1 m on ferruginised quartzite.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 0,8 m.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 38

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 39
Recorded by: es **Date:** 16/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57607 **X:** 2916837

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,8 m: Slightly moist becoming moist, light grey, medium dense, intact, silty, fine SAND; colluvium.			
-0.5		Thin irregular horizon of honeycomb ferricrete at 0,8 m to 0,9 m; pebble marker horizon(?).			
-1.0		0,8-1,2 m: Moist, light orange mottled and blotched khaki, stiff, slightly ferruginised, sandy SILT with traces of hard and soft, ferruginous concretions; colluvium (slightly ferruginised).			
-1.5		1,2-1,8 m: Medium and fine, angular, clast-supported GRAVEL of hard ferruginous concretions in an abundant matrix of slightly moist, khaki blotched orange-brown, sandy silt; overall consistency is dense; colluvium (ferruginised).			
-1.8		EOH @ 1,8 m.			
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,8 m

Page 1 of 1



- NOTES:**
- 1) Slow excavation at 1,8 m in ferruginised colluvium.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 1,0 m.
 - 4) Excavated fairly close to the stream.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 39

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 40
Recorded by: es **Date:** 16/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56767 **X:** 2916860

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Dotted pattern]	0,0-0,6 m: Slightly moist, light grey, medium dense, intact, silty SAND; colluvium.			
-0.5	[Dotted pattern]	0,6-1,0 m: Moist, light khaki, stiff, intact, sandy SILT; colluvium.			
-1.0	[Geometric pattern]	1,0-1,3 m: Medium and fine, subangular, matrix-supported, friable GRAVEL of hard and soft, ferruginous concretions in a minor matrix of moist, light khaki mottled dark brown, sandy silt; overall consistency is medium dense; pebble marker(?).			
-1.5	[Diamond pattern]	1,3-1,8 m: Orange-brown mottled dark brown, dense, intact, hardpan FERRICRETE; ferruginised residuum(?).			
-1.8	[Diamond pattern]	EOH @ 1,8 m.			
-2.0	[Blank]				
-2.5	[Blank]				
-3.0	[Blank]				
-3.5	[Blank]				

Total depth: 1,8 m

Page 1 of 1



- NOTES:**
- 1) Slow excavation at 1,8 m in ferruginised residuum.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 0,9 m.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 40

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 41

Recorded by: es **Date:** 16/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 56658 **X:** 2916973

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,5 m: Slightly moist to moist, light grey, medium dense, intact, silty SAND; colluvium.			
-0.5		0,5-1,4 m: Moist, khaki, firm to stiff, intact, sandy SILT; colluvium.			
-1.0					
-1.5		1,4-2,0 m: Slightly moist, light yellow khaki speckled reddish brown, stiff, intact, sandy SILT with scattered soft and some hard, slightly ferruginised, silt kernels; colluvium. Silt kernels more prevalent below 1,7m.			
-2.0		2,0-2,3 m: Slightly moist, pale grey mottled grey and dark brown, stiff to very stiff, intact, ferruginised, sandy SILT with abundant hard, ferruginous concretions; ferruginised residuum(?). Tends to ferricrete in places.			
-2.5		EOH @ 2,3 m.			
-3.0					
-3.5					

Total depth: 2,3 m

Page 1 of 1



- NOTES:**
- 1) Slow excavation at 2,3 m in ferruginised residuum(?)
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 1,2 m.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 41

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 42
Recorded by: es **Date:** 16/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56795 **X:** 2917007

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Dotted pattern]	0,0-0,6 m: Slightly moist, light greyish brown, medium dense, intact, silty SAND; colluvium.			
-0.5	[Dotted pattern]	0,6-1,5 m: Moist, light yellowish khaki, firm to stiff, intact, sandy SILT with scattered soft and some hard, silt kernels; colluvium.			
-1.0	[Dotted pattern]				
-1.5	[Angular gravel pattern]	1,5-1,8 m: Medium and fine, subangular, matrix-supported, friable GRAVEL of hard and soft, ferruginous concretions in a minor matrix of moist, light khaki speckled brown, sandy silt; overall consistency is medium dense; pebble marker(?).			
-2.0	[Angular gravel pattern]	1,8-2,2 m: Medium and fine, subangular, matrix-supported GRAVEL of hard and soft, ferruginous concretions in an abundant matrix of light grey mottled orange, sandy silt; overall consistency is dense; ferruginised residuum. Tends to ferricrete in places			
-2.2	[Horizontal line]	EOH @ 2,2 m.			
-2.5	[Horizontal line]				
-3.0	[Horizontal line]				
-3.5	[Horizontal line]				

Total depth: 2,2 m

Page 1 of 1



- NOTES:**
- 1) Difficult excavation at 2,2 m in ferricrete gravel (ferruginised residuum?).
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 1,7 m.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 42

SOIL PROFILE

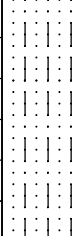

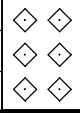
Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 43

Recorded by: es **Date:** 16/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 56936 **X:** 2917035

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,6 m: Slightly moist, light grey, medium dense, intact, silty SAND; colluvium.			
-0.5		0,6-1,3 m: Moist, light yellow khaki, firm to stiff, intact sandy SILT with scattered orange, soft, silt kernels; colluvium.			
-1.0			UD		
-1.5		1,3-1,6 m: Medium and fine, subangular, matrix-supported, friable GRAVEL of hard and soft, ferruginous concretions in a trace matrix of moist, light khaki speckled dark brown, sandy silt; overall consistency is dense; pebble marker(?) (ferruginised).			
-1.6		1,6-1,9 m: Light orange-brown blotched khaki, dense, hardpan FERRICRETE with pockets of grey and khaki, sandy silt; ferruginised residuum(?). EOH @ 1,9 m.			
-2.0					
-2.5					
-3.0					
-3.5					

Total depth: 1,9 m



- NOTES:**
- 1) Difficult excavation at 1,9 m in ferruginised residuum?
 - 2) Groundwater encountered.
 - 3) Fine roots in top 1,4 m.
 - 4) Undisturbed sample at 0,9-1,1m. CP=7,94%.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 43

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 44

Recorded by: es **Date:** 16/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 56822 **X:** 2917137

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,6 m: Slightly moist to moist, grey, medium dense, intact, silty SAND; colluvium.			
-0.5		0,6-1,5 m: Moist, khaki, firm to stiff, intact, sandy SILT; colluvium.			
-1.0					
-1.5		1,5-2,1 m: Medium and fine, subangular, matrix-supported, friable GRAVEL of hard and soft, ferruginous concretions in a minor matrix of moist, light khaki speckled brown, sandy silt; overall consistency is medium dense; pebble marker(?).			
-2.0					
-2.1		2,1-2,3 m: Orange-brown blotched and mottled grey and dark brown, dense FERRICRETE with lenses of grey, sandy silt; ferruginised residuum(?)			
-2.3		EOH @ 2,3 m.			
-2.5					
-3.0					
-3.5					

Total depth: 2,3 m

Page 1 of 1



- NOTES:**
- 1) Slow excavation at 2,3 in ferruginised residuum(?)
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 2,0 m.
 - 4) Excavated close to Randwater pipeline marker.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 44

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 45

Recorded by: es **Date:** 16/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 56686 **X:** 2917114

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Dotted pattern]	0,0-0,7 m: Slightly moist, light greyish brown, medium dense, intact, silty SAND; colluvium.			
-0.5	[Dotted pattern]				
-1.0	[Dotted pattern]	0,7-2,0 m: Slightly moist, light yellowish khaki with some reddish brown speckling below 1,5m, stiff to firm in places, intact, sandy SILT with widely scattered soft and some hard, silt kernels; colluvium.			
-1.5	[Dotted pattern]				
-2.0	[Geometric pattern]	2,0-2,4 m: Medium and fine, subangular, matrix-supported, friable GRAVEL of hard ferruginous concretions in a minor matrix of slightly moist, light grey mottled orange-brown, slightly sandy silt; overall consistency is medium dense to dense; pebble marker (slightly ferruginised).			
-2.5	[Horizontal line]	EOH @ 2,4 m.			
-3.0	[Blank]				
-3.5	[Blank]				

Total depth: 2,4 m

Page 1 of 1



- NOTES:**
- 1) Slow excavation at 2,4 m in ferruginised residuum(?).
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 2,0 m.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 45

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 46

Recorded by: es **Date:** 16/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 56640 **X:** 2917237

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,5 m: Slightly moist to moist, light greyish brown, medium dense, intact, silty SAND; colluvium.			
-0.5		0,5-2,0 m: Moist to very moist with depth, firm, intact, sandy SILT; colluvium.			
-1.0					
-1.5					
-2.0		2,0-2,4 m: Medium and fine, subangular, matrix-supported GRAVEL of hard and soft, ferruginous concretions in a minor matrix of wet, light grey speckled orange, sandy silt; overall consistency is medium dense; pebble marker (ferruginised).			
-2.5		2,4-2,7 m: Grey mottled and blotched orange, dense to very dense, honeycomb FERRICRETE with pockets of wet grey, sandy silt.			
		2,6-2,7 m: Standing from 2,6m after 2 hours.			
		EOH @ 2,7m.			
-3.0					
-3.5					

Total depth: 2,7 m

Page 1 of 1



- NOTES:**
- 1) Difficult excavation at 2,7 m in ferruginised residuum(?)
 - 2) Groundwater encountered below 2,35 m. Standing water at 2,6m after 2 hours.
 - 3) Fine roots in top 2,4m.
 - 4) Wettest hole - stormwater from the existing John Dube ultimately discharges into the area.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 46

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 47
Recorded by: es **Date:** 16/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56729 **X:** 2917259

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Dotted pattern]	0,0-0,6 m: Slightly moist to moist, light grey, medium dense, intact, silty SAND; colluvium.			
-0.5	[Dotted pattern]	0,6-1,7 m: Moist becoming very moist with depth, firm, intact, sandy SILT; colluvium.			
-1.0	[Dotted pattern]	Becoming very moist almost wet below 1,4m.			
-1.5	[Dotted pattern]	1,7-1,9 m: Medium and fine, subangular, matrix-supported GRAVEL of hard and soft ferruginous concretions in a minor matrix of very moist, grey mottled light orange, sandy silt; overall consistency is medium dense; pebble marker(?).			
-2.0	[Diamond pattern]	1,9-2,0 m: Becoming orange-brown speckled grey, dense to very dense FERRICRETE. EOH @ 2,0m.			
-2.5	[Diamond pattern]				
-3.0	[Diamond pattern]				
-3.5	[Diamond pattern]				

Total depth: 2,0 m

Page 1 of 1



- NOTES:**
- 1) Machine refusal at 2 m on ferricrete (hardpan and honeycomb).
 - 2) Groundwater not encountered but moist as a large volume of stormwater flows in this direction. Also a blocked sewer line nearby.
 - 3) Roots in top 1,8 m

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 47

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 48
Recorded by: es **Date:** 16/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 56627 **X:** 2917366

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Dotted pattern]	0,0-0,6 m: Slightly moist to moist, light grey, medium dense, intact, silty SAND with numerous roots; colluvium.			
-0.5	[Dotted pattern]	0,6-1,5 m: Moist becoming very moist, light khaki, firm, intact, sandy SILT; colluvium.			
-1.0	[Dotted pattern]	Becoming very moist to wet below 1,4 m.			
-1.5	[Angular gravel pattern]	1,5-1,8 m: Medium and fine, angular to subangular, matrix-supported GRAVEL of hard ferruginous concretions in a minor matrix of wet, greyish khaki, sandy silt; overall consistency is medium dense; pebble marker.			
-2.0	[Honeycomb pattern]	1,8-2,2 m: Grey mottled and blotched brown to orange-brown, dense, honeycomb FERRICRETE with small pockets of wet, sandy silt; ferruginised residuum(?).			
-2.1	[Water level line]	2,1-2,2 m: Standing water below 2,1 m after 1 hour.			
-2.2	[Horizontal line]	EOH @ 2,2m.			
-2.5	[Blank]				
-3.0	[Blank]				
-3.5	[Blank]				

Total depth: 2,2 m

Page 1 of 1



- NOTES:**
- 1) Machine refusal at 2,2 m on ferricrete.
 - 2) Groundwater seepage from below 1,8 m. Standing water at 2,1 m after one hour.
 - 3) Excavated at the end of an unlined stormwater ditch.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 48

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 49
Recorded by: es **Date:** 17/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57704 **X:** 2916520

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,4 m: Slightly moist, light brown, medium dense, silty SAND; colluvium.			
-0.5		0,4-1,5 m: Moist becoming very moist with depth, light reddish brown, firm, intact, sandy SILT; colluvium.			
-1.0					
-1.5		1,5-2,3 m: Very moist, light reddish brown, intact, sandy SILT with scattered soft and some hard, silt kernels; colluvium.			
-2.0					
-2.5		2,3-2,4 m: Very moist, dark khaki speckled reddish brown, firm, intact, sandy SILT with abundant soft and some hard, ferricrete nodules and slightly ferruginised, silt kernels; colluvium.			
-2.5		EOH @ 2,4 m			
-3.0					
-3.5					

Total depth: 2,4 m

Page 1 of 1



- NOTES:**
- 1) Hole stopped at 2,4 m in silty colluvium. No refusal.
 - 2) Groundwater not encountered but soil very moist at the bottom of the test pit.
 - 3) Fine roots in top 1,0 m.
 - 4) Excavated a day before profiling.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 49

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 50
Recorded by: es **Date:** 17/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57580 **X:** 2916469

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,5 m: Moist, light grey, medium dense, intact, silty, fine SAND; colluvium.			
-0.5		0,5-1,4 m: Moist to very moist, khaki mottled light orange in places, firm, intact, sandy SILT with widely scattered soft, ferruginous concretions and soft, silt kernels; colluvium.			
-1.0					
-1.5		1,4-1,9 m: Medium and fine, subangular, matrix-supported GRAVEL of hard and soft, ferruginous concretions in a minor matrix of moist to very moist, light grey mottled light orange, very slightly ferruginised, sandy silt; overall consistency is medium dense; colluvium (very slightly ferruginised).			
-2.0		1,9-2,1 m: Medium and fine, angular, clast-supported GRAVEL of hard and soft, ferruginous concretions in a trace matrix of moist, light grey mottled light orange, slightly ferruginised, sandy silt; overall consistency is dense; pebble marker(?).			
		EOH @ 2,1 m			
-2.5					
-3.0					
-3.5					

Total depth: 2,1 m

Page 1 of 1



- NOTES:**
- 1) Slow excavation at 2,1 m on slightly ferruginised colluvium.
 - 2) Groundwater not encountered.
 - 3) Fine roots in top 1,5 m.
 - 4) Excavated day before profiling

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 50

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 51

Recorded by: es **Date:** 17/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57588 **X:** 2916619

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,5 m: Slightly moist to moist, brown, medium dense, intact silty SAND; colluvium.			
-0.5		0,5-2,0 m: Moist to very moist below 1,5 m, reddish brown, firm, intact, sandy SILT; colluvium.			
-1.0			UD		
-1.5		2,0-2,5 m: Moist to very moist, khaki mottled and blotched light red and orange, firm, intact, slightly clayey, sandy SILT with minor soft, silt kernels and some very slightly ferruginised, silt concretions; colluvium (very slightly ferruginised).			
-2.0					
-2.5		EOH @ 2,5 m			
-3.0					
-3.5					

Total depth: 2,5 m

Page 1 of 1



- NOTES:**
- 1) Hole stopped at 2,5 m slightly ferruginised colluvium.
 - 2) Groundwater not encountered but very moist below 1,5 m.
 - 3) Fine roots in top 1,9 m. Excavated in old cultivated patch.
 - 4) Undisturbed taken at 0,9-1,1m. CP=2,49%.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 51

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 52
Recorded by: es **Date:** 17/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57466 **X:** 2916560

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,2 m: Medium and fine, angular, clast-supported GRAVEL of 50 mm quartzite aggregate in a trace matrix of slightly moist, light grey, silty sand; overall consistency is loose; fill.			
-0.5		0,2-0,6 m: Slightly moist to moist, light grey, medium dense, intact, silty SAND; colluvium.			
-1.0		0,6-0,9 m: Moist, greyish khaki mottled light orange, firm, intact, sandy SILT; colluvium.			
-1.5		0,9-1,5 m: Moist to very moist, light grey mottled and blotched light orange, firm to stiff, intact, very slightly ferruginised, sandy SILT with abundant hard and soft, ferruginous concretions; pebble marker(?).			
-2.0		1,5-2,2 m: Very moist to wet, dark reddish brown blotched grey, stiff, intact, very slightly ferruginised, sandy SILT with scattered hard and soft, ferruginous concretions; residuum(?).			
-2.5		2,13-2,2 m: Standing water below 2,13m after 45 minutes.			
-3.0		EOH @ 2,2 m.			
-3.5					

Total depth: 2,2 m

Page 1 of 1



- NOTES:**
- 1) Hole stopped at 2,2 m in slightly ferruginised residuum.
 - 2) Standing water at 2,13 m after 0,75 hr. Seepage from below 1,5 m.
 - 3) Roots in top 0,7 m.
 - 4) Excavated at edge of ruins.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 52

SOIL PROFILE


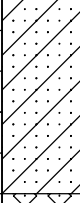
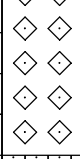

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 53

Recorded by: es **Date:** 17/9/2019

Elevation: mamsl

Coordinates Wgs: 29 **Y:** 57405 **X:** 2916428

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0		0,0-0,2 m: Medium and fine, angular, clast-supported GRAVEL of quartzite aggregate in a trace matrix of slightly moist, light grey, silty sand; overall consistency is loose; fill (wearing course).			
-0.5		0,2-0,7 m: Slightly moist, dark grey mottled orange, stiff, fractured, sandy CLAY; colluvium.			
-1.0		0,7-1,1 m: Orange-brown, dense, honeycomb FERRICRETE with discrete, coarse ferruginous concretions; colluvium (ferruginised).			
-1.5		1,1-1,5 m: Moist, light orange mottled khaki speckled black, firm to stiff, intact, sandy SILT with some soft and hard, ferruginous concretions; colluvium(?).			
-2.0		1,5-2,0 m: Standing water at 1,5m (0,5 m deep). EOH @ 2,0 m.			
-2.5					
-3.0					
-3.5					

Total depth: 2,0 m

Page 1 of 1



- NOTES:**
- 1) Hole excavated to 2,0 m.
 - 2) Standing water at 2,5 m after 20 hrs. No seepage above 1,5 m.
 - 3) Fine roots in top 0,7 m.
 - 4) Excavated a day before profiling.
 - 5) Profiling hampered by volume of groundwater.

Contractor: Alleyroad Construction

Machine: CAT 428F

Test Pit No: 53

SOIL PROFILE

Project: John Dube Extension 3
Location: Portions of Grootfontein 165-IR
Client: Alleyroad Construction
Project No: 19127JohnDube

TEST PIT No: 54
Recorded by: es **Date:** 17/9/2019
Elevation: mamsl
Coordinates Wgs: 29 **Y:** 57263 **X:** 2916396

Depth (m)	Lithology	Lithologic Description	Sample No	Unified/ TRB Class.	Potential Expansiveness
0.0	[Diagonal Hatching]	0,0-0,6 m: Slightly moist to moist, dark grey, stiff, fractured, sandy CLAY; colluvium.			
-0.5	[Diagonal Hatching]	0,6-1,3 m: Moist, olive to olive khaki mottled light orange, stiff, fractured, slightly sandy CLAY; colluvium.			
-1.0	[Diagonal Hatching]	1,3-1,9 m: Slightly moist to moist, light khaki olive speckled black and blotched off-white in places, stiff to very stiff, fissured, slightly sandy, clayey SILT with pockets of soft, calcareous nodules; colluvium.			
-1.5	[Diagonal Hatching]	EOH @ 1,9 m.			
-2.0	[Diagonal Hatching]				
-2.5	[Diagonal Hatching]				
-3.0	[Diagonal Hatching]				
-3.5	[Diagonal Hatching]				

Total depth: 1,9 m



- NOTES:**
- 1) Hole stopped at 1,9 m in clayey colluvium. No refusal.
 - 2) Groundwater not encountered although at the lowest point on the western side.
 - 3) Fine roots in top 1,0 m.
 - 4) Excavated a day before profiling.
 - 5) Mudcracks evident throughout the profile.

Contractor: Alleyroad Construction
Machine: CAT 428F

Test Pit No: 54

APPENDIX C

COLLAPSE POTENTIAL TEST RESULTS

Quality | Excellence | On Time

Client Name: Relly, Milner & Shedden
Project Name: John Dube X3
Sample: TP 20
Depth: (m) 0.9 - 1.1

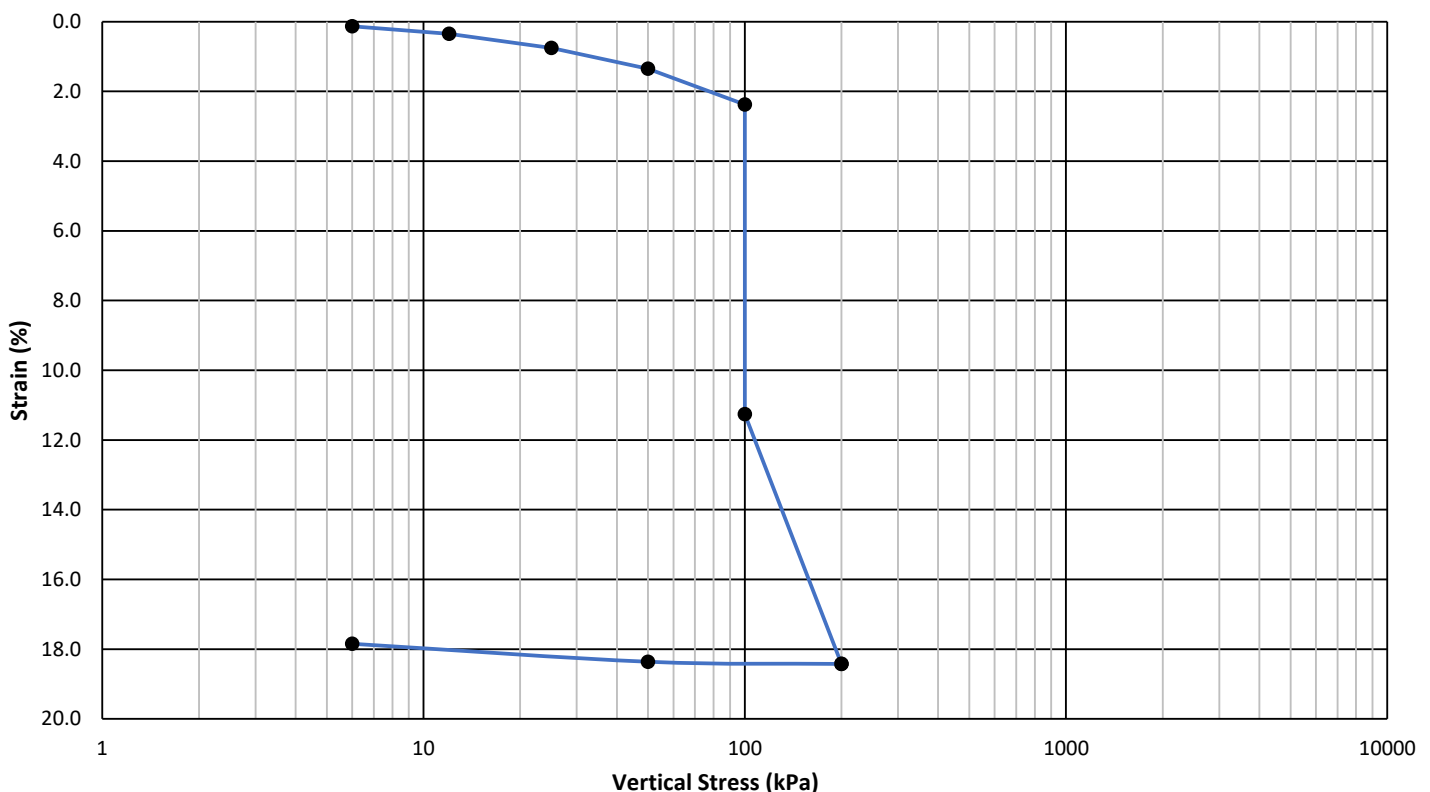
Job Number: RMS-31
Lab Number: RMS-31-83
Method: BS 1377 Part 5
Date: 24-Jun-20

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:
Test Specimen Height		mm	25.4	Collapse Potential: 8.89 %
Moisture Content	Initial	%	11.2	
	Final	%	24.4	
Dry Density		kg/m ³	1274	
Void Ratio		-	1.080	
Degree of Saturation		%	27.5	
Relative Density (SG)		-	2.650	Assumed

Vertical Stress Applied:	kPa	6	12	25	50	100	100	200	50	6				
Load applied for:	Hrs	1	1	1	1	1	24	1	1	1				
Height after increment	mm	25.37	25.31	25.21	25.06	24.80	22.54	20.72	20.74	20.87				
Total Strain	%	0.13	0.35	0.76	1.35	2.37	11.26	18.42	18.36	17.85				
Void Ratio	-	1.077	1.072	1.064	1.052	1.030	0.845	0.696	0.698	0.709				
Mv (1/Mpa)	-	-	0.361	0.317	0.238	0.208	-	0.807	0.005	0.143				

Strain vs Log Stress



Quality | Excellence | On Time

Client Name: Relly, Milner & Shedden
Project Name: John Dube X3
Sample: TP 20
Depth: (m) 0.9 - 1.1

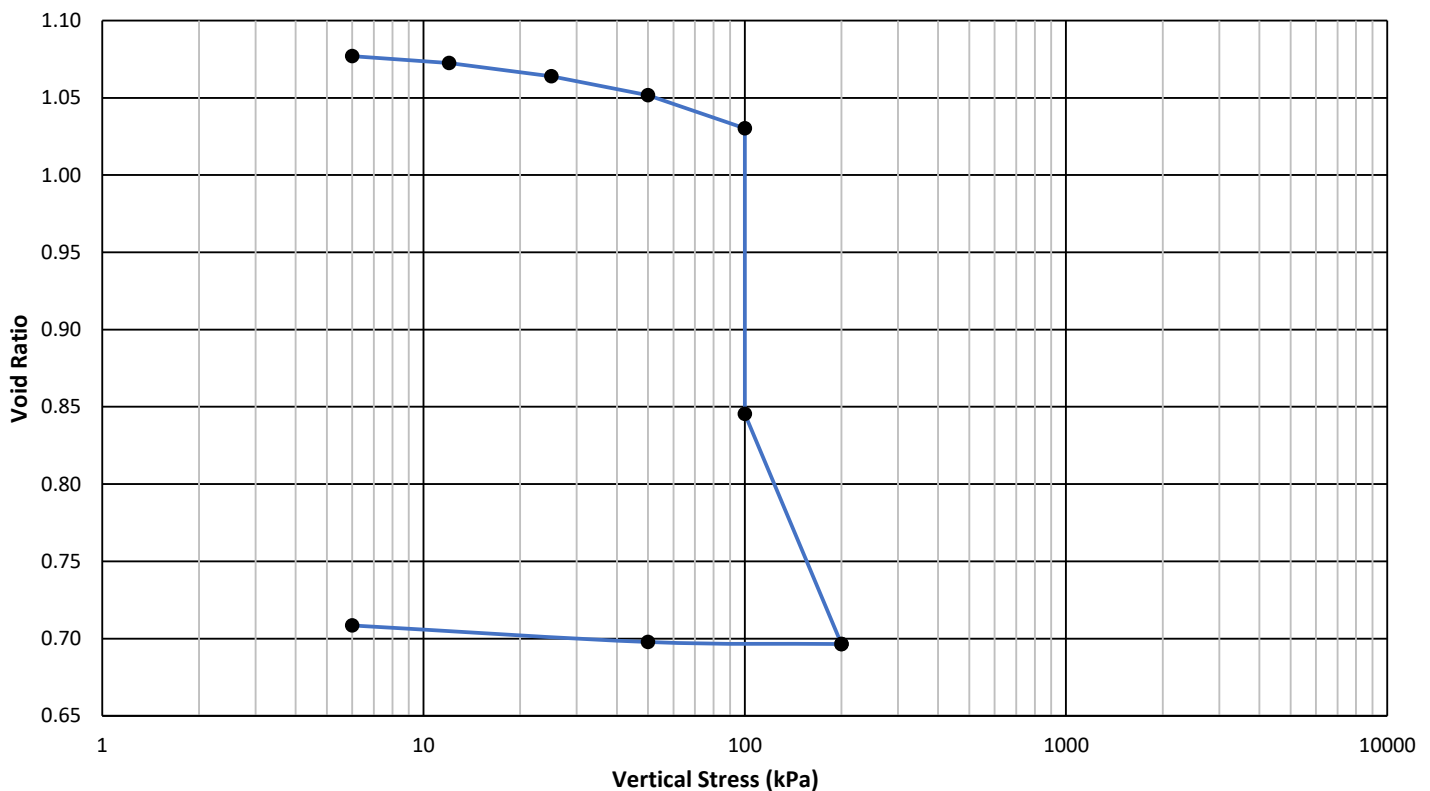
Job Number: RMS-31
Lab Number: RMS-31-83
Method: BS 1377 Part 5
Date: 24-Jun-20

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:
Test Specimen Height		mm	25.4	Collapse Potential: 8.89 %
Moisture Content	Initial	%	11.2	
	Final	%	24.4	
Dry Density		kg/m ³	1274	
Void Ratio		-	1.080	
Degree of Saturation		%	27.5	
Relative Density (SG)		-	2.650	Assumed

Vertical Stress Applied:	kPa	6	12	25	50	100	100	200	50	6				
Load applied for:	Hrs	1	1	1	1	1	24	1	1	1				
Height after increment	mm	25.37	25.31	25.21	25.06	24.80	22.54	20.72	20.74	20.87				
Total Strain	%	0.13	0.35	0.76	1.35	2.37	11.26	18.42	18.36	17.85				
Void Ratio	-	1.077	1.072	1.064	1.052	1.030	0.845	0.696	0.698	0.709				
Mv (1/Mpa)	-	-	0.361	0.317	0.238	0.208	-	0.807	0.005	0.143				

Void Ratio vs Log Stress



Quality | Excellence | On Time

Client Name: Relly, Milner & Shedden
Project Name: John Dube X3
Sample: TP 43
Depth: (m) 0.9 - 1.1

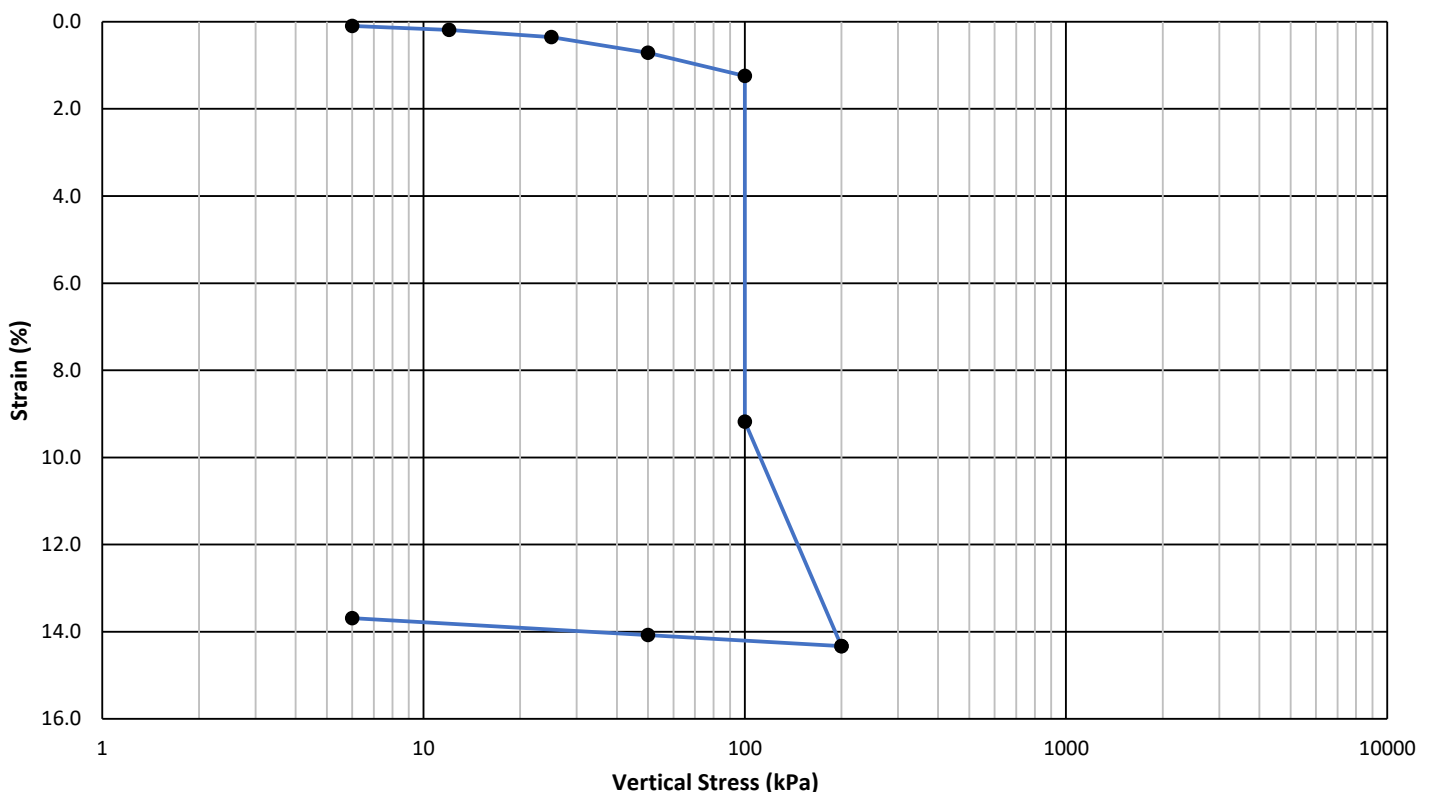
Job Number: RMS-31
Lab Number: RMS-31-84
Method: BS 1377 Part 5
Date: 24-Jun-20

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:
Test Specimen Height		mm	25.4	Collapse Potential: 7.94 %
Moisture Content	Initial	%	8.2	
	Final	%	20.5	
Dry Density		kg/m ³	1416	
Void Ratio		-	0.872	
Degree of Saturation		%	24.8	
Relative Density (SG)		-	2.650	Assumed

Vertical Stress Applied:	kPa	6	12	25	50	100	100	200	50	6				
Load applied for:	Hrs	1	1	1	1	1	24	1	1	1				
Height after increment	mm	25.38	25.35	25.31	25.22	25.08	23.07	21.76	21.82	21.92				
Total Strain	%	0.10	0.19	0.35	0.72	1.24	9.18	14.33	14.08	13.69				
Void Ratio	-	0.870	0.868	0.865	0.858	0.848	0.700	0.603	0.608	0.615				
Mv (1/Mpa)	-	-	0.150	0.127	0.147	0.106	-	0.567	0.020	0.103				

Strain vs Log Stress



Quality | Excellence | On Time

Client Name: Relly, Milner & Shedden
Project Name: John Dube X3
Sample: TP 43
Depth: (m) 0.9 - 1.1

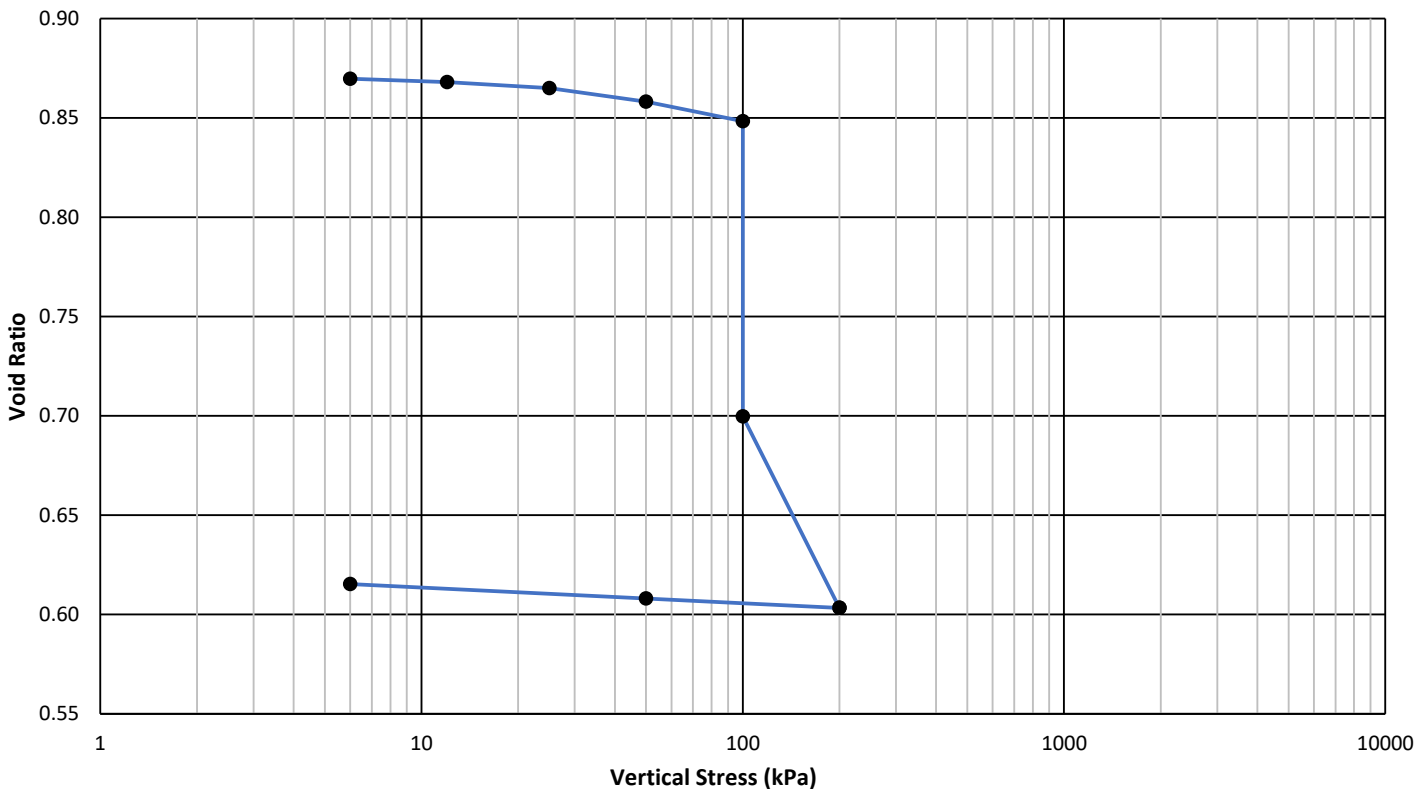
Job Number: RMS-31
Lab Number: RMS-31-84
Method: BS 1377 Part 5
Date: 24-Jun-20

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:
Test Specimen Height		mm	25.4	Collapse Potential: 7.94 %
Moisture Content	Initial	%	8.2	
	Final	%	20.5	
Dry Density		kg/m ³	1416	
Void Ratio		-	0.872	
Degree of Saturation		%	24.8	
Relative Density (SG)		-	2.650	Assumed

Vertical Stress Applied:	kPa	6	12	25	50	100	100	200	50	6				
Load applied for:	Hrs	1	1	1	1	1	24	1	1	1				
Height after increment	mm	25.38	25.35	25.31	25.22	25.08	23.07	21.76	21.82	21.92				
Total Strain	%	0.10	0.19	0.35	0.72	1.24	9.18	14.33	14.08	13.69				
Void Ratio	-	0.870	0.868	0.865	0.858	0.848	0.700	0.603	0.608	0.615				
Mv (1/Mpa)	-	-	0.150	0.127	0.147	0.106	-	0.567	0.020	0.103				

Void Ratio vs Log Stress



Quality | Excellence | On Time

Client Name: Relly, Milner & Shedden
Project Name: John Dube X3
Sample: TP 51
Depth: (m) 0.9 - 1.1

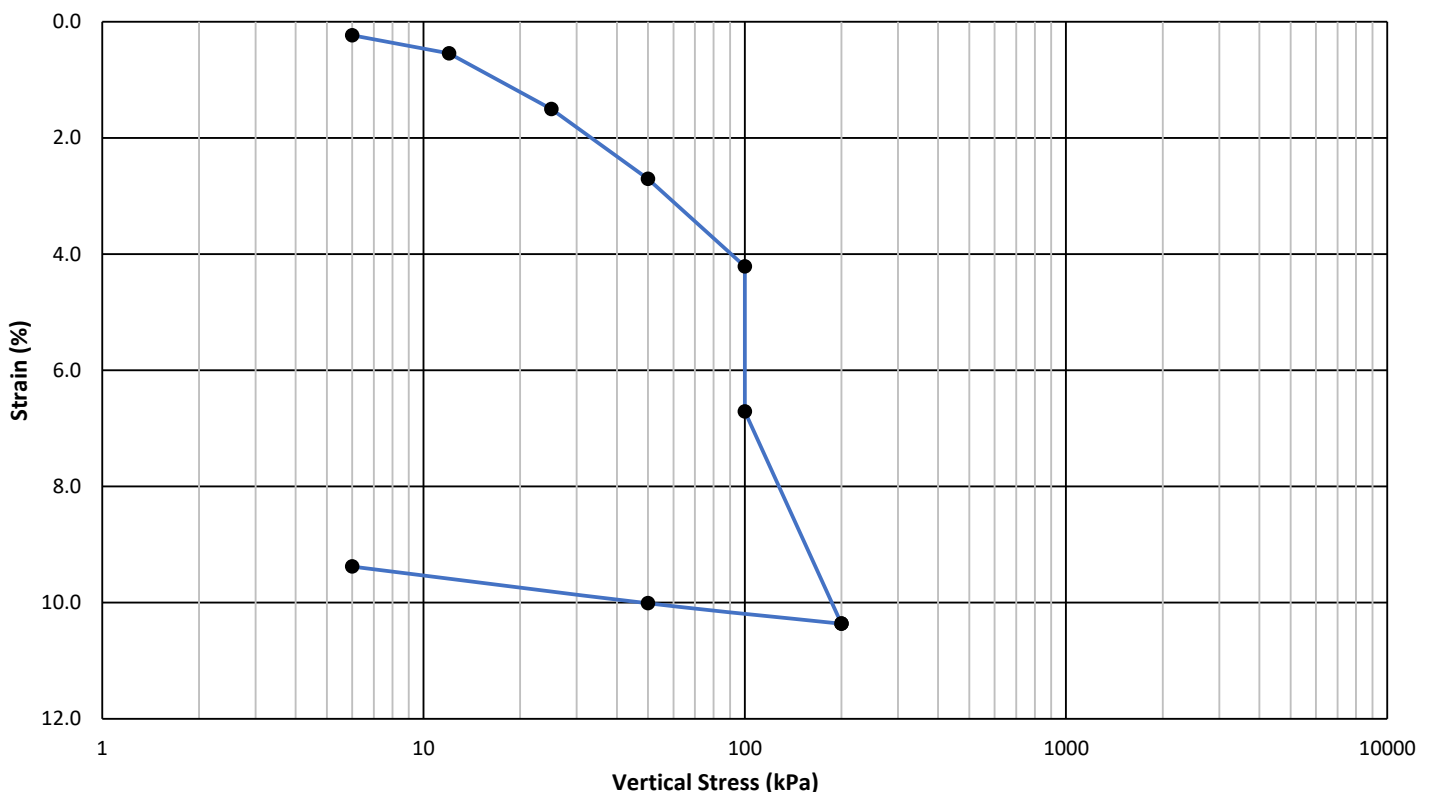
Job Number: RMS-31
Lab Number: RMS-31-85
Method: BS 1377 Part 5
Date: 24-Jun-20

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:
Test Specimen Height		mm	25.4	Collapse Potential: 2.49 %
Moisture Content	Initial	%	15.2	
	Final	%	18.5	
Dry Density		kg/m ³	1627	
Void Ratio		-	0.628	
Degree of Saturation		%	64.1	
Relative Density (SG)		-	2.650	Assumed

Vertical Stress Applied:	kPa	6	12	25	50	100	100	200	50	6				
Load applied for:	Hrs	1	1	1	1	1	24	1	1	1				
Height after increment	mm	25.34	25.26	25.02	24.71	24.33	23.70	22.77	22.86	23.02				
Total Strain	%	0.23	0.54	1.50	2.71	4.21	6.71	10.36	10.01	9.38				
Void Ratio	-	0.625	0.620	0.604	0.584	0.560	0.519	0.460	0.465	0.476				
Mv (1/Mpa)	-	-	0.519	0.742	0.489	0.310	-	0.392	0.026	0.160				

Strain vs Log Stress



Quality | Excellence | On Time

Client Name: Relly, Milner & Shedden
Project Name: John Dube X3
Sample: TP 51
Depth: (m) 0.9 - 1.1

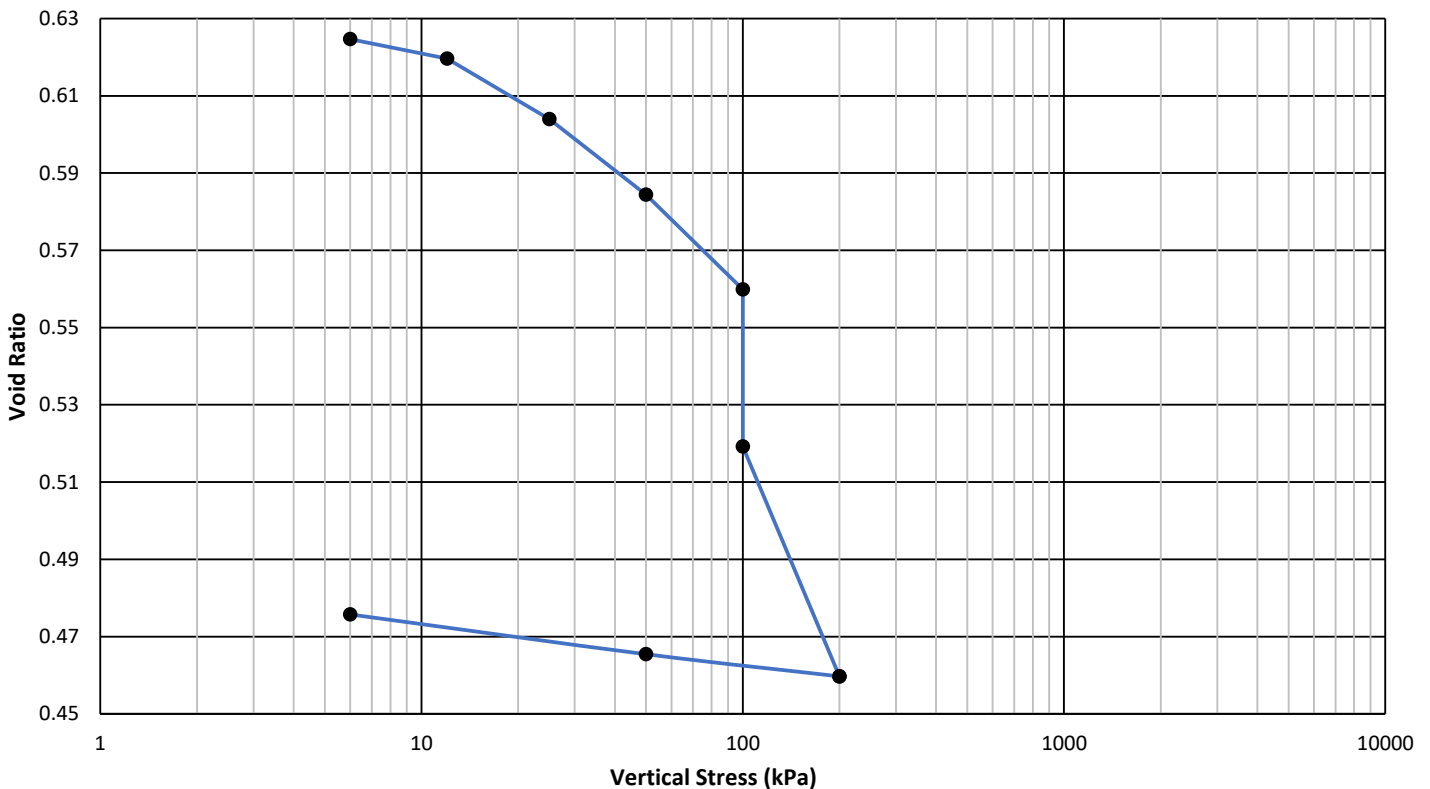
Job Number: RMS-31
Lab Number: RMS-31-85
Method: BS 1377 Part 5
Date: 24-Jun-20

ONE DIMENSIONAL COLLAPSE POTENTIAL TEST

Sample Info		Unit	Initial	Test Remarks:
Test Specimen Height		mm	25.4	Collapse Potential: 2.49 %
Moisture Content	Initial	%	15.2	
	Final	%	18.5	
Dry Density		kg/m ³	1627	
Void Ratio		-	0.628	
Degree of Saturation		%	64.1	
Relative Density (SG)		-	2.650	Assumed

Vertical Stress Applied:	kPa	6	12	25	50	100	100	200	50	6				
Load applied for:	Hrs	1	1	1	1	1	24	1	1	1				
Height after increment	mm	25.34	25.26	25.02	24.71	24.33	23.70	22.77	22.86	23.02				
Total Strain	%	0.23	0.54	1.50	2.71	4.21	6.71	10.36	10.01	9.38				
Void Ratio	-	0.625	0.620	0.604	0.584	0.560	0.519	0.460	0.465	0.476				
Mv (1/Mpa)	-	-	0.519	0.742	0.489	0.310	-	0.392	0.026	0.160				

Void Ratio vs Log Stress



APPENDIX D

TABLE OF GEOTECHNICAL CONSTRAINTS

Geotechnical Classification for Urban Development (after Partridge, Wood and Brink)

CONSTRAINT		Most favourable (1)	Intermediate (2)	Least favourable (3)
A	Collapsible Soil	Any collapsible horizon or consecutive horizons totaling a depth of less than 750mm in thickness*	Any collapsible horizon or consecutive horizons with a depth of more than 750mm in thickness	A least favourable situation for this constraint does not occur
B	Seepage	Permanent or perched water table more than 1,5m below ground surface	Permanent or perched water table less than 1,5m below ground surface	Swamps and marshes
C	Active Soil	Low soil-heave potential anticipated*	Moderate soil heave potential anticipated	High soil-heave potential anticipated
D	Highly compressible soil	Low soil compressibility anticipated*	Moderate soil compressibility anticipated	High soil compressibility anticipated
E	Erodability of soil	Low	Intermediate	High
F	Difficulty of excavation to 1,5m depth	Scattered or occasional boulders less than 10% of the total volume	Rock or hardpan pedocretes between 10 and 40% of the total volume	Rock or hardpan pedocretes more than 40% of the total volume
G	Undermined ground	Undermining at a depth greater than 240m below surface (except where total extraction mining has not occurred)	Old undermined areas to a depth of 90-240 m below surface where stope closure has ceased	Mining within less than 90-240 m of surface or where total extraction mining has taken place
H	Stability: (Dolomite & Limestone)	Possibly stable. Areas of dolomite overlain by Karoo rocks or intruded by sills. Areas of Black Reef rocks. Anticipated Inherent Risk Class I	Potentially characterised by instability. Anticipated Inherent Risk Classes 2 – 5.	Known sinkholes and dolines. Anticipated Inherent Risk Classes 6 –8.
I	Steep slopes	Between 2 and 6 degrees (all regions)	Slopes between 6 and 18 degrees and less than 2 degrees (Natal and Western Cape) Slopes between 6 and 12 degrees and less than 2 degrees (all other regions)	More than 18 degrees (Natal and Western Cape) More than 12 degrees (all other regions)
J	Areas of unstable natural slopes	Low risk	Intermediate risk	High risk (especially in areas subject to seismic activity)
K	Areas subject to seismic activity	10% probability of an event less than 100 cm/s ² within 50 years	Mining-induced seismic activity more 100 cm/s ²	Natural seismic activity more than 100 cm/s ²
L	Areas subject to flooding	A "most favourable" situation for this constraint does not occur	Areas adjacent to a known drainage channel or floodplain with slope less than 1%	Areas within a known drainage channel or floodplain

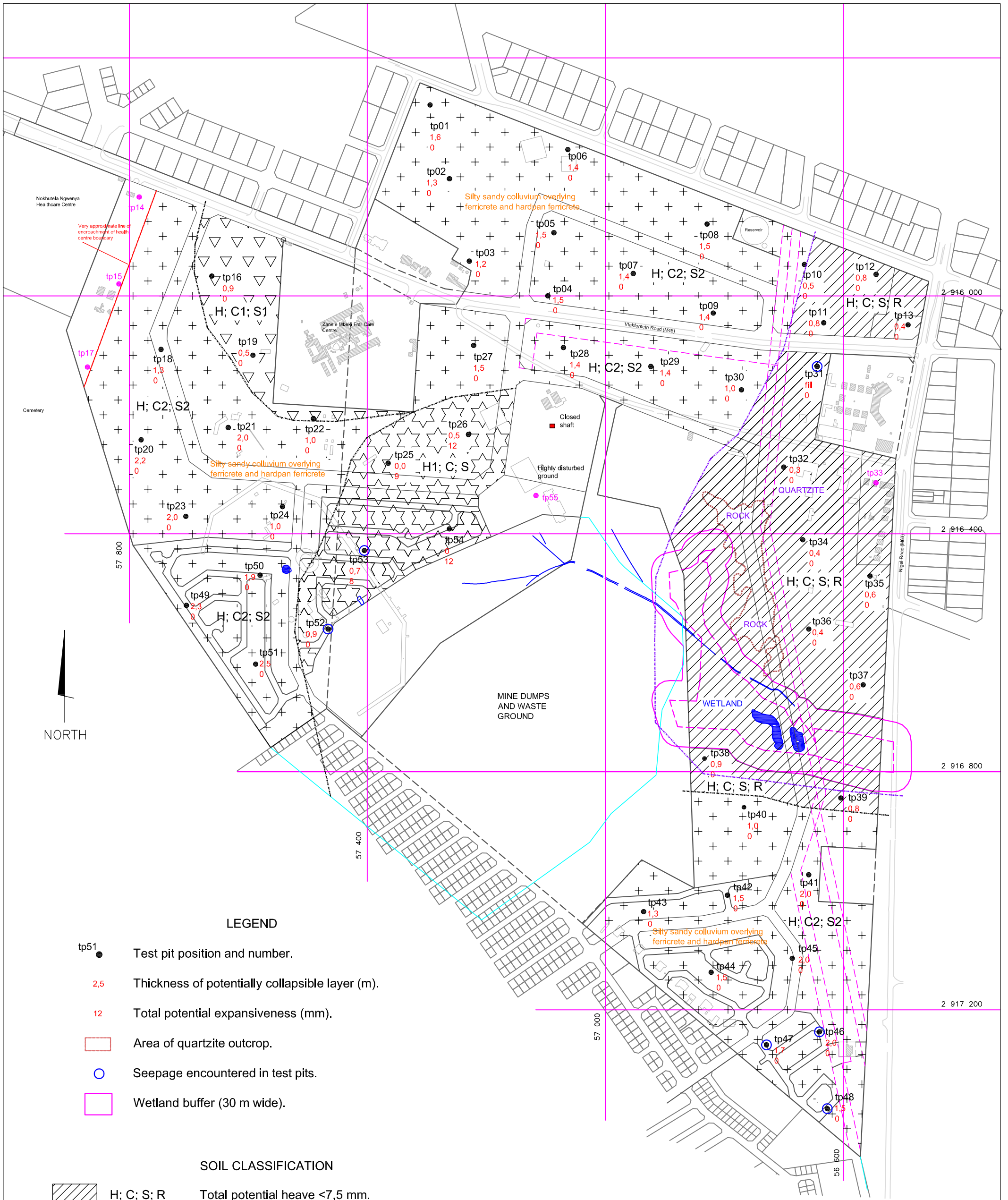
* These areas are designated as 1A, 1C, 1D, or 1F where localised occurrences of the constraint may arise.

Example:

A sub-area designated as Zone 2BF would be an intermediate class with anticipated seepage and excavation problems. A sub-area designated as Zone 3B would be designated as least favourable and not recommended for development due to surface water inundation.

APPENDIX E

GEOTECHNICAL MAP



LEGEND

- tp51 Test pit position and number.
- 2.5 Thickness of potentially collapsible layer (m).
- 12 Total potential expansiveness (mm).
- Area of quartzite outcrop.
- Seepage encountered in test pits.
- Wetland buffer (30 m wide).

SOIL CLASSIFICATION

- H; C; S; R

 Total potential heave <7,5 mm.
 Total collapse settlement <5 mm.
 Total normal settlement <10 mm.
 Hard rock <1,5 m below surface.
- H1; C; S

 Total potential heave >7,5-<15 mm.
 Total collapse settlement <5 mm.
 Total normal settlement <10 mm.
- H; C1; S1

 Total potential heave <7,5 mm.
 Total collapse settlement >5-<10 mm.
 Total normal settlement >10-<20 mm.
- H; C2; S2

 Total potential heave <7,5 mm.
 Total collapse settlement >20 mm.
 Total normal settlement >10 mm.

LOCALITY:		
JOHN DUBE EXTENSION 3		
TITLE:		
PROVISIONAL ENGINEERING GEOLOGY MAP.		
PREPARED BY:	SCALE	DATE
RELLY MILNER AND SHEDDEN P O BOX 32107 GLENSTANTIA 0010	1: 6 000	June 2020
Tel: 012 993 2049	JOB No.	FILE No.
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