

Draft Basic Assessment Report

Tembisa Licencing Hub

**Portion 67 of the farm Witfontein
15 IR**



BOKAMOSO

LANDSCAPE ARCHITECTS &
ENVIRONMENTAL CONSULTANTS CC

P.O. BOX 11375

MAROELANA

0161

TEL: (012) 346 3810

Fax: 086 570 5659

Email: Lizelleg@mweb.co.za

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Geotechnical: Dolomite Stability & Soils Investigation

A photograph of a modern, long building with a dark facade and large glass windows. The building is situated behind a paved road with a white dashed line. The sky is blue with some clouds. The text 'Appendix G5' is overlaid on the right side of the image.

Appendix G5

EKURHULENI METROPOLITAN MUNICIPALITY

**CONTRACT PS-CP 53-2013
DOLOMITE SPECIALIST CONSULTANTS**

WORKS ORDER NO. 830

***DOLOMITE STABILITY AND SOILS INVESTIGATION FOR
THE PROPOSED LICENSING HUB AT PORTION 67
WITFONTEIN 15 IR, ESSLEN PARK, EKURHULENI
METROPOLITAN MUNICIPALITY- Phase I***

**NA VUKEA
Engineering Geologist**

Prepared by

Blue Rain Consultants
PO Box 72292
4th floor, Office 21-23, 11 Van Reebeck Ave
Lavino's Towers
Edenvale
1609
Tel: +27 11 074 5694
Fax: +27 86 548 2764
e-mail: info@blueraincontractors.co.za

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1. INTRODUCTION

Blue Rain Consultants has been appointed by the Ekurhuleni Metropolitan Municipality (EMM) under Contract No. PS CP 53-2013, to perform a dolomite stability and soils investigation for the proposed Licensing Hub in Esslen Park at Portion 67 Witfontein 15 IR, Sam Molela Street.

2. SCOPE OF WORK

- Determine the dolomite stability of the Licensing Hub site with regard to dolomite-related subsidence.
- Characterise foundation and ground conditions for structures in accordance with the NHBRC methodology and suggested stability classification.
- Determine the ability to excavate and the suitability of excavated materials for use during construction.
- Identify geotechnical constraints, such as shallow groundwater, that may impact on the development.
- Provide a report on the investigation with comments and recommendations.

3. SITE LOCALITY AND DESCRIPTION

The site is situated on Portion 67 Witfontein 15 IR, at Sam Molela Street northern part of Esslen Park Location. The site under investigation covers an approximate area of (70 939 m²) 7.2ha. This site is situated adjacent to a railway line station at the intersection of Pretoria Road and Sam Molela Street in Esslen Park.

The area under investigation is currently vacant and it is covered by grasslands, weeds and trees. The site has a relatively flat slope of less than 1 degree with the highest elevation occurring in the north-eastern portion. Surface runoff water takes place through sheetwash.

4. PROPOSED DEVELOPMENT

This project is in line with the integrated Development plan as well as the objective of the department of establishing Motor Vehicle Registration Authority (MVRA) facilities and Drivers Licensing Testing Centre (DLTC) throughout the EMM. The proposed

structure constitute of two storey office building, testing bays, access roads, and the associated infrastructure (water, sewer and storm water).

Layouts and plans for the construction of the proposed Licensing Hub have not submitted to our office. Therefore this study focuses on a general dolomite stability and soil assessment for the whole site. No footprint drilling/investigation have been conducted on site.

The type of development is classified as a miscellaneous non-residential usage site as described in SANS 1936-1-2012 as a C1 i.e. Police Station type development.

The site layout is shown on Figure 1.

5. GEOLOGY AND GEOHYDROLOGY

According to the published scale Geological Map 2528 Pretoria, the site is underlain by chert-rich dolomite of the Monte christo Formation of Malmani Subgroup of the Chuniespoort Group, Transvaal Supergroup. The soil cover often comprises highly erodible soils, which can readily erode by downward percolating water to create leached or voided zones, which may result in the formation of sinkholes or dolines.

The geological map of the area under investigation is outlined in Figure 4.

Only limited groundwater information is available. According to Hobbs, the site is located in the Sterkfontein West groundawater compartment. The groundwater compartment compiled by DWAF shows that this site in the Sterkfontein West Compartment where generally deep groundwater can be expected i.e. in the order of 60 m depth. The original groundwater levels for this compartment are between 1490 and 1500 m.a.m.s.l. There was no groundwater was encountered during the investigation.

Unfortunately no borehole information exists within relevant proximity to the site.

6. PERCUSSION DRILLING AND TESTPITTING

The site investigation was conducted on 13-17 June 2014 and consisted of the drilling of seven percussion boreholes (EMM 1481A to EMM1487) within the proposed Licensing Hub site. Seven test pits (TP1 to TP7) were excavated to maximum reach of the TLB was conducted on the 07 July 2014. Drilling was performed by Didiba Drilling & Exploration Services Drilling Contractor and the test pits were excavated with a Cat 424 D TLB. Chip samples, taken at 1m intervals from the percussion drilling, were described by an engineering geologist, while accurate measurements were made of penetration rates.

The boreholes and soil profiles were described according to standard practice. Two disturbed soil samples were taken from the various horizons encountered on site for foundation indicator tests. No bulk samples were collected for Modified AASHTO compaction testing and California Bearing Ratio (CBR) determination.

The approximate positions of the test pits and percussion boreholes are shown in Figure 1 and Figure 3.

The test pits were excavated adjacent or close to the percussion boreholes to provide additional soil profile information and to confirm the consistency of soils near ground surface.

7. RESULTS

7.1 Percussion Drilling

The site is characterised by relatively shallow dolomite bedrock. Virtually moderately to slightly weathered sound dolomite rock was encountered in all the boreholes from a depth of between 15m and 31m.. Drilling extended to a depth of at least six meters into bedrock to confirm that bedrock had been reached, and that a large dolomite floater was not misinterpreted as bedrock. Typical penetration rates in the bedrock exceeded 3min/m.

The portion of the ground profile above sound bedrock is referred to as the blanket layer. The material constituting the blanket layer comprised colluvium, residual chert and weathered dolomite, including wad-rich material. Moderately to slightly weathered hard rock dolomite was encountered at various depths in EMM1481A, EMM1482, EMM1483, and EMM1486 above sound dolomite bedrock but at EMM 1484 highly to moderately weathered dolomite samples were recovered.

Zones of moderately weathered rock dolomite was encountered within sound slightly weathered dolomite rock in EMM 1481A (between a depth of 22 m and 30 m below surface), EMM 1482 (between a depth of 22m and 28m below ground level), in EMM 1483 (between a depth of 20m and 22m below the existing ground level) and in EMM 1484 a zone of highly to moderately weathered dolomite was encountered (between a depth of 15m to 22m below surface), EMM 1486 (between a depth of 16m and 31m below ground level) .

At EMM 1485 and EMM 1487 a highly to slightly weathered light grey speckled pink granite rock was encountered.

The distribution of all these material types is fairly irregular, which is typical for a dolomite environment.

Sample and air losses were encountered in any of the boreholes (EMM1481A: 14 m - 24 m , EMM 1482: 22 m - 28 m, EMM 1483: 16 m – 20 m, EMM 1486: 7 m – 26 m and EMM1487: 14 m – 28 m below ground level) during this investigation. Sample or air losses associated with highly weathered dolomite bedrock are based on penetration rates of more than 1min/m and sound dolomite bedrock are based on penetration rates of more than 3min/m. Air losses are an indication that either very porous subsurface conditions are present or that cavities exist that can act as receptacles for material eroded from the subsurface profile under the influence of percolating water.

No water strike has been encountered during the drilling on site.

A summary of the borehole profiles and the detailed borehole logs are given in Appendix B.

7.2 Test Pitting

The typical soil profile for the site can be summarised as follows:

The surface layer consists of colluvium comprising loose silty sand, with chert gravel varying with depth.

Below the colluvium is a residual chert layer consisting of loose silty clayey sand, with various percentages (30% to 70%) chert gravel. At TP4 the residual chert layer consisting of loose to medium dense consistency at depths ranging from 0.30 m to 2.30 m below existing surface was encountered with difficulty to excavate with a TLB.

No water seepage was encountered during the excavation of the test pits.

Table 1 and Table 2 [7.3] provides a summary of the soil profiles and the detailed soil profiles are given in Appendix C.

7.3 Laboratory Testing

Foundation indicator tests and a compaction test were conducted by Geostrada on representative soil samples. The test results are contained in Appendix D.

Table 1
Particle Size Distribution and Atterberg Limit Determination Tests

Pit No	Depth (m)	Description	Particle Size				Atterberg Limits %			GM	Activity
			Clay	Silt	Sand	Gravel	LL	PI	LS		
TP2	0.7-1.0	CLAYEY SANDY SILT.	41	22	34	3	36	15	8.0	0.55	Low
TP7	0.4-1.5	CLAYEY SILTY SAND.	21	23	47	1	31	15	6.0	066	Low

LL- Liquid Limit

GM - Grading Modulus

PI - Plasticity Index

LS - Linear Shrinkage

Results of laboratory tests conducted on the residual chert indicated a well-graded material, which is predominantly fine-grained with a low plasticity. It classified as CL in accordance with the Unified Soil Classification, i.e. silt and clay of low to medium plasticity. The residual chert has a liquid limit of between 31% and 31% and a plasticity index of 7 % with a low potential expansiveness on average.

8. DOLOMITE RISK CHARACTERISATION

8.1 General

The results of the borehole information were used collectively during this study to assess the stability of the site. The dolomite risk characterisation was done in accordance with the method proposed by Buttrick *et al.* [5]. The risk classification of the borehole profiles is summarised in Table 1 at the back of the report.

According to the methodology of scenario supposition [5], the conditions in each borehole must be evaluated in terms of a non-dewatering as well as a dewatering scenario. This method evaluates the stability of an area by investigating the presence of receptacles in the dolomite profile, depth to potential receptacles, maximum sinkhole development space, the nature and mobilisation potential of the blanket material and the presence of mobilising agents.

The factors influencing the stability of the area, as evaluated in the following sections, are described as follows:

The *blanket layer* (dolomitic overburden) comprises all the materials occurring between the ground surface and the dolomitic bedrock surface. The term blanket layer, is defined here as the component of the dolomitic overburden that overlies the potential receptacles.

Receptacles in the dolomite profile may occur either as small disseminated and interconnected openings in the overburden or as substantial openings (especially where chert rubble is present) or as substantial openings (cavities) in the bedrock. Both types of opening may be able to receive mobilised (transported) materials from overlying horizons.

Mobilisation and mobilising agents: Mobilising is defined as the movement of dolomite overburden by subsurface erosion. Mobilizing agents include ingress water, ground vibrations, water level drawdown or any process that can induce mobilisation of the material in the blanket layer under the force of gravity.

Maximum potential development space: This is a simplified estimation of the maximum size sinkhole that can be expected to develop in a particular profile, provided that the available space is fully exploited by a mobilising agent. The available space depends on the depth below ground surface to the throat of a receptacle or disseminated receptacle and the 'angle of draw' in the various blanket materials.

8.2 Risk Classification

Each borehole drilled was classified according to the eight different risk classes (1 to 8) proposed in the method for dolomite land hazard and risk assessment in South Africa [5]. The classification was carried out for both a non-dewatering and dewatering scenario (refer to Table 1 at the back of the report).

For the purpose of this study, the eight classes were combined to represent only one primary stability zone. This zone is defined in the table below.

According to the EMM cadastral data the regional Inherent Hazard Classification (IHC 1/4/7). However drilling results revealed that a larger portion of the site (EMM1483, EMM1484, EMM1485 and EMM1486) is classified as IHC1/3 implying a very small to no risk to sinkhole and subsidence formation and a smaller portion of the site (EMM1481 and EMM1487) classified as IHC 4 of the site implying a high risk for small to very large-size sinkhole and subsidence formation.

The inherent risk class for the footprint of the proposed Licensing Hub is outlined in Figure 3.

Table 2: Summary of the Inherent Hazard Classification

PRIMARY STABILITY ZONE	INHERENT RISK CLASS (NHBRC Risk Class)	NHBRC DOLOMITE AREA DESIGNATION	BOREHOLE NO.	RISK CHARACTERIZATION
ZONE	1/3/4	D3	EMM 1400 –EMM 1403	Low to Medium risk of small to medium sinkhole and medium to high risk for doline formation

Analysis of the inherent dolomite related subsidence risk classes has shown the following:

- Non Dewatering Scenario: No water was encountered during the drilling, therefore this can be regarded as a non-dewatering site.
- Dewatering Scenario: For a dewatering scenario to occur, the water table must be lowered to depths between 7m and 8m empty receptacles into which eroded material can be transported in order for sinkholes to develop. Assuming that all eroded materials can be accommodated in receptacles and that conduits to these receptacles do not become blocked by coarse material, sinkholes of sufficient size are theoretically possible that warrant classifying the area around Borehole EMM 1481, EMM 1487 as Risk Class 4 and EMM01482 and EMM1486 as Risk Class 3 and the remainder of the site as Risk Class 1. Both these risk classes are suitable for places of detention and police stations use provided adequate water control measures are implemented and any infrastructure in this regard is regularly maintained in an effective operational condition. ; therefore effect of dewatering will have a low hazard impact on this site.

Table 3: Summary of dolomite area designation

Dolomite area designation	Description
D1	No precautionary measures are required.
D2	General precautionary measures, in accordance with the requirements of SANS 1936-3, that are intended to prevent the concentrated ingress of water into the ground, are required.
D3	Precautionary measures in addition to those pertaining to the prevention of concentrated ingress of water into the ground, in accordance with the

	relevant requirements of SANS 1936-3, are required.
D4	The precautionary measures required in terms of SANS 1936-3 are unlikely to result in a tolerable hazard. Site-specific precautionary measures are required.

(a) *Blanketing Layer*

The upper portion of the blanket layer consists of residual chert while residual chert with wad was encountered in borehole EMM 1481, EMM 1482, EMM 1484, EMM 1485, and EMM 1486.

The residual chert (viz. chert fragments and/or layers within a matrix of silty sand) varied in thickness between 4 m and 16 m. The residual chert is characterised by its heterogeneous nature and it is therefore difficult to allocate a specific risk of mobilization. The penetration rates through these layers varied between 6s/m and 25s/m. The overall mobilization risk of this horizon is, however, classified as medium to high, the widespread presence of wad the sandy materials being highly erodible, silty materials moderately erodible and the clayey materials having low erodibility.

Weathered chert (viz. Silty clay and very soft wad rich soils) were encountered in EMM 14181A, EMM 1482, EMM 1483, EMM 1485 and EMM 1487 with a thickness varying from 4 m and 20 m below existing surface. The penetration rates through this material varied between 0.15s/m and 0.50min/s. This material is classified as having a medium to high risk due to the presence of wad with high penetration rate.

Weathered dolomite (viz. silty clay with minor chert fragments and wad or wad-rich soils) was encountered with depth. The thickness of the weathered dolomite layer that mainly comprises silty clay or silty sand with chert and dolomite fragments and wad varies between 16 m to 20 m at EMM 1483 and 14 m to 15 m at EMM 1484 below surface. This material classifies as having a medium to high risk, due to the presence of wad with a high penetration rate.

(b) *Receptacles*

Although no receptacles were encountered in any of the boreholes, residual chert comprising highly compressible and erodible wad was found in borehole the boreholes drilled. These wad layers could perhaps be disseminated and can accommodate some mobilised material from overlying horizons. For the purpose of risk assessment it should therefore be assumed that receptacles do occur within the upper portion of the bedrock and/or disseminated zones in the wad, irrespective whether these were encountered by drilling or not.

(c) *Mobilisation Agents*

In an urbanised area it should be assumed that a mobilising agent is always present in the form of leaking wet services, ponding of surface water and ground vibrations.

On site the water table is deep, a greater thickness of the blanketing layer is exposed to mobilisation than in areas with a shallower water table.

The site slopes at a gradient of less than 1° in a north-eastern direction, which implies that ponding and infiltration of water into the subsurface may take place, enhancing the potential of sinkhole or doline formation.

(d) *Maximum Potential Development Space of a Sinkhole and Doline Formation*

The depth to dolomite bedrock across the site is fairly variable but generally shallow. The potential development space for a sinkhole to develop for a non-dewatering scenario is limited and sinkholes, if any, will be small to medium (2m to 5m). In a dewatering scenario (i.e. drawdown of the groundwater level) the potential development space for a sinkhole is also considered to be limited, if any, it will also be small to medium probably in the range of 1m to 4m, due to a moderately competent blanket layer above sound bedrock. The maximum size sinkhole that may be expected to occur at each borehole is indicated in Table 1.

Dolines usually form where compaction of highly compressible material takes place (often associated with the gradual lowering of the groundwater level), or where the receptacles have limited available space, or where the potential sinkhole formation process is halted due to choking of conduits to receptacles or remedial measures taken in time. The potential for doline formation is [considered to be low in Boreholes EMM 1483, EMM 1484, EMM 1485 and EMM 1486, medium in Boreholes EMM1482 and EMM1486 and high in Boreholes EMM1481A and EMM1487.] Taken into account for the assessment of doline formation risk are the occurrence of highly erodible horizons comprising wad, the overall shallow bedrock depth and the lowering of the water table to below bedrock levels.

(e) *Risk Class*

Drilling revealed that Portion 67 Witfontein 15 IR is blanketed by a thin layer (6 m thick on average) of competent overburden, considered to have a low mobilization potential, consisting of residual chert. This was the layer intersected within the boreholes. However this is underlain by a layer of (6.0 m thick on average) of highly compressible wad. The top portion of the wad often contains stringers of chert, with was encountered in all seven of the boreholes. Some blocky wad concretions area also present within highly weathered dolomite intersected above medium to slightly weathered dolomite bedrock that is present to the maximum depth of the boreholes. The only exception is borehole EMM 1487 and EMM 1485 where a pinkish, slightly weathered granite gneiss was intersected below the weathered chert from 24 m to 32 m and 22 m to 28 m below surface. Slight to medium air and material loss was recorded during the drilling and is generally confined to the wad layer.

The entire site therefore generally constitutes Risk Class 1/3/4 for both a non-dewatering and dewatering scenario (NHBRC Class D3) due to the thick layer of wad present above the dolomite bedrock. The classification indicates that there is a low to medium risk for the development of small to medium sized sinkholes as well as

doline formation in both a non-dewatering and watering scenario. Dewatering the site will therefore no influence the stability of the site.

In general it is concluded that the properties of the blanketing layer within the site is fairly competent. The ERF is therefore suitable for the proposed Licensing Hub Construction provided the stringent water precautionary measures according to PW 344 for D3 classification as well as SANS 1936-2 be implemented.

9. GEOTECHNICAL EVALUATION AND DEVELOPMENT RECOMMENDATIONS

It is understood that the development will comprise of two storey office building, testing bays, access roads, and the associated infrastructure (water, sewer and storm water). For the associated infrastructure (water, sewer and storm water): severe water precautionary measures according to **PW344 (Ref. 2)** for **D3** site are instigated.

9.1 Earthworks

Due to the gently sloping nature of the site significant earthworks are not envisaged. It is recommended however that the construction of the earthworks be carried out in accordance with SABS1200D (current version).

9.2 Materials Evaluation

The materials found on the site have been tested and have been classified in terms of the laboratory test results.

The characteristics of the colluvium and residual materials found on site are mostly wad contaminated soils and are deemed not suitable for use for the construction for the proposed Licensing Hub development; therefore it is recommended that foreign competent to a quality of G5 or G6 be imported.

9.3 Foundation Recommendations

The laboratory test results indicate that all the in-situ materials in the upper 3 m have low grading moduli of between 0.55 and 0.66, Plasticity Indices of 15 and Linear Shrinkages of between 6.0 and 8.0.

According to Van der Merwe's plasticity chart, the subsoils have a low potential for expansiveness (moisture related movement of the soils), due to low percentage of clay in the soil matrix.

It is recommended that the two storey building and other heavily loaded structure be founded on a reinforced concrete raft design to span a 5m loss of support.

For other lightly loaded structures can be founded on Normal shallow strip foundations can be used considering the prevailing geological conditions on site. Design a foundation and structural solution which will ensure that the occupants of the structure can escape safely should loss of support occur and also ensure that the structure is in such a state after the event that remedial action can be put in a place and the structure be used again in the future. This could be applied for a warehouse type structure/ vehicle evaluation areas where it could settle or crack but be repaired with underpinning.

The construction of large concrete rafts is expected to be very costly and therefore economically less attractive.

It is recommended that an experienced geotechnical engineer or engineering geologist inspect the foundation excavations prior to commencing with the backfilling and/or casting of concrete to ensure that suitable foundations have been reached.

9.4 Roads and Paved Areas

From the results of the field investigation and laboratory test results it is apparent that the colluvial and residual soils underlying the site are generally poor subgrade materials. Depending on the road design adopted, it may be necessary that as a minimum subgrade improvement measure. The road prism on a site like this is unlikely to exceed 1 m and subgrade can therefore be placed directly on the natural soil provided the latter is compacted to at least 90% Mod AASHTO.

Subsequent layerworks, after the above recommended minimum improvement, will depend on the anticipated traffic loads, volumes and design life and must be designed accordingly.

10. RISK MANAGEMENT PLAN AND PRECAUTIONARY MEASURES

Standard precautionary measures regarding foundation design, wet services specifications, stormwater management and general measures for dolomite areas designated as Risk Class 3 and 5 (NHBRC Class D3) should be adhered to.

The aspects to be attended to are as follows:

10.1 Foundation Design

- The foundations will be constructed as per the structural engineers specifications. The design should be in accordance with the Journal of the Joint Structural Division of SAICE, draft specifications of SANS 1936-4 of 2012.

10.2 Wet Services Specifications

- No new boreholes shall be permitted on the site, except for the monitoring of groundwater levels. If any boreholes currently exist on the site, the groundwater level should be monitored by the owner or manager of the property and recorded regularly (every month) by the responsible person, since the drastic lowering of the groundwater table will increase the risk of sinkhole and doline formation. Actual measurements should ultimately be reported to the Department of Water Affairs and Forestry to form part of a broader, regional monitoring programme.
- All water and sewer materials should be HDPE quality materials with flexible joints to be used. No plumbing and drainage pipes shall be placed under floor slabs.
- Rodding eyes must be provided on the sewer line.
- Pressure release leaking system will flow directly into the sewer system.
- The NBRI air test for leaks will be conducted on all underground sewerage and stormwater pipes (see NBRI info sheet X/BOU 2-34. A plumber should perform Tests after installation).
- Water pipe entries into the building will be in accordance with Figure 53 (Home Builders Manual Part 1, page 27).
- WC pans shall be provided with a flexible connection at the junction with the outlet pipe.
- Water pipes shall have a minimum cover of 500mm.
- All pipes shall be inspected every 6 months.

10.3 Site Stormwater Management

- The entire development should be landscaped to facilitate good drainage and prevent the ponding of surface water against structures. All water courses and road surfaces shall be sealed and rendered impervious.
- The site should be inspected immediately after a heavy downpour to assess the drainage of the site. If ponding is visible it should be noted and be corrected as soon

as possible to prevent any ponding in the future. Ponding should be prevented at all times.

- A minimum gradient of 1:15 should be maintained along site stormwater systems.
- All water borne in sleeves and ducts.
- Stormwater to be discharged into municipall storm water system
- Down pipe guttering should be discharged into a pre-cast furrow, which will remove the water from the structure on a sealed surface.
- Paving immediately against the buildings, should be shaped to fall in excess of 75mm over the first 1,0m beyond the perimeter of the building.
- The regional stormwater system should be well established and thoroughly integrated with the Local Council's Stormwater Management Plan.
- No boreholes to be drilled for water abstraction.

10.4 General

- All structures should be closely inspected for signs of structural cracking on a bi-annual basis. If structural cracks appeared the date and width shall be recorded. If the width increases a structural engineer should be consulted for professional advice.
- Stormwater and sewer pipes should be laid properly in a bed of selected fill or granular material.
- The water pipe should be laid in sleeve.
- Sewer or water pipe line should not be encased in concrete or soilcrete.
- All trenches and excavation works must be properly backfilled and compacted according to the recommendations in sub clause 5.2.4 SABS 1200BA to prevent them as functioning French drains.
- Water pipes entering buildings should be kinked either a Z or a U to allow for relative movement.
- No plants, trees, shrubs, flower beds etc. which require large amounts of water should be allowed. If such is required, it should be placed in sealed pots.
- An isolation valve should be installed in the waterline where it enters the building.
- Water supply to the site should be checked regularly and any leakage and repairs be recorded. This should be done once a month to ensure early detection of leakage.

- Water meter checks should be done once a month. The meter must be observed once the isolation valve is closed to see if there is any consumption. The actual meter reading and date must be recorded. If any flow is detected a plumber shall be appointed to repair the leakage and tested afterwards.
- Sewer line should be checked on a monthly basis to ensure early detection of leakage and any leakage and repairs be recorded.
- A pressure test must be done once a year on the sewer line.
- Brick and pre-cast walls must be designed as to provide drainage ports at ground level permitting passage of water.
- Ensure the roadways are placed below site so as to facilitate drainage.

10.5 Emergency Procedures

- In the event of a sinkhole or doline occurrence a competent person (i.e. geotechnical engineer or engineering geologist) should be consulted for the rehabilitation of the sinkhole or doline.
- A responsible person (manager for example, staying on site) should be assigned and trained to respond to emergency situations caused by sinkhole or doline formation (e.g. where to cut off the water supply if instability had been caused by a leaking pipe or if evacuation of a building is justified).

10.6 Data Base

The findings of the monitoring and maintenance plan should be fed into a data bank and reported regularly to the Council for Geoscience (CGS). The following information should inter alia be included in the data system:

- the dolomite stability and geotechnical report
- relevant (old) reports and correspondence
- a layout plan with location of services
- the zonation map
- records of inspection and testing
- records of maintenance (detailing when, how and what was done)
- a register of damaged structures
- a record of sinkhole and doline occurrences (with rehabilitation taken)

11. CONCLUSIONS AND RECOMMENDATIONS

11.1 Dolomite Stability

A low to medium risk exists for small to medium size sinkhole formation in a non-dewatering and dewatering scenario for the site (NHBRC Class D3). A medium to high risk exists for doline formation, particularly with ingress of surface water.

11.2 Foundation Conditions

Reinforced concrete raft designed to span a 5 m loss of support.

It is recommended that an experienced geotechnical engineer or engineering geologist inspect the foundation excavations prior to the placing of concrete or wet services to ensure that suitable foundations have been reached.

11.3 Risk Management and Precautionary Measures

The risk management plan as set out in Section 9, should be adhered to and precautionary measures followed. NHBRC requirements for development of areas underlain by areas designated by D3 must strictly be adhered to.

REFERENCES

1. Brink, A.B.A. (1979). *Engineering geology of Southern Africa, Volume 1*. Building Publications, Silverton, 319 pp.
2. Hobbs, P.J. (1988). *Hydrogeology of the Verwoerdburg Dolomite Aquifer*. Department of Water Affairs and Forestry, Report No. GH 3502.
3. The South African Institute of Engineering Geologists, 1996. *Guidelines for Soil and Rock Logging*.
4. Technical Recommendations for Highways No. 14 (1985). *Guidelines for Road Construction Material*. Department of Transport, pp. 1-57.
5. Buttrick, D.B., Van Schalkwyk, A., Kleywegt, R.J. and Watermeyer, R.B. (2001). *Proposed method for dolomite land hazard and risk assessment in South Africa*. Journal of the South African Institution of Civil engineering, 43(2), pp. 27 – 36.
6. National Home Builders Registration Council (1999). *Home Building Manual*. Revision No. 1.

APPENDIX A

ASPECTS OF DOLOMITIC STABILITY ASSESSMENT

ASPECTS OF DOLOMITIC STABILITY ASSESSMENT

A study area is characterized in terms of eight standard Inherent Hazard Classes, also referred to as Inherent Risk Classes. These classes denote the chance of a sinkhole or subsidence occurring as well as its likely size (diameter).

The terminology used in terms of likely size of an event (sinkhole or subsidence) is defined as follows:

Table A.1: Sinkhole size definitions

Maximum diameter of surface manifestation (in metres)	Terminology
<2	Small-size
2-5	Medium-size
5-15	Large-size
>15	Very large-size

The larger the Inherent Hazard Class number, the greater the chance of a sinkhole or subsidence occurring and the larger its potential size should it occur. The meaning/definition of each Inherent Hazard Class is as follows:

Table A.2: Description of Classes and Associated Risk

Class	Description of expected risk
Class 1 Areas:	Areas characterised as reflecting a <u>low</u> Inherent Risk of sinkhole and doline formation (<u>all sizes</u>) with respect to ingress of water.
Class 2 Areas:	Areas characterised as reflecting a <u>medium</u> Inherent Risk of <u>small sinkhole</u> and doline formation with respect to ingress of water.
Class 3 Areas:	Areas characterised as reflecting a <u>medium</u> Inherent Risk of <u>medium</u> sinkhole and doline formation with respect to ingress of water.
Class 4 Areas:	Areas characterised as reflecting a <u>medium</u> Inherent Risk of <u>large</u> size sinkhole and doline formation with respect to ingress of water.
Class 5 Areas:	Areas characterised as reflecting a high Inherent Risk of <u>small</u> sinkhole and doline formation (<u>all sizes</u>) with respect to ingress of water.
Class 6 Areas:	Areas characterised as reflecting a <u>high</u> Inherent Risk of <u>medium</u> size sinkhole and doline formation with respect to ingress of water.
Class 7 Areas:	Areas characterised as reflecting a <u>high</u> Inherent Risk of <u>large</u> sinkhole and doline formation with respect to ingress of water.
Class 8 Areas:	Areas characterised as reflecting a <u>high</u> Inherent Risk of <u>very large</u> size sinkhole and doline formation with respect to ingress of water.

The table below sets out the inherent hazard classes in terms of sinkhole sizes and associated risk of occurrence.

Table A.3: Statistical occurrences of inherent hazard classes of subsidence and specified-size sinkholes

	2	3	4	5	6
Inherent hazard class	Statistical occurrences of sinkholes and subsidences				
	Small sinkhole	Medium Sinkhole	Large sinkhole	Very Large Sinkhole	Subsidence
	<2 m	2 m to 5 m	5 m to 15 m	> 15m	
1	Low	Low	Low	Low	Low
2	Medium	Low	Low	Low	Medium
3	Medium	Medium	Low	Low	Medium
4	Medium	Medium	Medium	Low	Medium
5	High	Low	Low	Low	High
6	High	High	Low	Low	High
7	High	High	High	Low	High
8	High	High	High	High	High

NOTE: The statistical occurrence of the events/hectare over a 20-year period is in the following ranges:
 -Low: 0 < 0,1 (return period is greater than 200 years)
 -Medium > 0,1 < 1,0 (return period is between 200 and 20 years)
 - High > 1,0 (return period is less than 20 years)

Dolomite Area Designations

Dolomite Area Designations must be identified on sites located on or near dolomite land (land where dolomite is present within 100m of the ground surface).

The definitions of the Dolomite Area Designations as defined in SANS 1936 Part 1 (2012) are as follows:

Table A.4: Guidelines for assessing the risk for mobilisation of the blanketing layer (Inherent Risk for sinkholes)

Inherent Risk	Typical site conditions
Low	The profile displays no voids. No air loss or sample loss is recorded during drilling operations. Either a very shallow water table or a substantial horizon of materials with a low potential susceptibility to mobilisation may be present within the blanketing layer (e.g. continuous intrusive features or shale material). Depth to potential receptacles is typically great and the nature of the blanketing layer is not conducive to mobilisation.
Medium	This type of profile is characterised by an absence of a substantial 'protective' horizon and has a blanketing layer of materials potentially susceptible to mobilisation by extraneous mobilisation agencies. The water table is below the blanketing layer.
High	The blanketing layer of the high-risk profile reflects a great susceptibility to mobilisation. A void may be present and is interpreted to be very likely, within the potential development space, indicating that the process of sinkhole formation has already started. Boreholes may register large cavities, sample loss, air loss, etc. Convincing evidence exists of cavernous subsurface conditions which will act as receptacles. The water table is below the blanketing layer. In a dewatering situation, the lowering of a shallow groundwater level would obviously increase the risk of mobilisation.

The table above is used to provide an indication of how many incidences of subsidence could be expected in a zone categorised as described in the previous table. It is important to note that these figures are largely derived from developments not effectively and appropriately designed or maintained.

Inherent susceptibility is a reflection of the geological susceptibility of a karst area to an event (sinkhole or subsidence formation) and is expressed in three broad categories, namely low, medium and high. The following reference to incidences, gives a perspective of the magnitude of problems encountered in each of the of hazard zones in research areas.

In a dolomitic stability study report Inherent Susceptibility is normally defined in terms of ingress water and groundwater level drawdown reflected by two Inherent Hazard Class designations separated by a double forward slash, i.e. -

Inherent Hazard Class (ingress water) // Inherent Hazard Class (groundwater level drawdown)

As an example, a designation of 1//8 indicates that the zone displays a low inherent susceptibility with respect to water ingress but a high inherent susceptibility with respect to groundwater level drawdown.

As a further example, a designation of Inherent Hazard Class 1//1/4/8 indicates that the zone displays a low inherent susceptibility with respect to water ingress but a low to high inherent susceptibility with respect to groundwater level drawdown. This definition may, for example, be necessary in cases where groundwater was not encountered or the original groundwater level is not known and dolomite bedrock could not be confirmed.

Often a zone is not characterized by a single Inherent Hazard Class. In some instances, the Inherent Hazard Classes are then indicated with the primary zone description given first followed by a suffix in brackets. The primary Inherent Hazard Class describes the predominant characterization of the zone and the suffix describes the characterization of anticipated pockets or small sub-areas within the zone. For example, a designation of Inherent Hazard Class 8(4) indicates that the zone predominantly displays a high inherent susceptibility for up to very large-size sinkhole and subsidence formation with anticipated pockets or small sub-areas of Class 4 i.e. displaying a medium susceptibility for up to large-size sinkhole and subsidence formation.

Specific commentary should be provided on the impact that a lowering of the ground water level or base level of erosion may have on the action of ingress water, i.e. does the susceptibility of the subsurface profile remain unchanged from an ingress of water perspective or not as the groundwater level is lowered, and the previously “protected” profile is exposed?

As a further example, the lowering of the groundwater level and exposure of a poor subsurface profile in an area of previously shallow groundwater level designated as Inherent Hazard Class 3//7 results in a change in susceptibility from medium to high and the Inherent Hazard Class from 3 to 6 thus the Inherent Hazard Class 3//7 will change to Inherent Hazard Class 6//7 once groundwater level drawdown is factored in.

APPROPRIATE LAND USE IN DOLOMITE AREAS

The land uses appropriate to dolomitic areas, depending on their dolomitic designations derived by subsurface stability analysis and geological modeling are given in the table below

Table A.5: Appropriate land use recommendations

1	2	3	4	5	6	7	8	9	10	
Land usage		Inherent hazard class determined in accordance with the requirement of SANS 1936-2								
Designation	Description	1	2	3	4	5	6	7	8	
		Dolomite area designation and footprint investigation requirement								
Commercial and miscellaneous non-residential usage										
C1	Places of detention, police stations, and institutional homes for the handicapped or aged	D3 + FPI					D4			
C2	Hospitals, hostels, hotels	D3 + FPI						D4		
C3	Commercial developments < 3 storeys, including railway stations, shops, wholesale stores, offices, places of worship, theatrical, indoor sports or public assembly venues, other institutional land uses such as universities, schools, colleges, libraries, exhibition halls and museums, light (dry) industrial developments, dry manufacturing, commercial uses such as warehousing, packaging, and electrical sub-stations, filling stations	D2 + FPI	D3 + FPI					D4		
C4	Commercial developments > 3 storeys, including railway stations, shops, wholesale stores, offices, places of worship, theatrical, indoor sports or public assembly venues, other institutional land uses such as universities, schools, colleges, libraries, exhibition halls and museums, light (dry) industrial developments, dry manufacturing, commercial uses such as warehousing, packaging, and electrical sub-stations	D2 + FPI	D3 + FPI	D4						
C5	Fuel depots, processing plants or any other areas for the storage of liquids, waste sites.	D2 + DLI	D3 + DLI				D4			
C6	Outdoor storage facilities, stock yards, container depots	D2 + DLI	D3 + DLI						D4	
C7	Parking garages	D2	D3 + FPI					D4		
C8	Parking garages	D2	D3					D4		

DLI = Design level investigation in accordance with the requirements of SANS 1936-2, as deemed appropriate by the competent person.
FPI = Design level investigation specifically below the footprint of the structure.

Table A.5 (continued)...

Land usage		Inherent hazard class determined in accordance with the requirement of SANS 1936-2							
Designation	Description	1	2	3	4	5	6	7	8
		Dolomite area designation and footprint investigation requirement							
High rise dwelling units									
RH1	>10 Storeys	D4							
RH2	>3 Storeys with a residential with a population of $\leq 1\ 500$ people per hectare	D2 + FPI	D4						
RH3	>3 storeys with a residential coverage ratio of ≤ 0.4 , no higher than 10 storeys, and a population of ≤ 800 people per hectare	D2 + FPI	D3 + FPI				D4		
Low rise dwelling units									
RL1	≤ 3 Storeys with 80 to 120 units per hectare and a population not exceeding 600 people per hectare	D2 + FPI	D4						
RL2	≤ 3 Storeys with up to 80 units per hectare and a population not exceeding 400 people per hectare	D2 + FPI	D3 + FPI				D4		
Dwelling Houses									
RN1	Up to 60 dwelling houses per hectare with stands larger than $150\ m^2$, and a population of ≤ 300 people per hectare	D2	D3	D4					
RN2	Up to 25 dwelling houses per hectare with stands no smaller than $300\ m^2$, and a population of ≤ 200 people per hectare	D2	D3			D4			
RN3	Up to 10 dwelling houses per hectare with 1 000 to 4 000 m^2 stands, and a population of ≤ 60 people per hectare	D2	D3			D3 + FPI		D4	
Other									
AO	Agriculture that does not require irrigation in any form or the storage of water, parkland and public open spaces that are not irrigated and grazing pastures	See SANS 1936-4							
DLI = Design level investigation in accordance with the requirements of SANS 1936-2, as deemed appropriate by the competent person. FPI = Design level investigation specifically below the footprint of the structure.									

Table A5. (continued)

1	2	3	4	5	6	7	8	9	10
Land usage		Inherent hazard class determined in accordance with the requirement of SANS 1936-2							
Designation	Description	1	2	3	4	5	6	7	8
		Dolomite area designation and footprint investigation requirement							
A1	Agriculture that requires intensive irrigation	See SANS 1936-4							
A2	Agriculture that requires irrigation, including botanical gardens, sports fields, driving ranges, golf courses, parkland and public open spaces	See SANS 1936-4							
DLI = Design level investigation in accordance with the requirements of SANS 1936-2, as deemed appropriate by the competent person.									
FPI = Design level investigation specifically below the footprint of the structure.									
NOTE 1 D1, D2, D3 and D4 have the meanings assigned in table 1.									
NOTE 2 Residential coverage ratio = footprint area/site area.									

APPENDIX B

BOREHOLE PROFILES

HOLE No: EMM 1482
Sheet 1 of 2

JOB NUMBER: WO 830

FORMATION
C - cavity
VS - Very Soft
S - Soft
FH - fairly Hard
SD - Solid
CA - cavernous

HAMMER OPERATION
VI - very irregular
IR - Irregular
R - Regular

CHIP SIZE
CC - coarse (>10mm)
MC - medium (5-10mm)
FC - fine (<5mm)
NA - not applicable

JOINT ROUGHNESS
W - wet
M - moist
D - dry

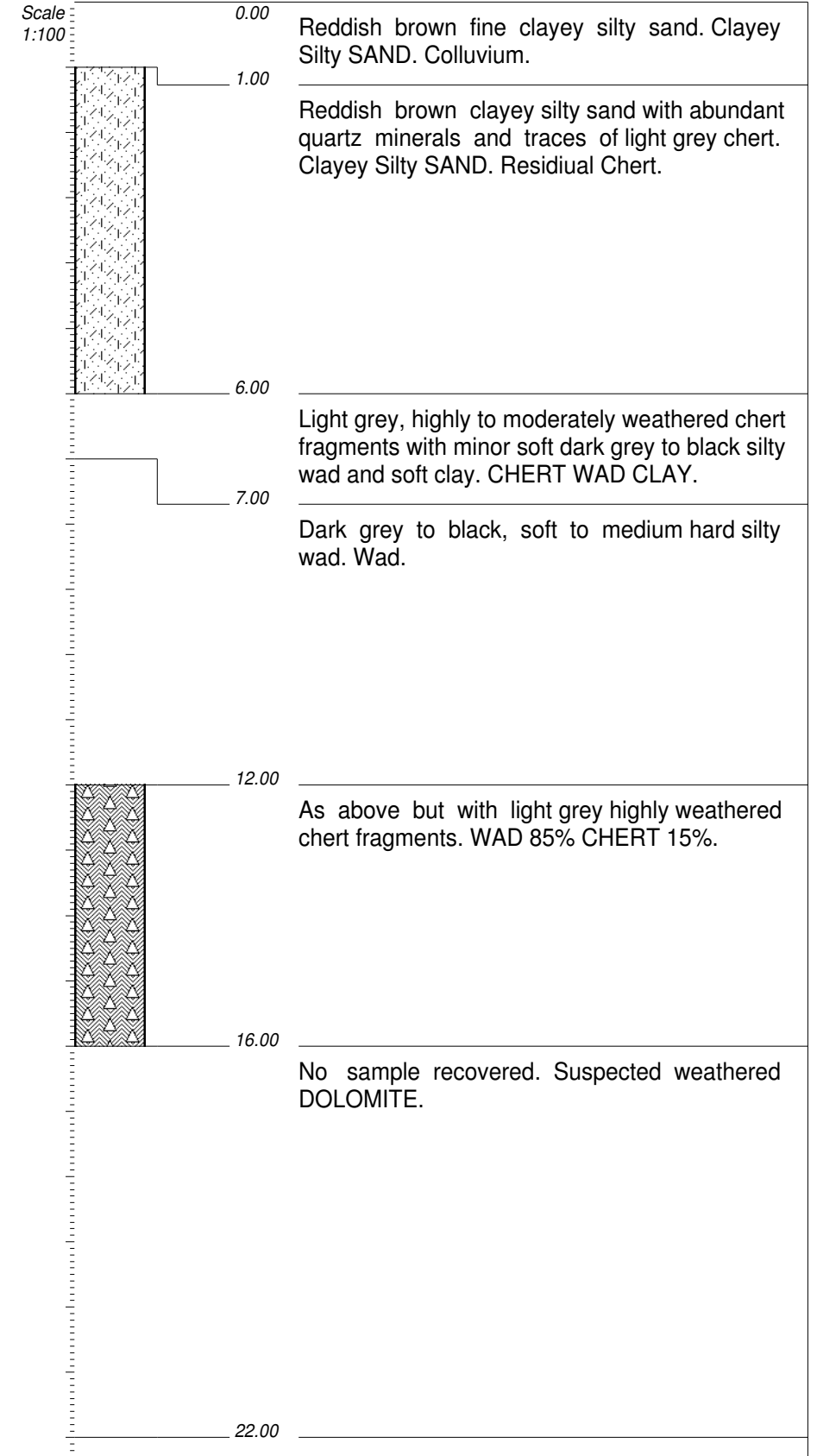
HOLE COLLAPSE
NH - none
MH - moderate
SH - severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1482

HOLE No: EMM 1482
Sheet 1 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
1.00		0.18	VS	R			NH	F	D	-1.00	1
2.00		0.26	VS	R			NH	F-M	M		2
3.00		0.41	VS	R			NH	F-M	M		3
4.00		0.33	VS	R			NH	F-M	M		4
5.00		0.52	VS	R			NH	F-M	M		5
6.00		1.45	S	R			NH	F-M	M	-6.00	6
7.00		1.58	S	R			NH	F-M	M	-7.00	7
8.00		1.22	S	R			NH	F	M		8
9.00		1.41	S	R			NH	F	M		9
10.00		1.37	S	R			NH	F	M		10
11.00		1.17	S	R			NH	F	M		11
12.00		1.45	S	R			NH	F	M	-12.00	12
13.00		1.36	S	R			NH	F-M	M		13
14.00		1.59	S	R			NH	F-M	M		14
15.00		1.40	S	R			NH	F-M	M		15
16.00		1.54	S	R			NH	F-M	M	-16.00	16
17.00		2.20	FH	IR			NH	NA	M		17
18.00		3.35	SD	IR			NH	NA	M		18
19.00		3.49	SD	IR			NH	NA	M		19
20.00		3.32	SD	IR			NH	NA	M		20
21.00		3.54	SD	IR			NH	NA	M		21
22.00		3.37	SD	IR			NH	NA	M	-22.00	22



HOLE No: EMM 1482
Sheet 2 of 2

JOB NUMBER: WO 830

FORMATION
C -cavity
VS -Very Soft
S -Soft
FH -fairly Hard
SD -Solid
CA -cavernous

HAMMER OPERATION
VI-very irregular
IR-Irregular
R-Regular

CHIP SIZE
CC-coarse (>10mm)
MC -medium (5-10mm)
FC -fine (<5mm)
NA -not applicatble

JOINT ROUGHNESS
W-wet
M-moist
D-dry

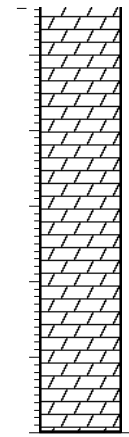
HOLECOLLAPSE
NH-none
MH-moderate
SH-severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1482

HOLE No: EMM 1482
Sheet 2 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)
23.00			3.34	SD	R		NH	M-C	M	
24.00			3.46	SD	R		NH	M-C	M	
25.00			3.33	SD	R		NH	M-C	M	
26.00			3.52	SD	R		NH	M-C	M	
27.00			3.55	SD	R		NH	M-C	M	
28.00			3.59	SD	R		NH	M-C	M	-28.00



Grey stained olive brown moderately to highly weathered dolomite. DOLOMITE.

End of hole.

NOTES

- 1) Hole completed at 28m
- 2) No water strike
- 3) No collapse of hole recorded

CONTRACTOR : SA Rock drills
MACHINE :
DRILLED BY : Isaac
LOGGED BY : N Vukea
TYPE SET BY :
SETUP FILE : CHIPLO~2.SET

INCLINATION : Vertical
DIAM : 165 mm
DATE : 14/06/2014
DATE :

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: EMM 1482

HOLE No: EMM 1483
Sheet 1 of 2

JOB NUMBER: WO 830

FORMATION
C -cavity
VS -Very Soft
S -Soft
FH -fairly Hard
SD -Solid
CA -cavernous

HAMMER OPERATION
VI-very irregular
IR-Irregular
R-Regular

CHIP SIZE
CC-coarse (>10mm)
MC -medium (5-10mm)
FC -fine (<5mm)
NA -not applicatble

JOINT ROUGHNESS
W-wet
M-moist
D-dry

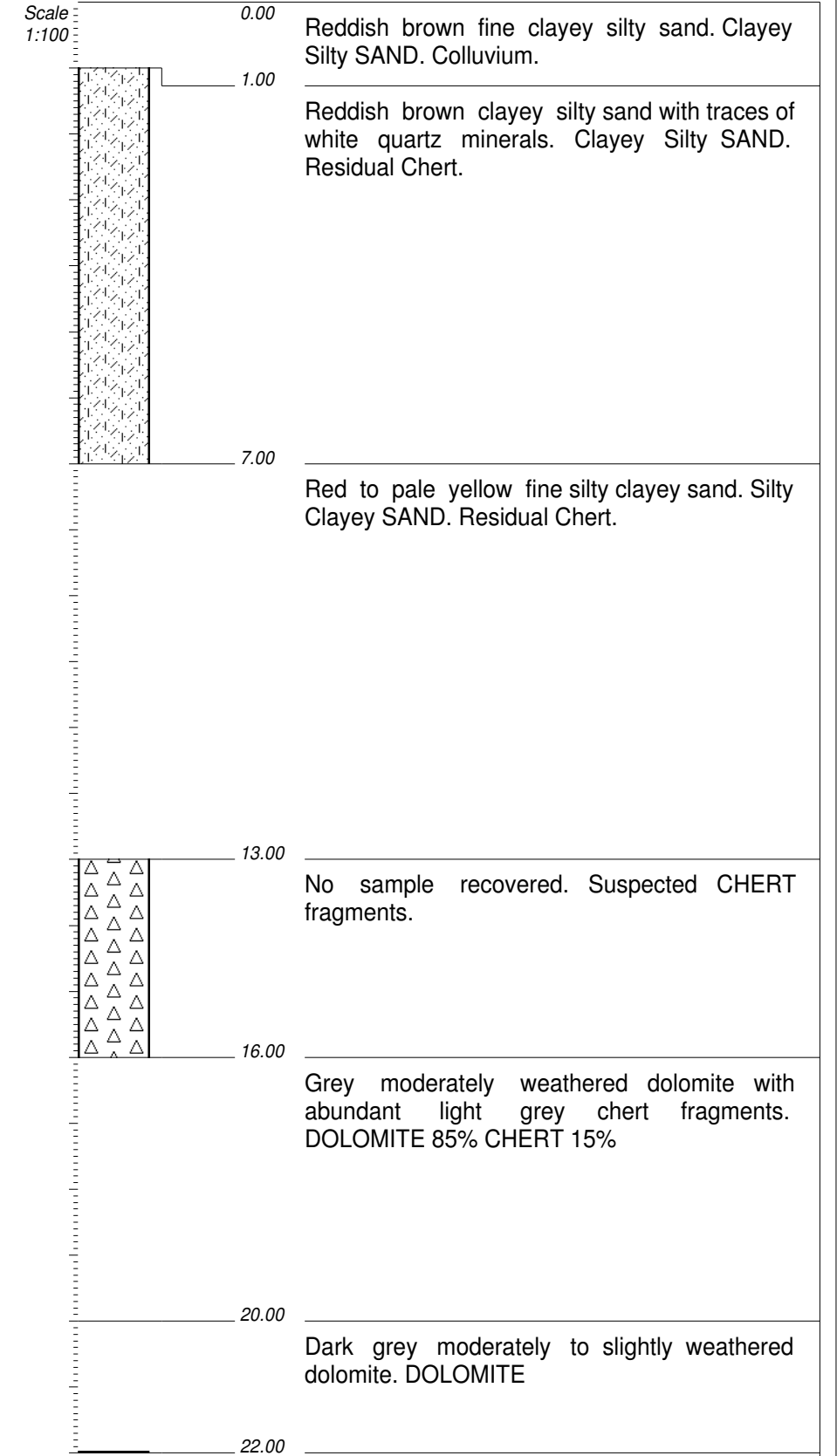
HOLECOLLAPSE
NH-none
MH-moderate
SH-severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1483

HOLE No: EMM 1483
Sheet 1 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
1.00		0.14	VS	R			NH	F-M	M	-1.00	1
2.00		0.21	VS	R			NH	F-M	M		2
3.00		0.42	VS	R			NH	F-M	D		3
4.00		0.25	VS	R			NH	F-M	D		4
5.00		1.30	S	R			NH	F-M	D		5
6.00		1.48	S	R			NH	F-M	D		6
7.00		1.20	S	R			NH	F-M	D	-7.00	7
8.00		1.33	S	R			NH	F-M	M		8
9.00		1.26	S	R			NH	F-M	M		9
10.00		1.43	S	R			NH	F-M	M		10
11.00		1.29	S	R			NH	F-M	M		11
12.00		1.46	S	R			NH	F-M	M		12
13.00		1.52	S	R			NH	F-M	M	-13.00	13
14.00		1.44	N/A	IR			NH	NA	N/A		14
15.00		1.58	N/A	IR			NH	NA	N/A		15
16.00		1.45	N/A	IR			NH	NA	N/A	-16.00	16
17.00		3.21	SD	R			NH	M-C	W	-17.00	17
18.00		3.17	SD	R			NH	M-C	W		18
19.00		3.48	SD	R			NH	M-C	W		19
20.00		3.19	SD	R			NH	M-C	W		20
21.00		3.43	SD	R			NH	M-C	W		21
22.00		3.17	SD	R			NH	M-C	W	-22.00	22



HOLE No: EMM 1483
Sheet 2 of 2

JOB NUMBER: WO 830

FORMATION
C -cavity
VS -Very Soft
S -Soft
FH -fairly Hard
SD -Solid
CA -cavernous

HAMMER OPERATION
VI-very irregular
IR-Irregular
R-Regular

CHIP SIZE
CC-coarse (>10mm)
MC -medium (5-10mm)
FC -fine (<5mm)
NA -not applicatble

JOINT ROUGHNESS
W-wet
M-moist
D-dry

HOLECOLLAPSE
NH-none
MH-moderate
SH-severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1483

HOLE No: EMM 1483
Sheet 2 of 2

JOB NUMBER: WO 830

End of hole.

NOTES

- 1) Hole completed at 22m
- 2) No water strike
- 3) No collapse of hole recorded

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
2	4	6			20	60	90	25	50	75	

CONTRACTOR : SA Rock drills
MACHINE :
DRILLED BY : Isaac
LOGGED BY : N Vukea
TYPE SET BY :
SETUP FILE : CHIPLO~2.SET

INCLINATION : Vertical
DIAM : 165 mm
DATE : 15/06/2014
DATE :

ELEVATION :
X-COORD :
Y-COORD :

DATE : 22/08/2014 08:44
TEXT : ..OTINPUT\EMM1481A1487.txt

HOLE No: EMM 1483

HOLE No: EMM 1484
Sheet 1 of 2

JOB NUMBER: WO 830

FORMATION
C - cavity
VS - Very Soft
S - Soft
FH - fairly Hard
SD - Solid
CA - cavernous

HAMMER OPERATION
VI - very irregular
IR - Irregular
R - Regular

CHIP SIZE
CC - coarse (>10mm)
MC - medium (5-10mm)
FC - fine (<5mm)
NA - not applicable

JOINT ROUGHNESS
W - wet
M - moist
D - dry

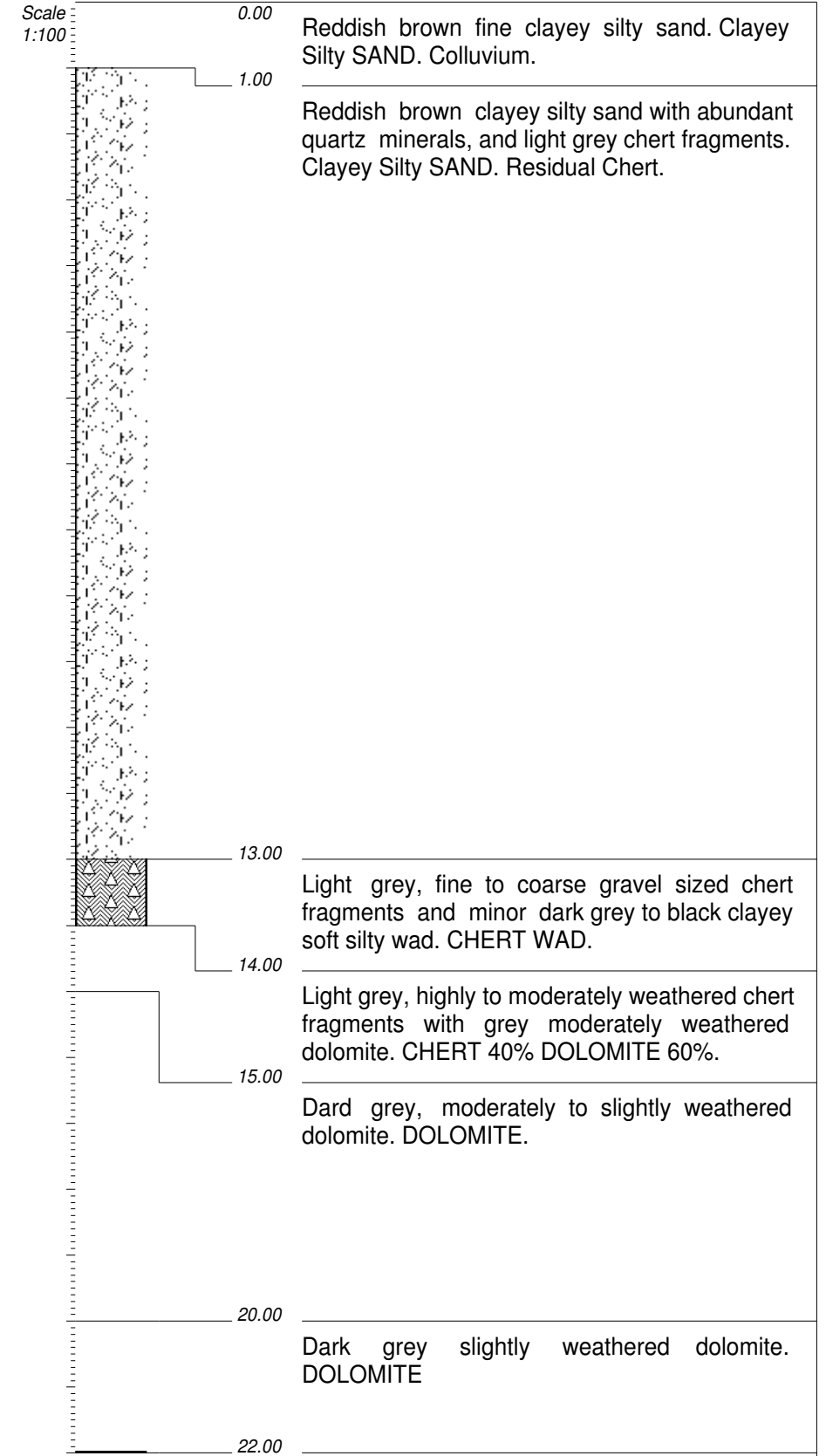
HOLE COLLAPSE
NH - none
MH - moderate
SH - severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1484

HOLE No: EMM 1484
Sheet 1 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
1.00		0.22	VS	R			NH	F-M	M	-1.00	1
2.00		0.27	VS	R			NH	F-M	M		2
3.00		0.19	VS	R			NH	F-M	M		3
4.00		0.36	VS	R			NH	F-M	M		4
5.00		0.41	VS	R			NH	F-M	M		5
6.00		0.32	VS	R			NH	F-M	M		6
7.00		0.58	VS	R			NH	F-M	M		7
8.00		1.25	S	R			NH	F-M	M		8
9.00		1.14	S	R			NH	F-M	M		9
10.00		1.34	S	R			NH	F-M	M		10
11.00		1.17	S	R			NH	F-M	M		11
12.00		1.23	S	R			NH	F-M	M		12
13.00		1.40	S	R			NH	F-M	M	-13.00	13
14.00		2.28	FH	R			NH	F-M	M	-14.00	14
15.00		2.44	FH	R			NH	M-C	M	-15.00	15
16.00		3.18	SD	R			NH	M-C	M		16
17.00		3.26	SD	R			NH	M-C	M		17
18.00		3.56	SD	R			NH	M-C	M		18
19.00		3.33	SD	R			NH	M-C	M		19
20.00		3.29	SD	R			NH	M-C	M	-20.00	20
21.00		3.51	SD	R			NH	M-C	M		21
22.00		3.48	SD	R			NH	M-C	M	-22.00	22



HOLE No: EMM 1484
Sheet 2 of 2

JOB NUMBER: WO 830

FORMATION
C -cavity
VS -Very Soft
S -Soft
FH -fairly Hard
SD -Solid
CA -cavernous

HAMMER OPERATION
VI-very irregular
IR-Irregular
R-Regular

CHIP SIZE
CC-coarse (>10mm)
MC -medium (5-10mm)
FC -fine (<5mm)
NA -not applicatble

JOINT ROUGHNESS
W-wet
M-moist
D-dry

HOLECOLLAPSE
NH-none
MH-moderate
SH-severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1484

HOLE No: EMM 1484
Sheet 2 of 2

JOB NUMBER: WO 830

End of hole.

NOTES

- 1) Hole completed at 22m
- 2) No water strike
- 3) No collapse of hole recorded

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
2	4	6			20	60	90	25	50	75	

CONTRACTOR : SA Rock drills
MACHINE :
DRILLED BY : Isaac
LOGGED BY : N Vukea

TYPE SET BY :
SETUP FILE : CHIPLO~2.SET

INCLINATION : Vertical
DIAM : 165 mm
DATE : 15/06/2014
DATE :

ELEVATION :
X-COORD :
Y-COORD :

DATE : 22/08/2014 08:44
TEXT : ..OTINPUT\EMM1481A1487.txt

HOLE No: EMM 1484

HOLE No: EMM 1485
Sheet 1 of 2

JOB NUMBER: WO 830

FORMATION
C -cavity
VS -Very Soft
S -Soft
FH -fairly Hard
SD -Solid
CA -cavernous

HAMMER OPERATION
VI-very irregular
IR-Irregular
R-Regular

CHIP SIZE
CC-coarse (>10mm)
MC -medium (5-10mm)
FC -fine (<5mm)
NA -not applicatble

JOINT ROUGHNESS
W-wet
M-moist
D-dry

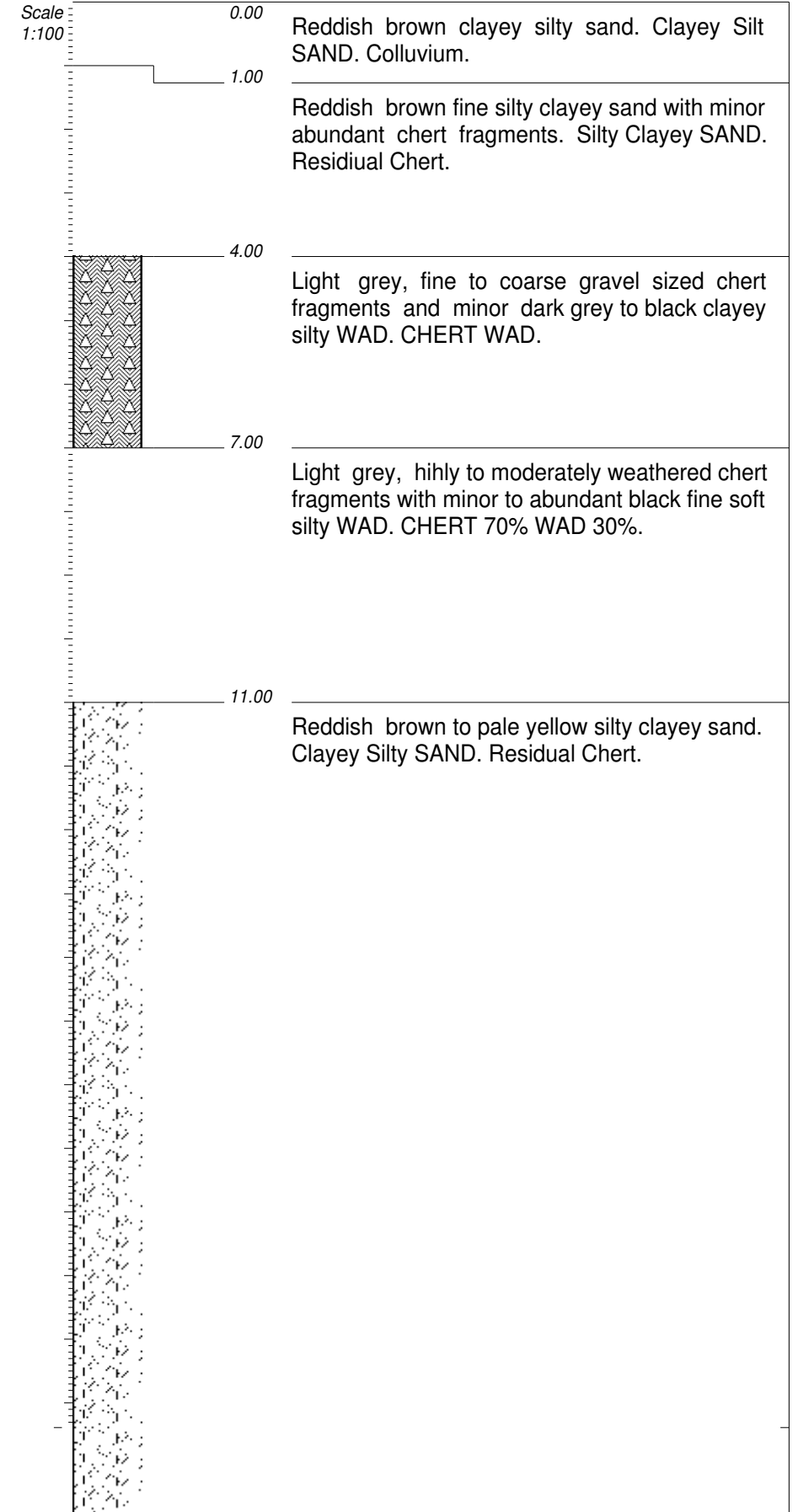
HOLECOLLAPSE
NH-none
MH-moderate
SH-severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1485

HOLE No: EMM 1485
Sheet 1 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
1.00		0.09	VS	R			NH	F-M	M	-1.00	1
2.00		0.17	VS	R			NH	F-M	M		2
3.00		0.51	VS	R			NH	F-M	M		3
4.00		0.43	VS	R			NH	F-M	M	-4.00	4
5.00		1.31	S	R			NH	F-M	M		5
6.00		1.46	S	R			NH	F-M	M		6
7.00		1.28	S	R			NH	F-M	M	-7.00	7
8.00		1.55	S	R			NH	F-M	M		8
9.00		1.47	S	R			NH	F-M	M		9
10.00		1.49	S	R			NH	F-M	M		10
11.00		0.57	VS	R			NH	F-M	M	-11.00	11
12.00		0.43	VS	R			NH	F-M	M		12
13.00		0.48	VS	R			NH	F-M	M		13
14.00		1.52	S	R			NH	F-M	M		14
15.00		1.33	VS	R			NH	F-M	M		15
16.00		0.49	S	R			NH	F-M	M		16
17.00		1.38	S	R			NH	F-M	M		17
18.00		1.55	S	R			NH	F-M	M		18
19.00		1.41	S	R			NH	F-M	M		19
20.00		1.34	S	R			NH	F-M	M		20
21.00		1.46	S	R			NH	F-M	M		21
22.00		1.50	S	R			NH	F-M	M		22



HOLE No: EMM 1485
Sheet 2 of 2

JOB NUMBER: WO 830

FORMATION
C -cavity
VS -Very Soft
S -Soft
FH -fairly Hard
SD -Solid
CA -cavernous

HAMMER OPERATION
VI-very irregular
IR-Irregular
R-Regular

CHIP SIZE
CC-coarse (>10mm)
MC -medium (5-10mm)
FC -fine (<5mm)
NA -not applicatble

JOINT ROUGHNESS
W-wet
M-moist
D-dry

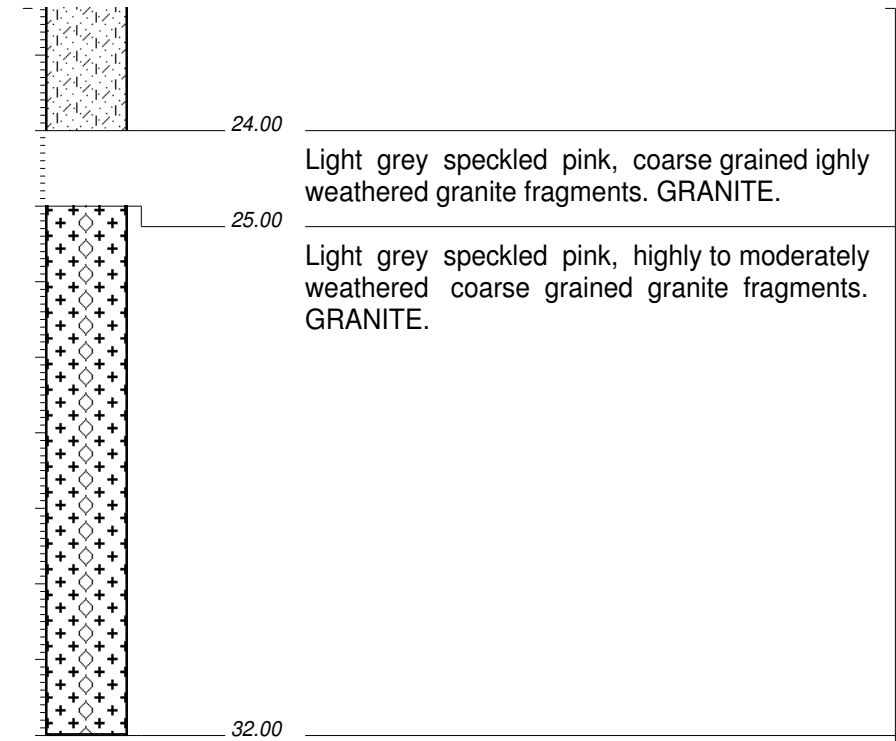
HOLECOLLAPSE
NH-none
MH-moderate
SH-severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1485

HOLE No: EMM 1485
Sheet 2 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
23.00		1.32	S	R				NH	F-M	M	
24.00		1.55	S	R				NH	F-M	M	
25.00		1.37	S	R				NH	M-C	M	-24.00
26.00		2.13	FH	R				NH	M-C	M	-25.00
27.00		3.21	SD	R				NH	M-C	D	
28.00		3.17	SD	R				NH	M-C	D	
29.00		3.48	SD	R				NH	M-C	D	
30.00		3.18	SD	R				NH	M-C	D	
31.00		3.21	SD	R				NH	M-C	D	
32.00		3.27	SD	R				NH	M-C	D	-32.00



Light grey speckled pink, coarse grained ighly weathered granite fragments. GRANITE.

Light grey speckled pink, highly to moderately weathered coarse grained granite fragments. GRANITE.

End of hole.

NOTES

- 1) Hole completed at 32m
- 2) No water strike
- 3) No collapse of hole recorded

CONTRACTOR : SA Rock drills
MACHINE :
DRILLED BY : Isaac
LOGGED BY : N Vukea
TYPE SET BY :
SETUP FILE : CHIPLO~2.SET

INCLINATION : Vertical
DIAM : 165 mm
DATE : 16/06/2014
DATE :
DATE : 22/08/2014 08:44
TEXT : ..OTINPUT\EMM1481A1487.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: EMM 1485

HOLE No: EMM 1486
Sheet 1 of 2

JOB NUMBER: WO 830

FORMATION
C -cavity
VS -Very Soft
S -Soft
FH -fairly Hard
SD -Solid
CA -cavernous

HAMMER OPERATION
VI-very irregular
IR-Irregular
R-Regular

CHIP SIZE
CC-coarse (>10mm)
MC -medium (5-10mm)
FC -fine (<5mm)
NA -not applicatble

JOINT ROUGHNESS
W-wet
M-moist
D-dry

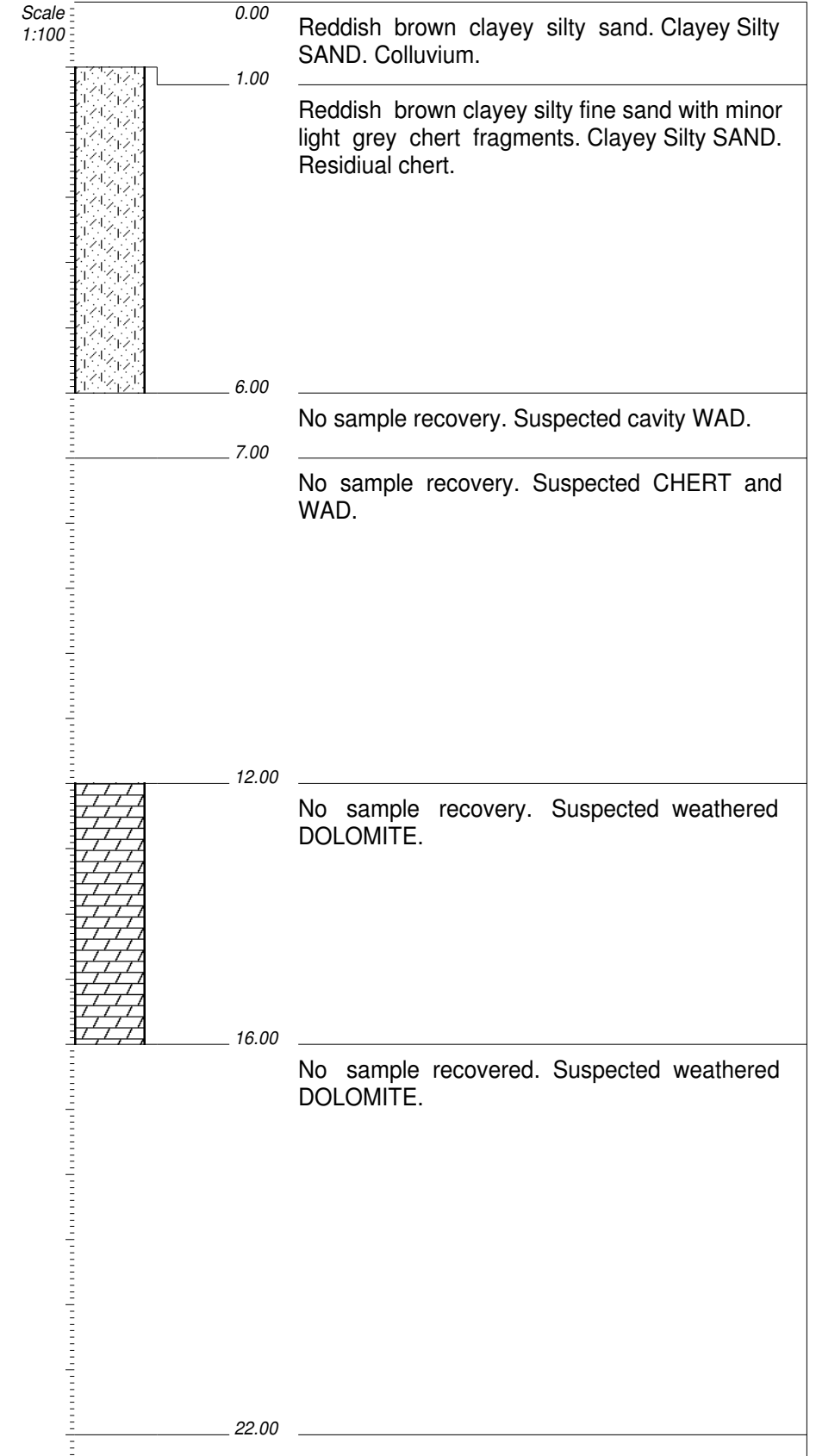
HOLECOLLAPSE
NH-none
MH-moderate
SH-severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1486

HOLE No: EMM 1486
Sheet 1 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
1.00		1.31	S	R			NH	F-M	M	-1.00	1
2.00		1.26	S	R			NH	F-M	M		2
3.00		1.12	S	R			NH	F-M	M		3
4.00		0.22	VS	R			NH	F-M	M		4
5.00		0.19	VS	R			NH	F-M	M		5
6.00		1.28	S	R			NH	F-M	M		6
7.00		1.34	S	R			NH	F-M	M	-7.00	7
8.00		1.47	S	R			NH	NA	N/A		8
9.00		1.44	S	R			NH	NA	N/A		9
10.00		1.32	S	R			NH	NA	N/A	-10.00	10
11.00		1.22	S	R			NH	NA	N/A		11
12.00		1.49	S	R			NH	NA	N/A		12
13.00		1.58	S	R			NH	NA	N/A		13
14.00		2.18	FH	R			NH	NA	N/A	-14.00	14
15.00		2.25	FH	R			NH	NA	N/A		15
16.00		2.42	FH	R			NH	NA	N/A		16
17.00		2.35	FH	R			NH	NA	N/A		17
18.00		2.53	FH	R			NH	NA	N/A		18
19.00		2.55	FH	R			NH	NA	N/A		19
20.00		3.14	SD	R			NH	NA	N/A		20
21.00		3.20	SD	R			NH	NA	N/A		21
22.00		3.16	SD	R			NH	NA	N/A	-22.00	22



HOLE No: EMM 1486

Sheet 2 of 2

JOB NUMBER: WO 830

FORMATION
 C -cavity
 VS -Very Soft
 S -Soft
 FH -fairly Hard
 SD -Solid
 CA -cavernous

HAMMER OPERATION
 VI-very irregular
 IR-Irregular
 R-Regular

CHIP SIZE
 CC-coarse (>10mm)
 MC -medium (5-10mm)
 FC -fine (<5mm)
 NA -not applicatble

JOINT ROUGHNESS
 W-wet
 M-moist
 D-dry

HOLECOLLAPSE
 NH-none
 MH-moderate
 SH-severe

Client: Ekurhuleni Metropolitan Municipality
 Project name: LICENCING HUB
 Site: MODDERFONTEIN
 Borehole No: EMM 1486

HOLE No: EMM 1486

Sheet 2 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
23.00			3.32	SD	R			NH	NA	N/A	23
24.00			3.39	SD	R			NH	NA	N/A	24
25.00			3.46	SD	R			NH	NA	N/A	25
26.00			3.26	SD	R			NH	M-C	M	26
27.00			3.28	SD	R			NH	M-C	M	27
28.00			3.24	SD	R			NH	M-C	M	28
29.00			3.40	SD	R			NH	M-C	M	29
30.00			3.56	SD	R			NH	M-C	M	30
31.00			3.52	SD	R			NH	M-C	M	31

No sample recovered. Suspected weathered DOLOMITE

Grey moderately to slightly weathered dolomite. DOLOMITE.

End of hole.

NOTES

- 1) Hole completed at 31m
- 2) No water strike
- 3) No collapse of hole recorded

CONTRACTOR : SA Rock drills
 MACHINE :
 DRILLED BY : Isaac
 LOGGED BY : N Vukea
 TYPE SET BY :
 SETUP FILE : CHIPLO~2.SET

INCLINATION : Vertical
 DIAM : 165 mm
 DATE : 16/06/2014
 DATE :

ELEVATION :
 X-COORD :
 Y-COORD :

HOLE No: EMM 1486

HOLE No: EMM 1487
Sheet 1 of 2

JOB NUMBER: WO 830

FORMATION
C -cavity
VS -Very Soft
S -Soft
FH -fairly Hard
SD -Solid
CA -cavernous

HAMMER OPERATION
VI-very irregular
IR-Irregular
R-Regular

CHIP SIZE
CC-coarse (>10mm)
MC -medium (5-10mm)
FC -fine (<5mm)
NA -not applicatble

JOINT ROUGHNESS
W-wet
M-moist
D-dry

HOLECOLLAPSE
NH-none
MH-moderate
SH-severe

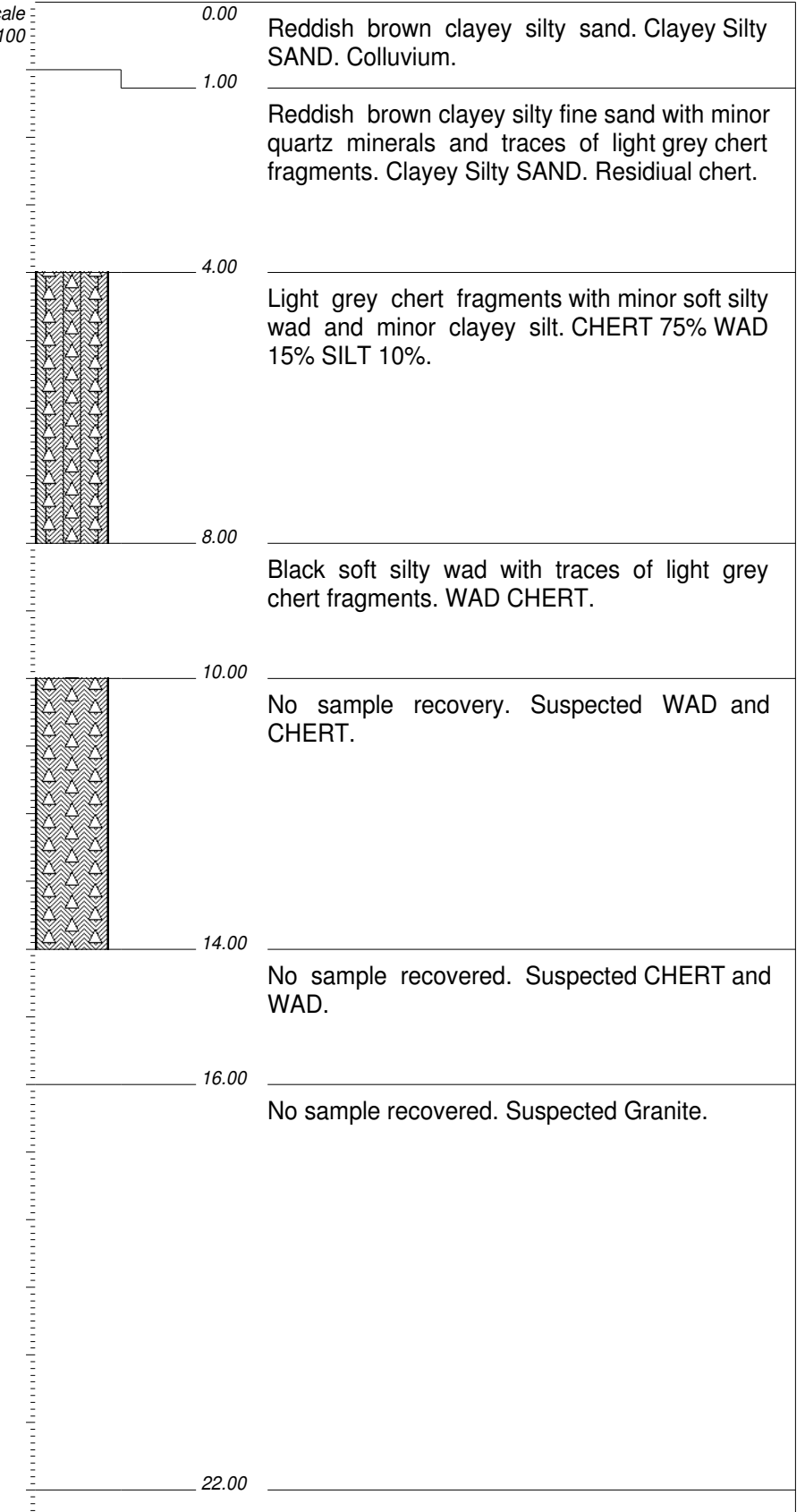
Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1487

HOLE No: EMM 1487
Sheet 1 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100	Description
1.00		0.21	VS	R			NH	FC	M	-1.00	1	Reddish brown clayey silty sand. Clayey Silty SAND. Colluvium.
2.00		0.16	VS	R			NH	FC-MC	M		2	Reddish brown clayey silty fine sand with minor quartz minerals and traces of light grey chert fragments. Clayey Silty SAND. Residual chert.
3.00		0.25	VS	R			NH	FC-MC	M		3	
4.00		0.30	VS	R			NH	FC-MC	M	-4.00	4	
5.00		1.23	S	R			NH	FC-MC	M		5	Light grey chert fragments with minor soft silty wad and minor clayey silt. CHERT 75% WAD 15% SILT 10%.
6.00		1.42	S	R			NH	FC-MC	M		6	
7.00		1.49	S	R			NH	FC-MC	M		7	
8.00		1.29	S	R			NH	FC-MC	M	-8.00	8	Black soft silty wad with traces of light grey chert fragments. WAD CHERT.
9.00		0.14	VS	R			NH	FC-MC	M		9	
10.00		0.18	VS	R			NH	FC-MC	M	-10.00	10	No sample recovery. Suspected WAD and CHERT.
11.00		0.44	VS	IR			NH	NA	NA		11	
12.00		0.51	VS	IR			NH	NA	NA		12	
13.00		0.47	VS	IR			NH	NA	NA		13	
14.00		0.43	VS	IR			NH	NA	NA	-14.00	14	No sample recovered. Suspected CHERT and WAD.
15.00		1.09	VS	IR			NH	NA	NA		15	
16.00		1.12	VS	R			NH	NA	NA	-16.00	16	No sample recovered. Suspected Granite.
17.00		1.27	S	R			NH	NA	NA		17	
18.00		1.18	S	R			NH	NA	NA		18	
19.00		1.24	S	R			NH	NA	NA		19	
20.00		1.28	S	R			NH	NA	NA		20	
21.00		1.34	S	R			NH	NA	NA		21	
22.00		1.45	S	R			NH	NA	NA	-22.00	22	

Scale 1:100



HOLE No: EMM 1487
Sheet 2 of 2

JOB NUMBER: WO 830

FORMATION
C -cavity
VS -Very Soft
S -Soft
FH -fairly Hard
SD -Solid
CA -cavernous

HAMMER OPERATION
VI-very irregular
IR-Irregular
R-Regular

CHIP SIZE
CC-coarse (>10mm)
MC -medium (5-10mm)
FC -fine (<5mm)
NA -not applicatble

JOINT ROUGHNESS
W-wet
M-moist
D-dry

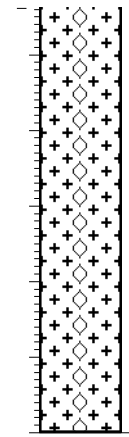
HOLECOLLAPSE
NH-none
MH-moderate
SH-severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1487

HOLE No: EMM 1487
Sheet 2 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
23.00											23
24.00											24
25.00											25
26.00											26
27.00											27
28.00											28
										-28.00	



Light grey speckled pink slightly moderately weathered Granite. GRANITE.

End of hole.

NOTES

- 1) Hole completed at 28m
- 2) No water strike
- 3) No collapse of hole recorded

CONTRACTOR : SA Rock drills
MACHINE :
DRILLED BY : Isaac
LOGGED BY : N Vukea
TYPE SET BY :
SETUP FILE : CHIPLO~2.SET

INCLINATION : Vertical
DIAM : 165 mm
DATE : 15/06/2014
DATE :

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: EMM 1487

HOLE No: EMM 1481A
Sheet 1 of 2

JOB NUMBER: WO 830

FORMATION
C - cavity
VS - Very Soft
S - Soft
FH - fairly Hard
SD - Solid
CA - cavernous

HAMMER OPERATION
VI - very irregular
IR - Irregular
R - Regular

CHIP SIZE
CC - coarse (>10mm)
MC - medium (5-10mm)
FC - fine (<5mm)
NA - not applicable

JOINT ROUGHNESS
W - wet
M - moist
D - dry

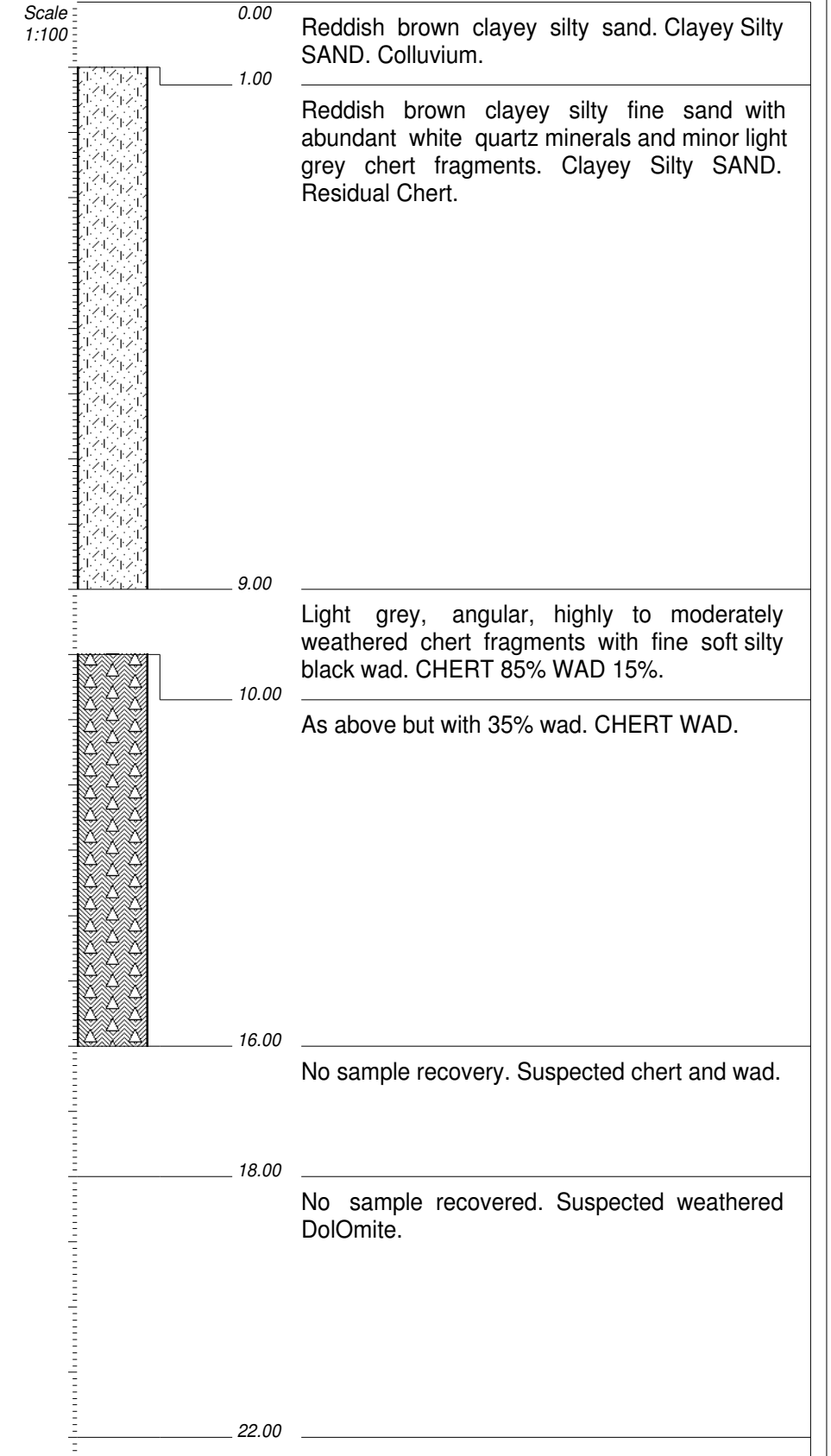
HOLE COLLAPSE
NH - none
MH - moderate
SH - severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1481A

HOLE No: EMM 1481A
Sheet 1 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
1.00		0.14	VS	R			NH	F	M	-1.00	1
2.00		0.21	VS	R			NH	F-M	M		2
3.00		0.38	VS	R			NH	F-M	M		3
4.00		0.26	VS	R			NH	F-M	M		4
5.00		0.44	VS	R			NH	F-M	M		5
6.00		0.18	VS	R			NH	F-M	M		6
7.00		0.30	VS	R			NH	F-M	M		7
8.00		0.57	VS	R			NH	F-M	M		8
9.00		1.19	S	R			NH	F-M	M	-9.00	9
10.00		1.22	S	R			NH	F-M	M	-10.00	10
11.00		1.54	S	R			NH	F-M	M		11
12.00		1.31	S	R			NH	F-M	M		12
13.00		1.35	S	R			NH	F-M	M		13
14.00		1.26	S	R			NH	F-M	M		14
15.00		1.34	S	R			NH	F-M	M		15
16.00		1.43	S	R			NH	F-M	M	-16.00	16
17.00		1.20	S	IR			NH	NA	M		17
18.00		1.33	S	IR			NH	NA	M	-18.00	18
19.00		1.54	S	IR			NH	NA	M		19
20.00		1.59	S	IR			NH	NA	M		20
21.00		2.19	FH	IR			NH	NA	M		21
22.00		2.25	FH	IR			NH	NA	M	-22.00	22



HOLE No: EMM 1481A
Sheet 2 of 2

JOB NUMBER: WO 830

FORMATION
C -cavity
VS -Very Soft
S -Soft
FH -fairly Hard
SD -Solid
CA -cavernous

HAMMER OPERATION
VI-very irregular
IR-Irregular
R-Regular

CHIP SIZE
CC-coarse (>10mm)
MC -medium (5-10mm)
FC -fine (<5mm)
NA -not applicatble

JOINT ROUGHNESS
W-wet
M-moist
D-dry

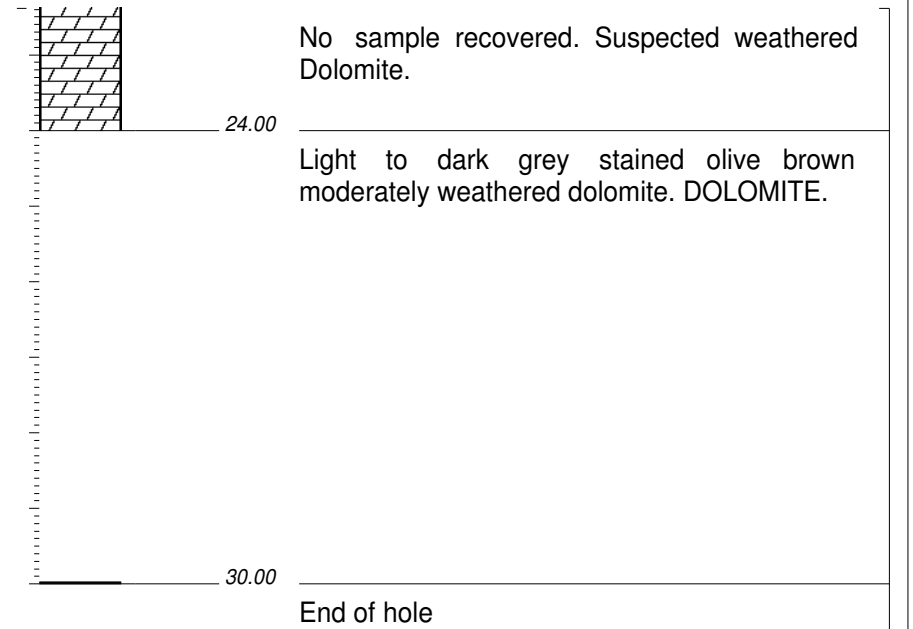
HOLECOLLAPSE
NH-none
MH-moderate
SH-severe

Client: Ekurhuleni Metropolitan Municipality
Project name: LICENCING HUB
Site: MODDERFONTEIN
Borehole No: EMM 1481A

HOLE No: EMM 1481A
Sheet 2 of 2

JOB NUMBER: WO 830

Depth (m)	Penetration rate (min/m)	Rate (min & sec)	Formation	Hammer operation	Air return (%)	Sample return (%)	Hole collapse	Chip Size	Moisture or Drilling Aid	Elevation (m.a.m.s.l.)	DEPTH Scale 1:100
23.00			3.21	FH	IR			NH	NA	M	23
24.00			3.38	FH	IR			NH	NA	M	24
25.00			4.16	SD	R			NH	M-C	M	25
26.00			3.19	SD	R			NH	M-C	M	26
27.00			3.22	SD	R			NH	M-C	M	27
28.00			3.37	SD	R			NH	M-C	M	28
29.00			3.16	SD	R			NH	M-C	M	29
30.00			3.21	SD	R			NH	M-C	M	30



- NOTES
- 1) Hole completed at 31m
 - 2) No water strike
 - 3) No collapse of hole recorded

CONTRACTOR : SA Rock drills
MACHINE :
DRILLED BY : Isaac
LOGGED BY : N Vukea
TYPE SET BY :
SETUP FILE : CHIPLO~2.SET

INCLINATION : Vertical
DIAM : 165 mm
DATE : 13/06/2014
DATE :
DATE : 22/08/2014 08:44
TEXT : ..OTINPUT\EMM1481A1487.txt

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: EMM 1481A

APPENDIX C

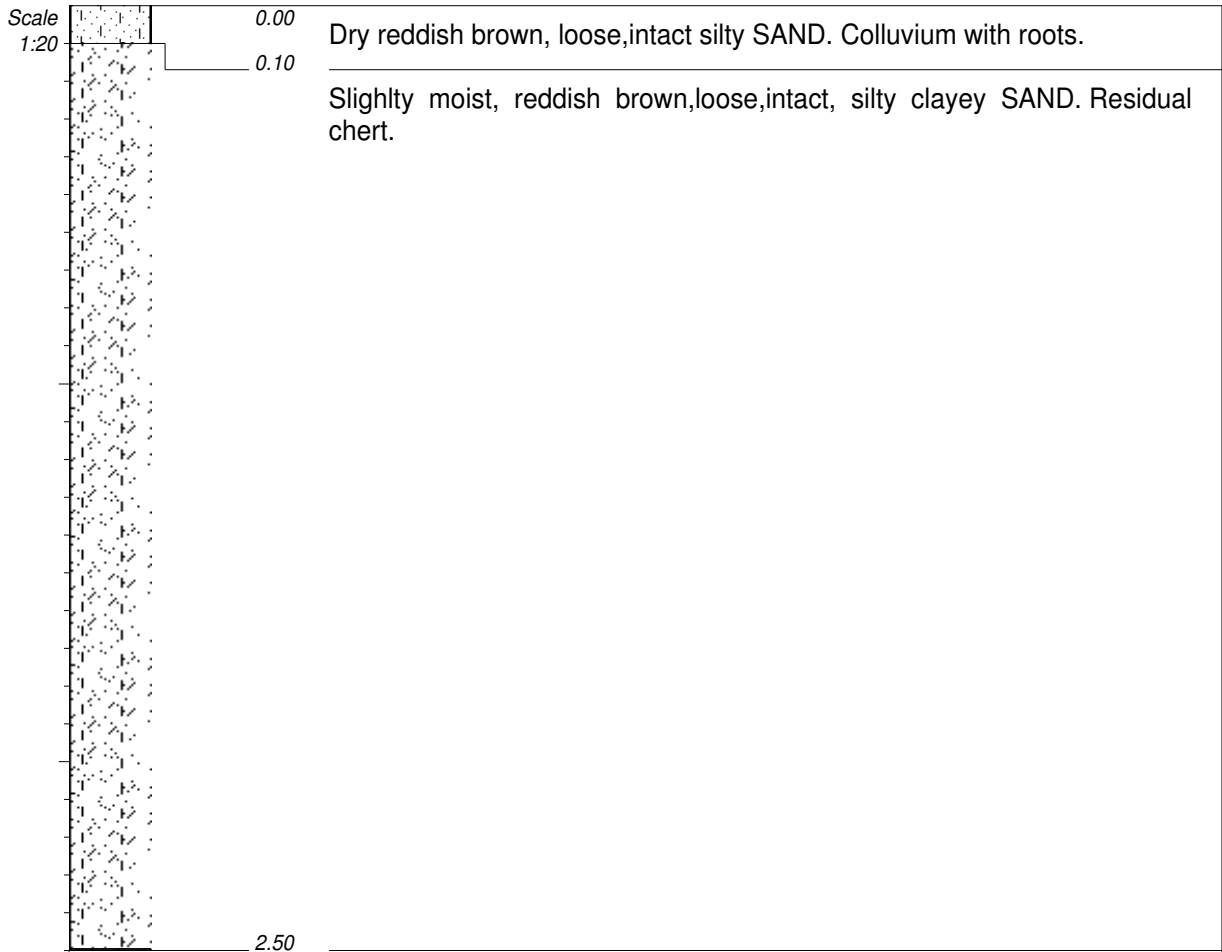
SOIL PROFILES



Client: Ekurhuleni
DOLOMITE STABILITY INVESTIGATION
Site: Modderfontein/Tembisa Licencing Hub

HOLE No: TP1
Sheet 1 of 1

JOB NUMBER: W0:830



End of hole

NOTES

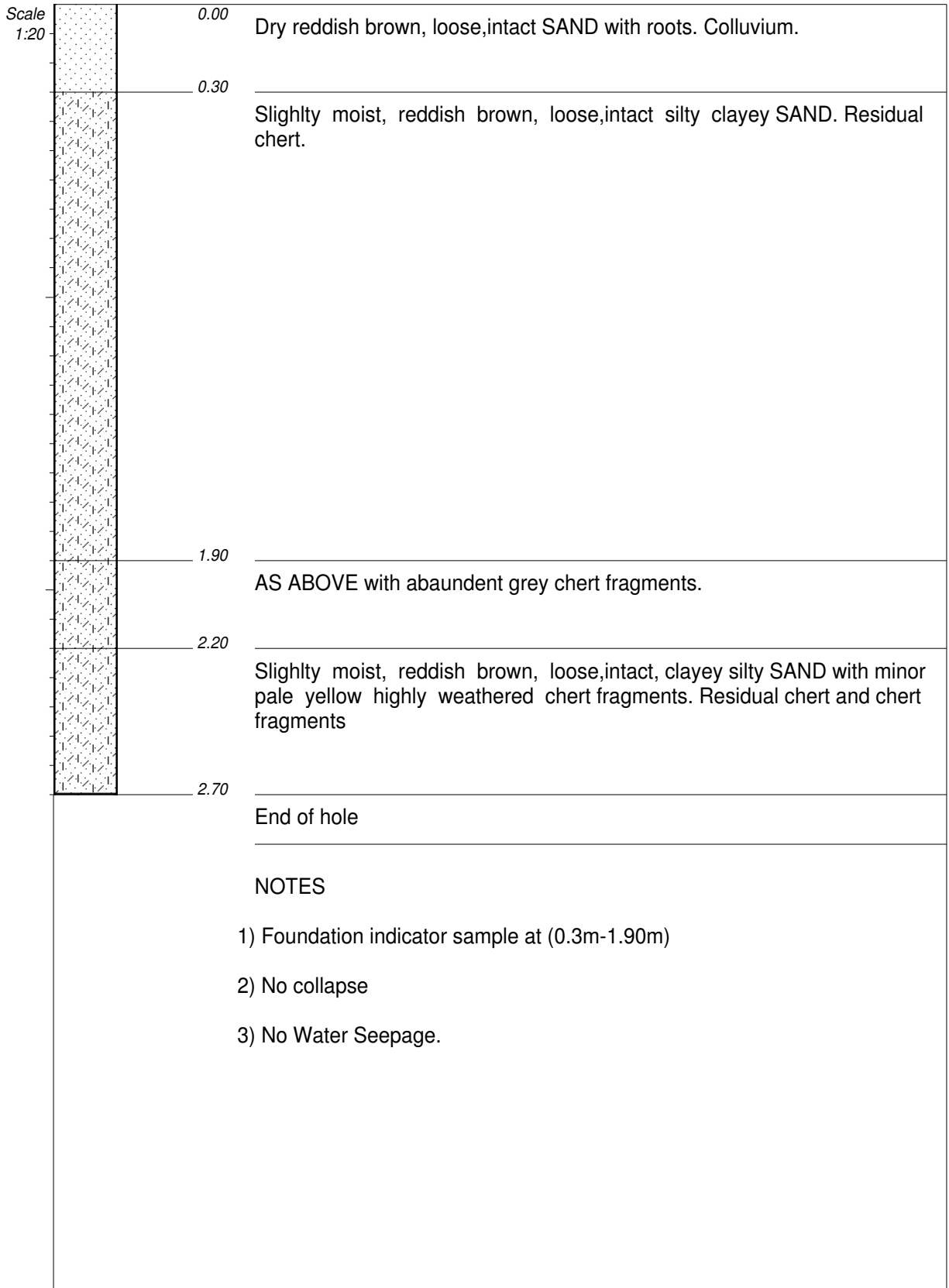
- 1) No sample
- 2) No collapse
- 3) No Water Seepage.

CONTRACTOR : TLB contractors
MACHINE : TLB
DRILLED BY :
LOGGED BY : N.VUKEA

INCLINATION :
DIAM :
DATE : 08/07/2014
DATE : 08/07/2014
DATE : 10/07/2014 09:18
TEXT : C:\DOTPLOT\INPUT\TP15.TXT

ELEVATION :
X-COORD : S25t 56' 39
Y-COORD : E28t 13' 21

HOLE No: TP1



CONTRACTOR : TLB contractors
MACHINE : TLB
DRILLED BY :
LOGGED BY : N.VUKEA
TYPE SET BY :
SETUP FILE : TESTPI~2.SET

INCLINATION :
DIAM :
DATE : 08/07/2014
DATE : 08/07/2014
DATE : 10/07/2014 09:18
TEXT : C:\DOTPLOT\INPUT\TP15.TXT

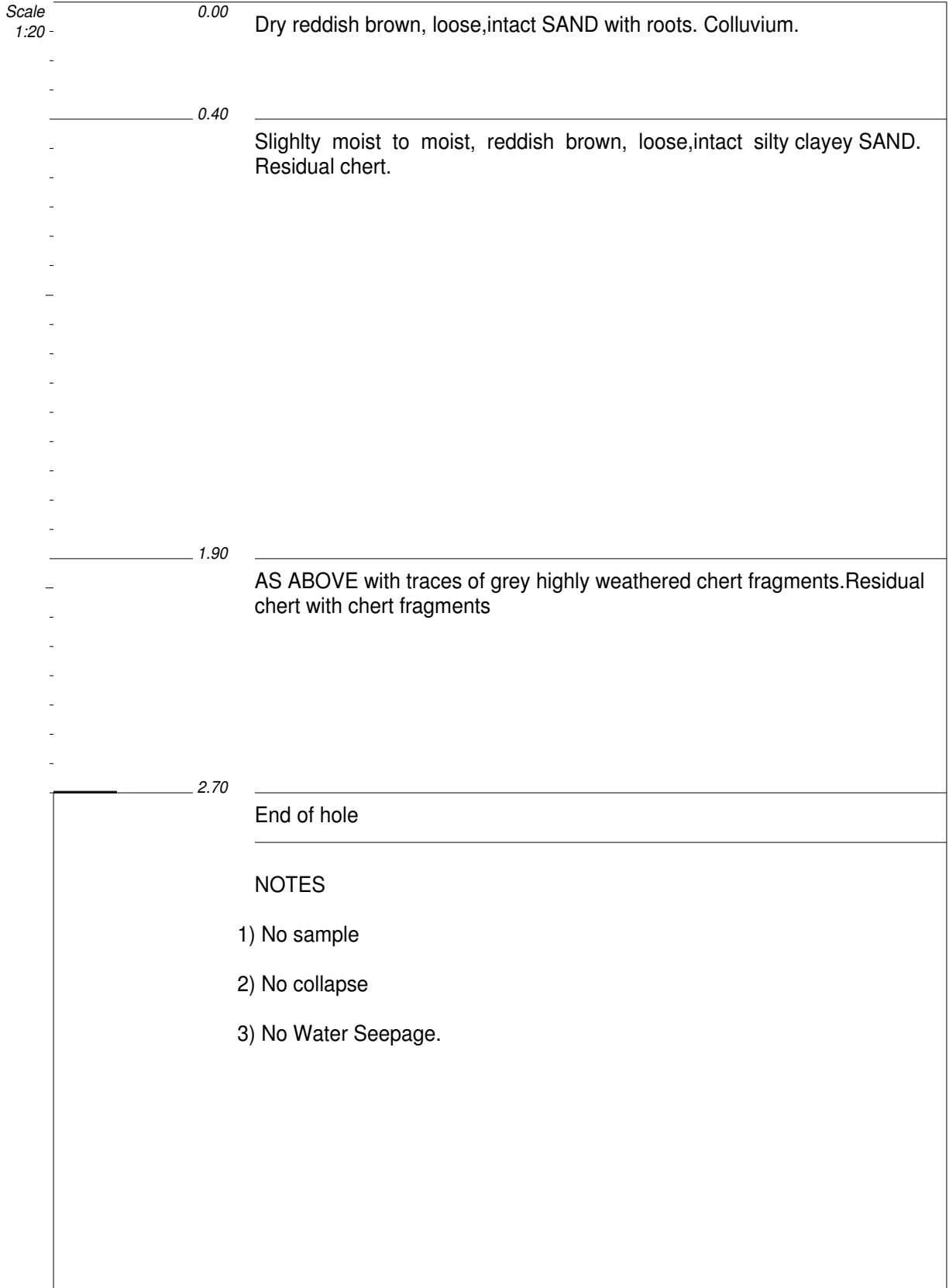
ELEVATION :
X-COORD : S26° 01' 50
Y-COORD : E28° 15' 04



Client: Ekurhuleni
DOLOMITE STABILITY INVESTIGATION
Site: Modderfontein/Tembisa Licencing Hub

HOLE No: TP3
Sheet 1 of 1

JOB NUMBER: W0:830



CONTRACTOR : TLB contractors
MACHINE : TLB
DRILLED BY :
LOGGED BY : N.VUKEA
TYPE SET BY :
SETUP FILE : TESTPI~2.SET

INCLINATION :
DIAM :
DATE : 08/07/2014
DATE : 08/07/2014
DATE : 10/07/2014 09:18
TEXT : C:\DOTPLOT\INPUT\TP15.TXT

ELEVATION :
X-COORD : S26° 01' 53
Y-COORD : E28° 15' 06

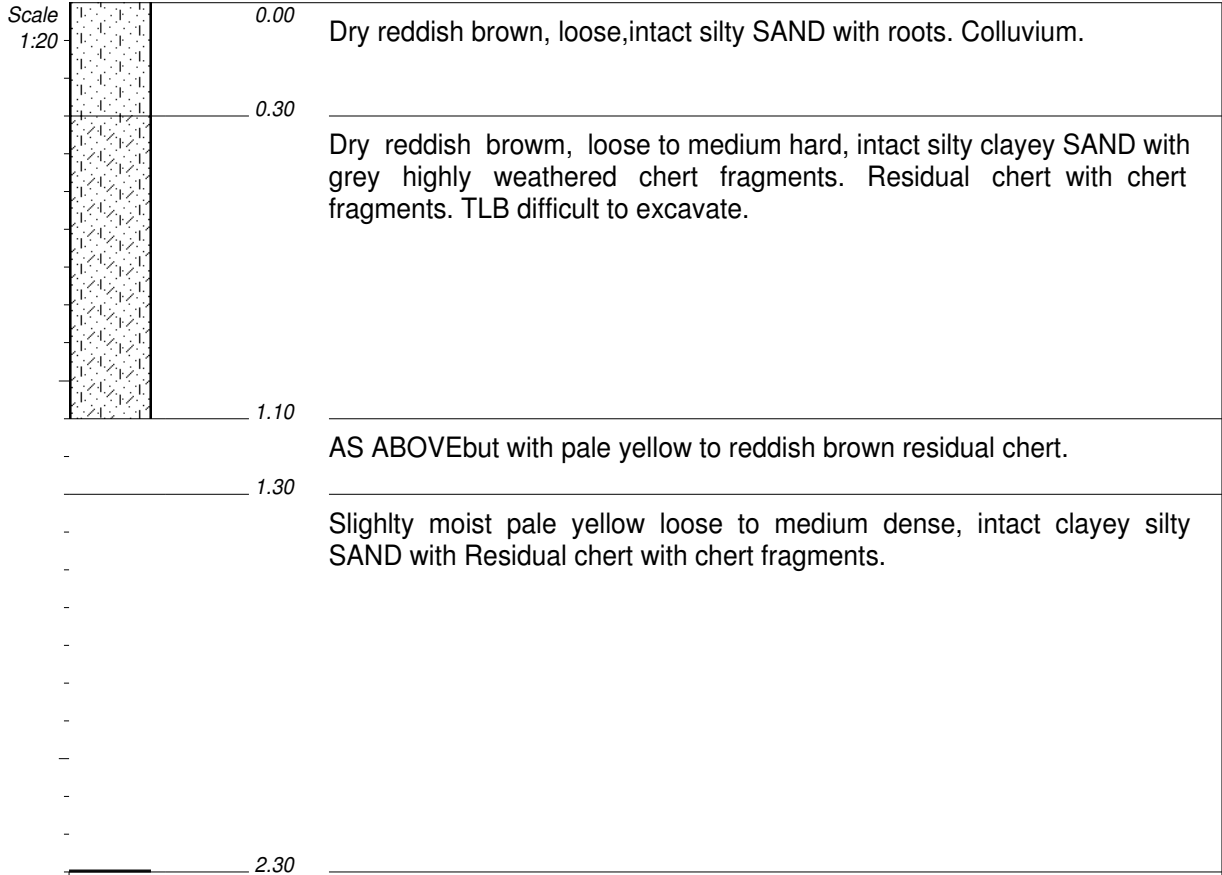
HOLE No: TP3



Client: Ekurhuleni
DOLOMITE STABILITY INVESTIGATION
Site: Modderfontein/Tembisa Licencing Hub

HOLE No: TP4
Sheet 1 of 1

JOB NUMBER: W0:830



End of hole

NOTES

- 1) No sample
- 2) No collapse
- 3) No Water Seepage.

CONTRACTOR : TLB contractors
MACHINE : TLB
DRILLED BY :
LOGGED BY : N.VUKEA
TYPE SET BY :
SETUP FILE : TESTPI~2.SET

INCLINATION :
DIAM :
DATE : 08/07/2014
DATE : 08/07/2014
DATE : 10/07/2014 09:18
TEXT : C:\DOTPLOT\INPUT\TP15.TXT

ELEVATION :
X-COORD : S26t 01' 52
Y-COORD : E28t 15' 08

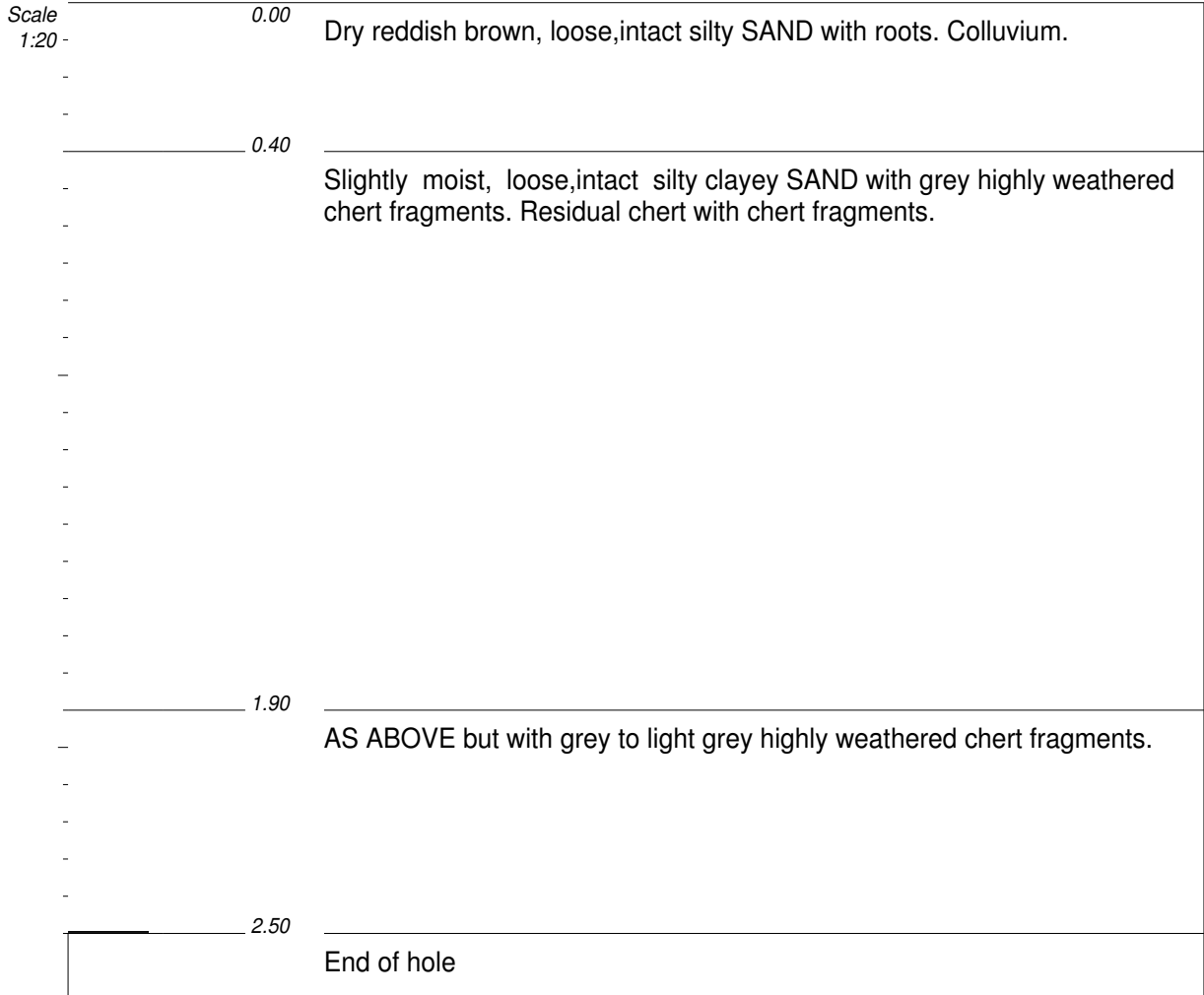
HOLE No: TP4



Client: Ekurhuleni
DOLOMITE STABILITY INVESTIGATION
Site: Modderfontein/Tembisa Licencing Hub

HOLE No: TP5
Sheet 1 of 1

JOB NUMBER: W0:830



NOTES

- 1) No sample
- 2) No collapse
- 3) No Water Seepage.

CONTRACTOR : TLB contractors
MACHINE : TLB
DRILLED BY :
LOGGED BY : N.VUKEA

INCLINATION :
DIAM :
DATE : 08/07/2014
DATE : 08/07/2014
DATE : 10/07/2014 09:18
TEXT : C:\DOTPLOT\INPUT\TP15.TXT

ELEVATION :
X-COORD : S26° 01' 51"
Y-COORD : E28° 15' 10"

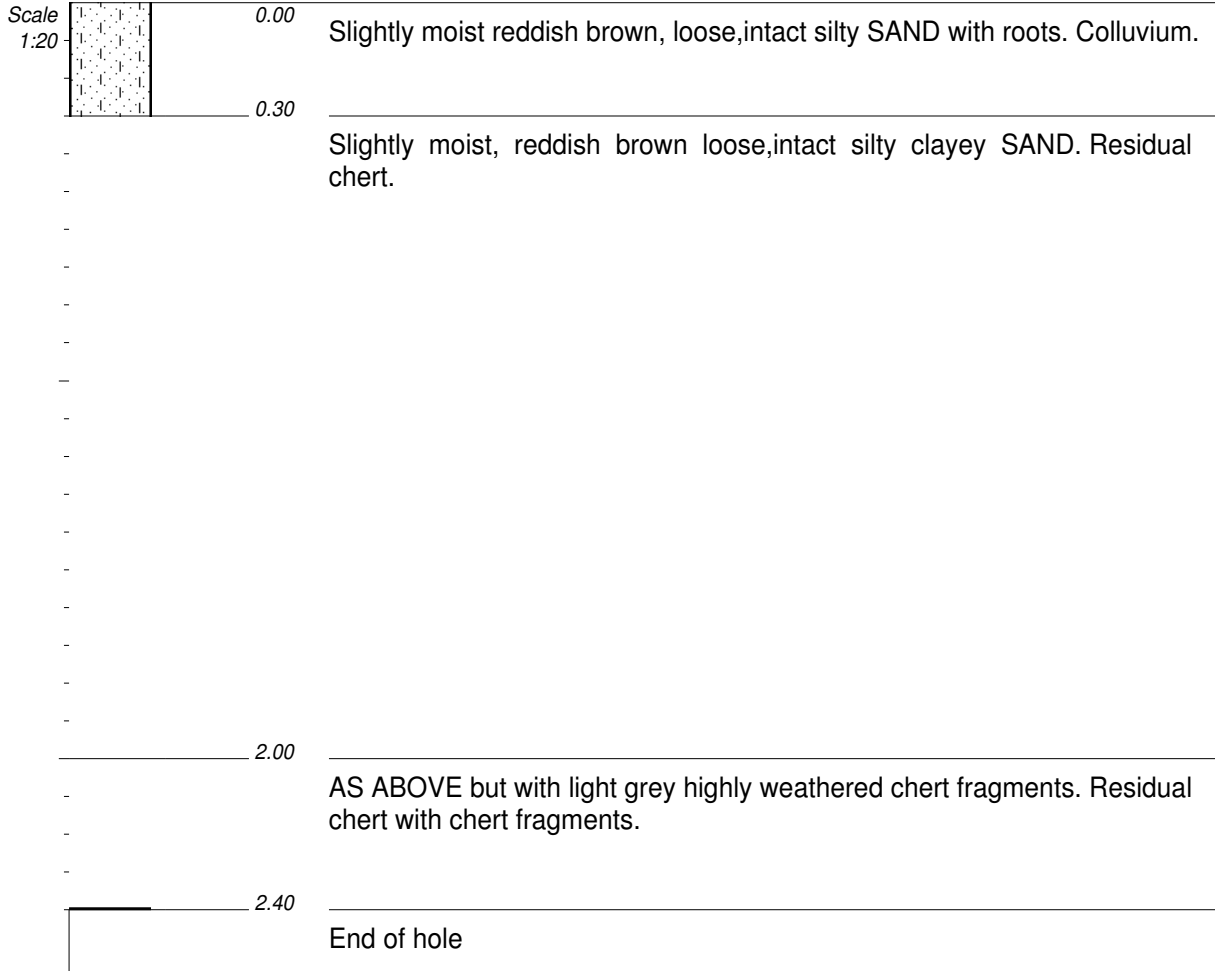
HOLE No: TP5



Client: Ekurhuleni
DOLOMITE STABILITY INVESTIGATION
Site: Modderfontein/Tembisa Licencing Hub

HOLE No: TP6
Sheet 1 of 1

JOB NUMBER: W0:830



NOTES

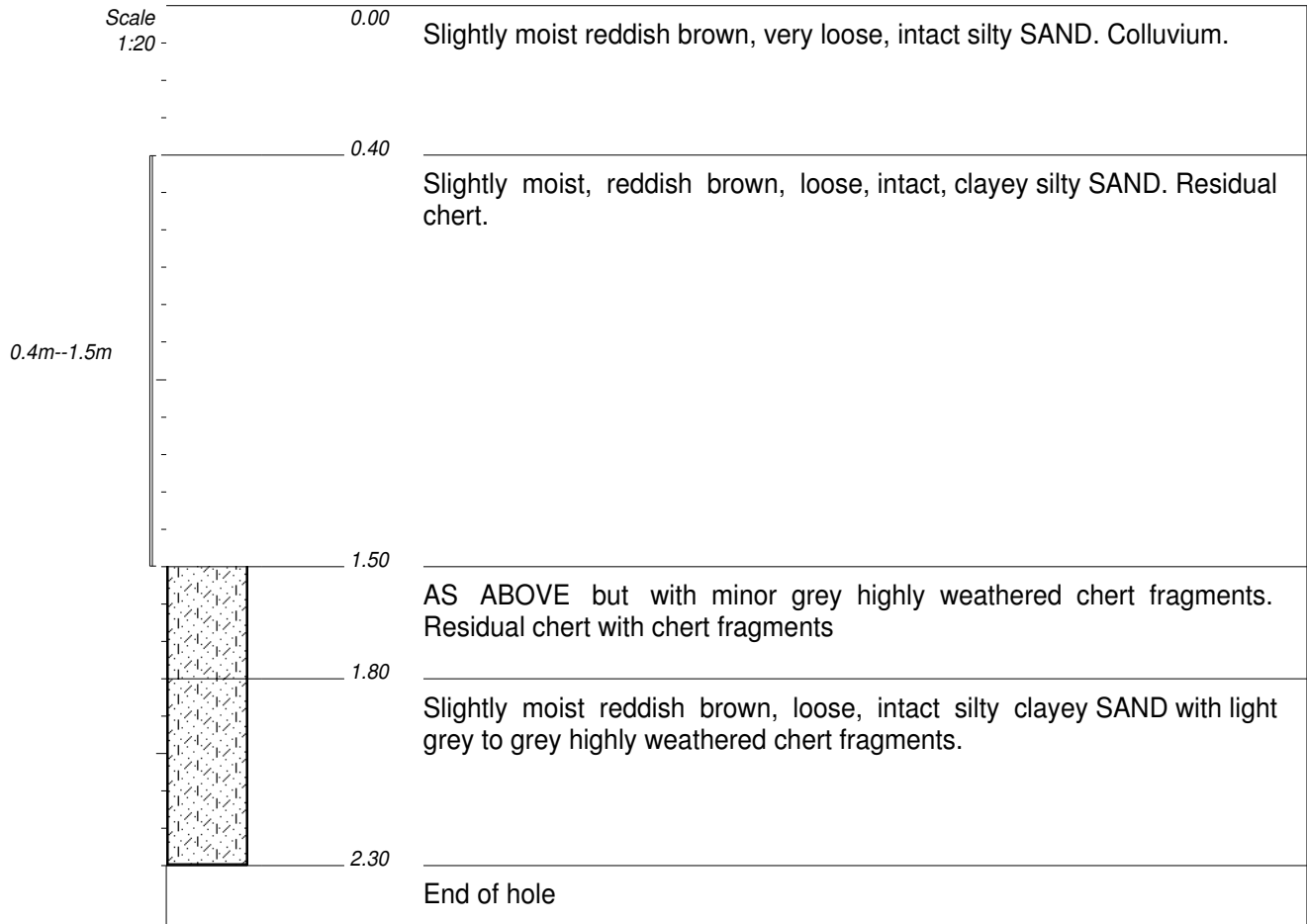
- 1) No sample
- 2) No collapse
- 3) No Water Seepage.

CONTRACTOR : TLB contractors
MACHINE : TLB
DRILLED BY :
LOGGED BY : N.VUKEA

INCLINATION :
DIAM :
DATE : 08/07/2014
DATE : 08/07/2014
DATE : 10/07/2014 09:18
TEXT : C:\DOTPLOT\INPUT\TP15.TXT

ELEVATION :
X-COORD : S26t 15' 02
Y-COORD : E28t 15' 12

HOLE No: TP6



NOTES

- 1) Foundation indicator sample at 0.4m--1.5m
- 2) No collapse
- 3) No Water Seepage.

CONTRACTOR : TLB contractors
MACHINE : TLB
DRILLED BY :
LOGGED BY : N.VUKEA
TYPE SET BY :
SETUP FILE : TESTPI~2.SET

INCLINATION :
DIAM :
DATE : 08/07/2014
DATE : 08/07/2014
DATE : 10/07/2014 09:18
TEXT : C:\DOTPLOT\INPUT\TP15.TXT

ELEVATION :
X-COORD : S26t 01' 54
Y-COORD : E28t 15' 14

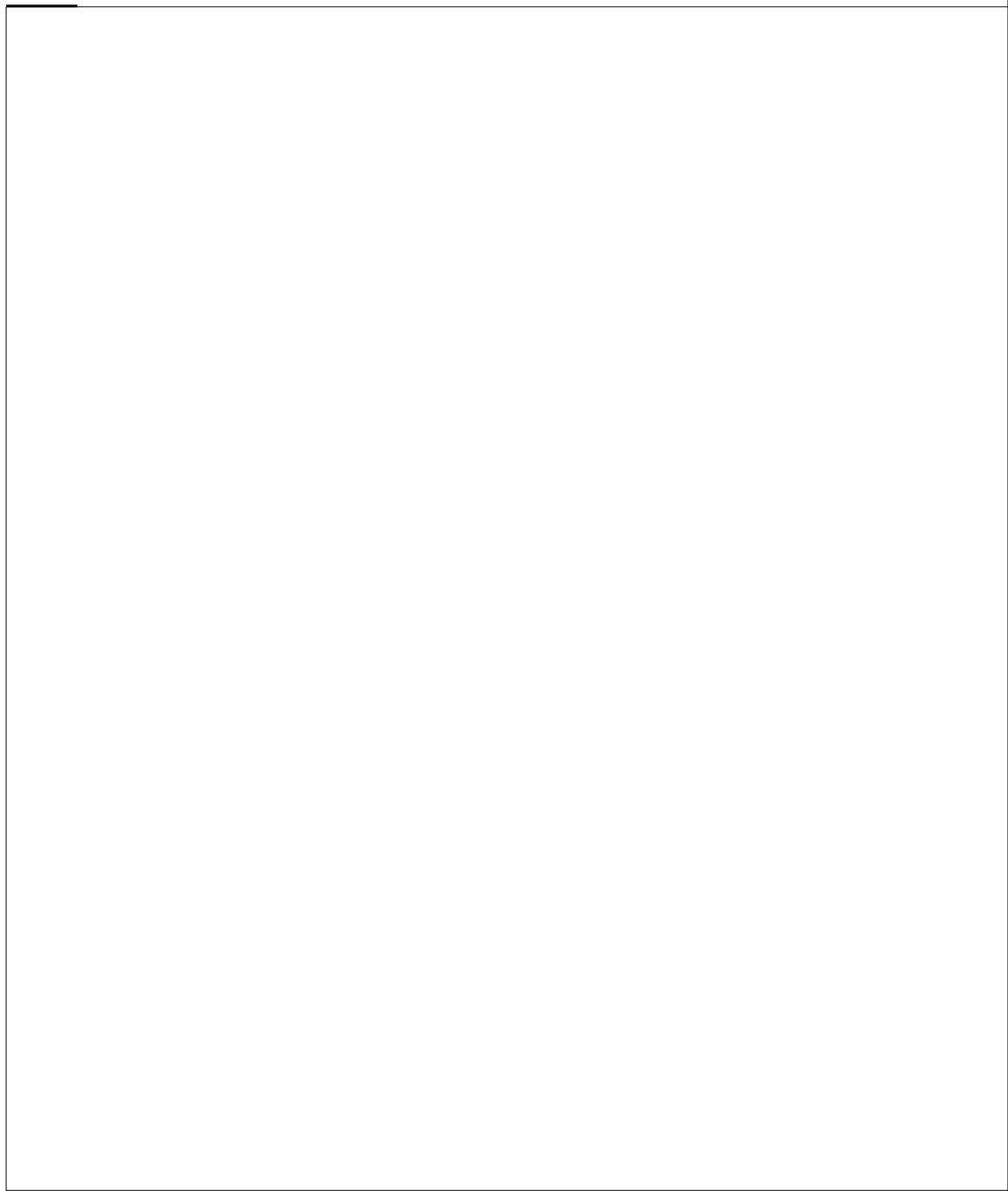


Client: Ekurhuleni
DOLOMITE STABILITY INVESTIGATION
Site: Modderfontein/Tembisa Licencing Hub

LEGEND
Sheet 1 of 1

JOB NUMBER: W0:830

	SAND	{SA04}
	SILTY	{SA07}
	CLAYEY	{SA09}
Name	DISTURBED SAMPLE	{SA38}



CONTRACTOR :
MACHINE :
DRILLED BY :
LOGGED BY :

INCLINATION :
DIAM :
DATE :
DATE :

ELEVATION :
X-COORD :
Y-COORD :

TYPE SET BY :
SETUP FILE : TESTPI~2.SET

DATE : 10/07/2014 09:18
TEXT : C:\DOTPLOT\INPUT\TP15.TXT

LEGEND
SUMMARY OF SYMBOLS

APPENDIX D

LABORATORY TEST RESULTS

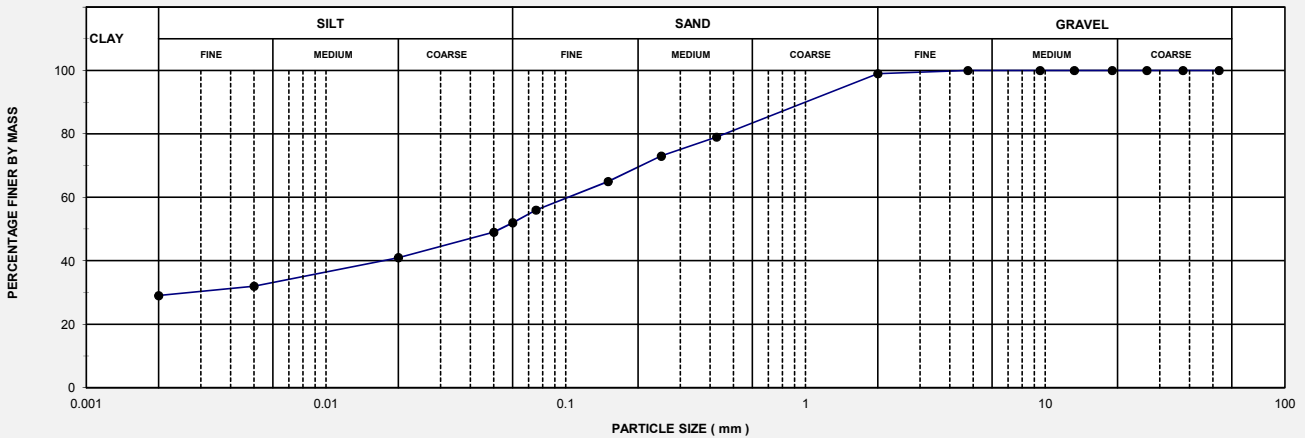


FOUNDATION INDICATOR TEST RESULTS - REP COM 7

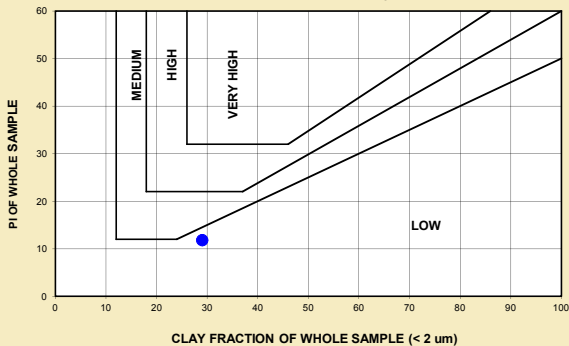
Client:	Blue Rain Trading	Source/Location:	Job No:	2014-C-974
Project Name:	Tembisa Licensing Hub	Layer:	Sample No:	4/6742
Project No:	830	Lane:	Date:	2014-08-15
Hole/TP No:	TP 7	Stabilizing Agent:	Test Method:	TMH1 A1, A5 & MT1
Depth (m):	0.4 - 1.5	Section:	Client Ref No:	
Description:		Chainage:	GPS X:	
Additional Info:		Offset:	GPS Y:	

SIEVE ANALYSIS				ATTERBERG LIMITS		SOIL CLASSIFICATION	
Sieve (mm)	% Passing	Sieve (mm)	% Passing				
75.0	100	0.425	79	Liquid Limit (%)	31	% Gravel	1
63.0	100	0.250	73	Plastic Limit (%)	16	% Sand	47
53.0	100	0.150	65	Plasticity Index (%)	15	% Silt	23
37.5	100	0.075	56	Weighted PI (%)	12	% Clay	29
26.5	100	0.060	52	Linear Shrinkage (%)	6.0	Activity	0.5
19.0	100	0.050	49	Grading Modulus	0.66	Unified Classification	CL
13.2	100	0.020	41	Uniformity coefficient	54	TRB Classification	A - 6
9.5	100	0.005	32	Coefficient of curvature	0.0		
4.75	100	0.002	29	Remarks:			
2.00	99						

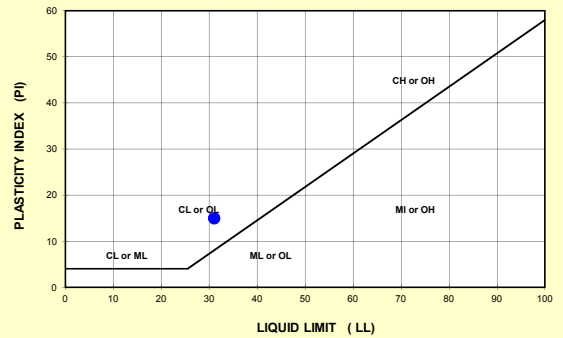
PARTICLE SIZE DISTRIBUTION



POTENTIAL EXPANSIVENESS Van der Merwe's Activity Chart



CASAGRANDE 'A' LINE



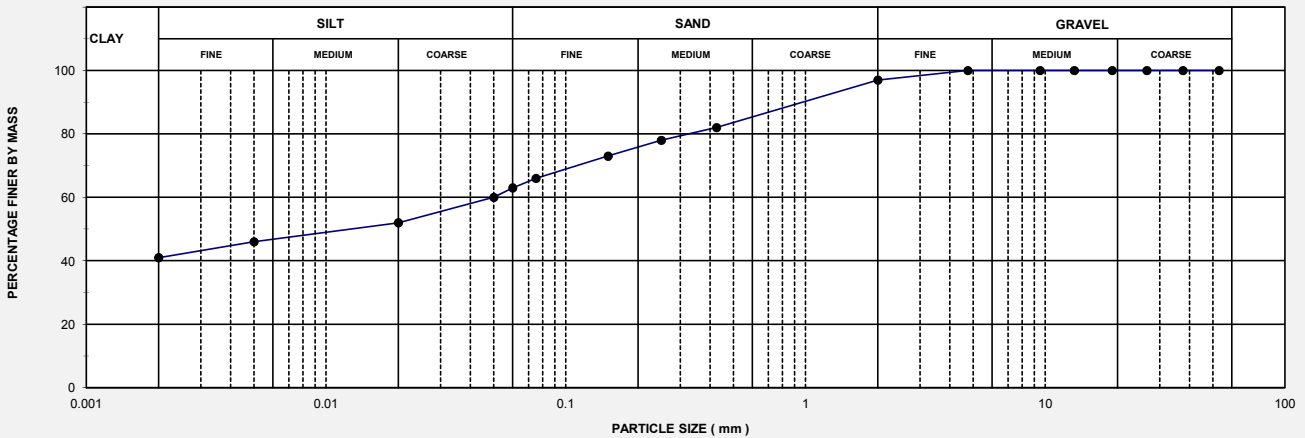


FOUNDATION INDICATOR TEST RESULTS - REP COM 7

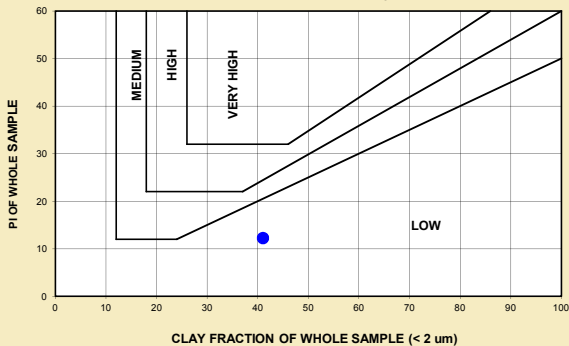
Client:	Blue Rain Trading	Source/Location:	Job No:	2014-C-974
Project Name:	Tembisa Licensing Hub	Layer:	Sample No:	4/6741
Project No:	830	Lane:	Date:	2014-08-15
Hole/TP No:	TP 2	Stabilizing Agent:	Test Method:	TMH1 A1, A5 & MT1
Depth (m):	0.3 - 1.9	Section:	Client Ref No:	
Description:		Chainage:	GPS X:	
Additional Info:		Offset:	GPS Y:	

SIEVE ANALYSIS				ATTERBERG LIMITS		SOIL CLASSIFICATION	
Sieve (mm)	% Passing	Sieve (mm)	% Passing				
75.0	100	0.425	82	Liquid Limit (%)	36	% Gravel	3
63.0	100	0.250	78	Plastic Limit (%)	21	% Sand	34
53.0	100	0.150	73	Plasticity Index (%)	15	% Silt	22
37.5	100	0.075	66	Weighted PI (%)	12	% Clay	41
26.5	100	0.060	63	Linear Shrinkage (%)	8.0	Activity	0.4
19.0	100	0.050	60	Grading Modulus	0.55	Unified Classification	CL
13.2	100	0.020	52	Uniformity coefficient	25	TRB Classification	A - 6
9.5	100	0.005	46	Coefficient of curvature	0.0		
4.75	100	0.002	41	Remarks:			
2.00	97						

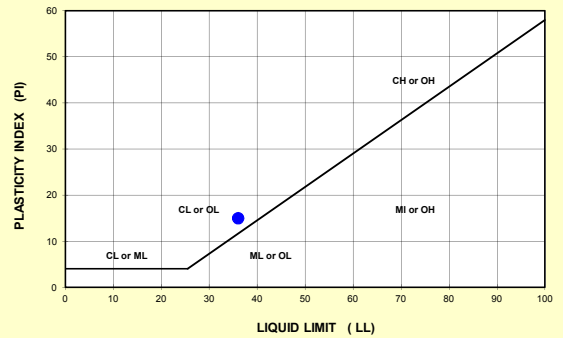
PARTICLE SIZE DISTRIBUTION



POTENTIAL EXPANSIVENESS Van der Merwe's Activity Chart



CASAGRANDE 'A' LINE



APPENDIX E

GEOPHYSICS RESULTS/REPORT

8 Pieter Avenue
Technopark Highveld
Centurion
Republic of South Africa
T: +27-12-665 2160
F: +27(0)-12-665 1296
M: +27(0) 72 083 3745
E: info@resourceexploration.com



WITFONTEIN 15 IR PORTION 67: LICENSING HUB IN ESLEN PARK:

**DOLOMITE STABILITY
GRAVITY SURVEY REPORT**

**CLIENT : EKURHULENI METROPOLITAN MUNICIPALITY
PREPARED BY : PANGA HOLDINGS [PTY] LTD
REPORT NO. : WIT 67 5/14
DATE : MAY 2014**

**DIRECTORS: P. Dzanga [PhD] (Pr.Sci. Nat.) L.M Ledweba: B.luris (Unin) LLB (UP) Dip
Insolvency Law & Practice (UP)**

1 INTRODUCTION

The Department of Transport Planning and Provision identified Portion 67 of Witfontein 15IR for the construction of a Licensing Hub for the Thembisa Area. The project is in line with the integrated Development Plan as well as the objective of establishing Motor Vehicle Registration Authority (MVRA) facilities and Drivers Licensing Testing Centres (DLTC) throughout the EMM. The site is underlain by dolomites.

As a prerequisite to construction, dolomitic stability investigation is required. Gravity survey was recommended to assess the integrity of the dolomite. The technique is useful for mapping subsurface cavities.

2 PROCEDURE

The survey was conducted in grid. The locations and elevations of the stations were recorded with a Trimble Geomatics DGPS [Figure 2-1] whilst a CG5 Autograv was used to observe gravity [Figure 2-2].



FIGURE 2-1: THE TRIMBLE DGPS



FIGURE 2-2: THE GEO-TECHNICIAN ACQUIRING GRAVITY DATA

3 DATA PROCESSING

Data reduction followed normal procedures for dolomite. The latitude correction formula of 1967 was used for data reduction. Data were reduced to relative Bouguer values and then contoured [Figure 4-1].

Further processing of the data was carried out using Geosoft Oasis Montaj. Anomalies in the residual field were of exploration interest [Figure 4-2]. The residual gravity map was created by removing the first order trend of the Bouguer grid.

4 RESULTS

The results are presented as contoured colour maps in Figure 4-1 and 4-2. The Bouguer map shows gravity low to the western side and an easterly trend. This trend has been removed on the residual map. The residual map shows two significant gravity lows to the western side of the grid and another low to the eastern side of the grid. Four boreholes have been planned to test these gravity lows of any cavities. The borehole positions are shown on the residual gravity maps. The coordinates for these borehole positions are shown in Table 4-1.

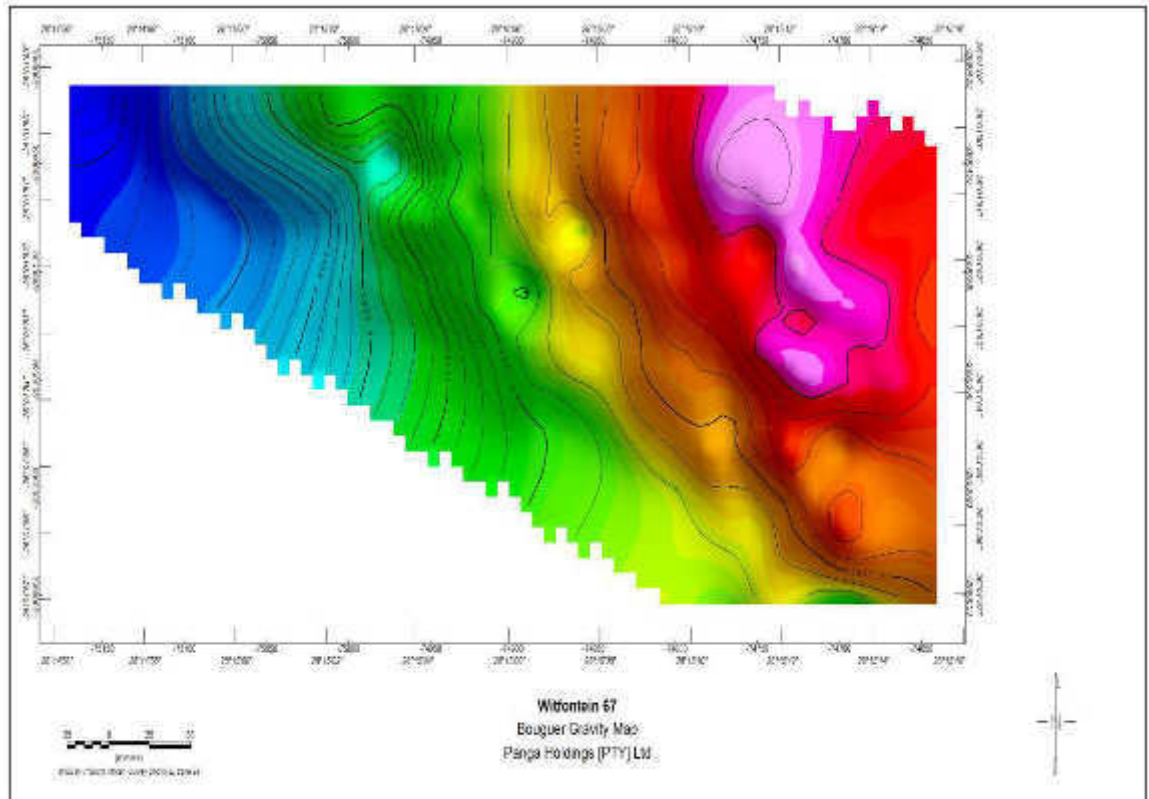


FIGURE 4-1: THE WITFONTEIN 15IR PORTION 67: BOUGUER MAP

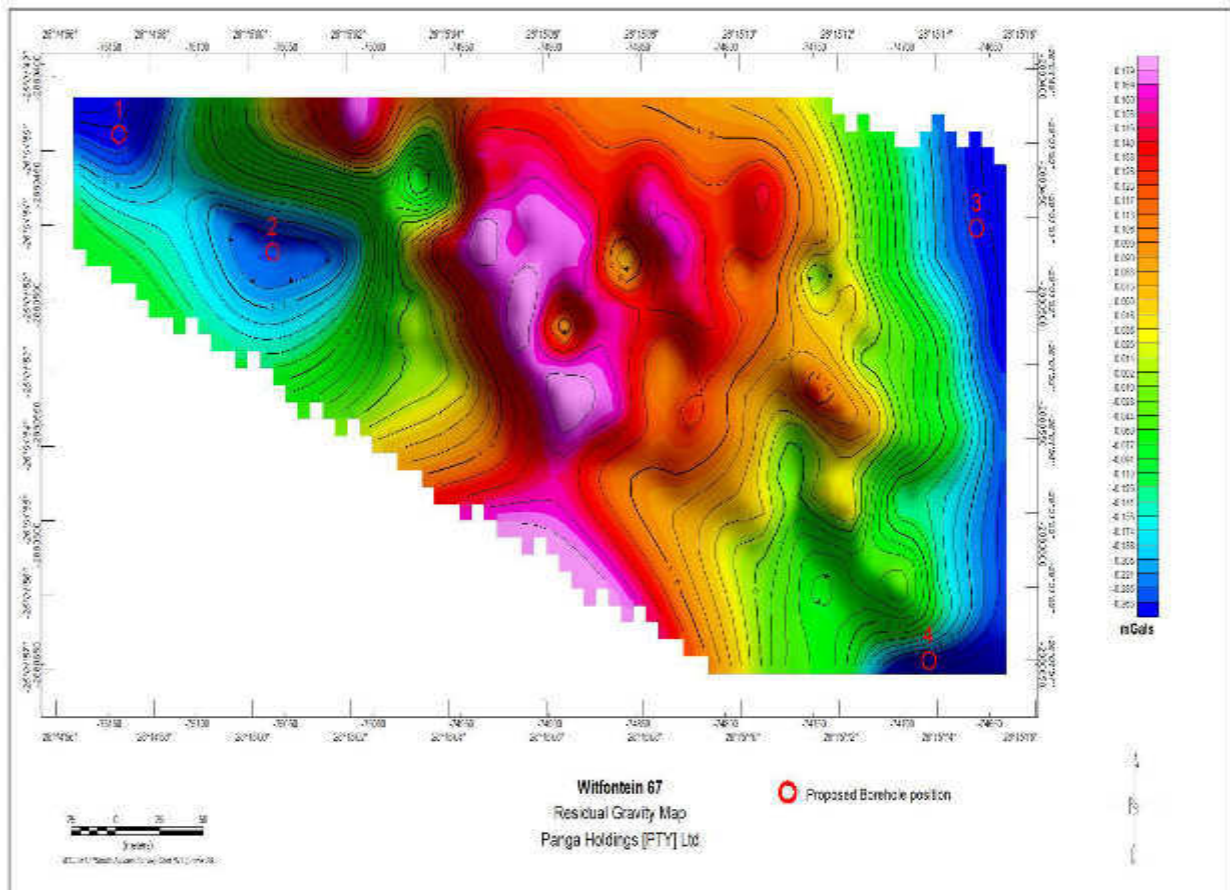


FIGURE 4-2: THE WITFONTEIN 15 IR PORTION 67: THE GRAVITY RESIDUAL MAP

TABLE 4-1: PROPOSED BOREHOLE POSITIONS


Y_LO29	X_LO29	Latitude	Longitude	BHID
75144.6	2880429	-26.03049395	28.24925719	1
75057.4	2880478	-26.03094072	28.2501257	2
74657.6	2880468	-26.03087113	28.25411998	3
74684.7	2880648	-26.03249431	28.25383837	4

Heritage Impact Assessment

A photograph of a modern building with large glass windows and a paved road in the foreground. The building has a dark facade and is surrounded by greenery. The sky is blue with some clouds.

Appendix G6

Phase 1 Heritage Impact Assessment for the proposed Ekurhuleni Licensing Hub on Portion 67 of Portion 15 of the Farm Witkoppies 151R, Kempton Park, Gauteng Province.


<p>Leonie Marais-Botes Heritage Practitioner</p> <p>868 Endeman Street Wonderboom South Pretoria 0084 Mobile: 082 576 6253 E-mail: leoniembotes@gmail.com</p>
<p><i>BA (Cultural History and Archaeology) (UP), BA (Hons) Cultural History (UP), Post Grad Dip Museology (UP), Cert Conservation of Traditional Buildings (Univ of Canberra) Post Grad Dip: Heritage (Wits)</i></p>
<p><i>Accredited member: SA Society for Cultural History (CH002)</i></p>

For:

Bokamoso Environmental
PO Box 11375
MAROELANA
0161

July 2015

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Leonie Marais-Botes Heritage Practitioner.

The information contained in this report is the sole intellectual property of Leonie Marais-Botes Heritage Practitioner.

It may only be used for the purposes it was commissioned for by the client.

DISCLAIMER:

Although all possible care is taken to identify/find all sites of cultural importance during the initial survey of the study area, the nature of archaeological and historical sites are as such that it is always possible that hidden or sub-surface sites could be overlooked during the study. Leonie Marais-Botes Heritage Practitioner will not be held liable for such oversights or for the costs incurred as a result thereof.

ACKNOWLEDGEMENTS

Australia ICOMOS. The Burra Charter.

Bergh, J.S. Geskiedenis Atlas van Suid-Afrika. Die vier Noordelike Provinsies. Van Schaik Uitgewers, 1998.

Beyers C.J. (Editor-in-Chief). Dictionary of South African Biography (Vol I – V). Pretoria, 1987.

Coertze, P.J. & Coertze, R.D. Verklarende vakwoordeboek vir Antropologie en Argeologie. Pretoria, 1996.

Huffman, T.N. A Handbook to the Iron Age: The Archaeology of Pre- Colonial Farming Societies in Southern Africa. University of KwaZulu-Natal Press, 2007

Human Tissues Act (Act 65 of 1983 as amended)

Government Printers. 1 : 50 000

National Heritage Legislation (Act 25 of 1999)

National Environmental Management Act (Act 107 of 1998)

Ordinance on Exhumations (no 12 of 1980)

Potgieter, D.J. (editor-in-chief) Standard Encyclopaedia of Southern Africa. London 1971.

Rosenthal E. (Editor) Encyclopaedia of Southern Africa, 1973

The National Archives of South Africa databases.

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ABOUT THIS REPORT

The heritage report must reflect that consideration has been given to the history and heritage significance of the study area and that the proposed work is sensitive towards the heritage resources and does not alter or destroy the heritage significance of the study area.

The heritage report must refer to the heritage resources currently in the study area.

The opinion of an independent heritage consultant is required to evaluate if the proposed work generally follows a good approach that will ensure the conservation of the heritage resources.

The National Heritage Resources Act (Act 25 of 1999), the National Environmental Management Act (Act 107 of 1998), Ordinance on Exhumations (no 12 of 1980) and the Human Tissues Act (Act 65 of 1983 as amended) are the guideline documents for a report of this nature.

Leonie Marais-Botes Heritage Practitioner was appointed by Bokamoso Environmental to carry out a Phase 1 Heritage Impact Assessment (HIA) for the proposed Ekurhuleni Licensing Hub on Portion 67 of Portion 15 of the Farm Witkoppies 151R, Kempton Park, Gauteng Province. The site visit was conducted on 1 June 2015.

DEFINITION OF TERMS:

“alter” means any action affecting the structure, appearance or physical properties of a place or object, whether by way of structural or other works, by painting, plastering or other decoration or any other means.

“archaeological” means—

(a) material remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures;

(b) rock art, being any form of painting, engraving or other graphic representation on a fixed rock surface or loose rock or stone, which was executed by human agency and which is older than 100 years, including any area within 10m of such representation;

(c) wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation; and

(d) features, structures and artefacts associated with military history which are older than 75 years and the sites on which they are found.

“conservation”, in relation to heritage resources, includes protection, maintenance, preservation and sustainable use of places or objects so as to safeguard their cultural significance.

“cultural significance” means aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

“development” means any physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including—

(a) construction, alteration, demolition, removal or change of use of a place or a structure at a place;

(b) carrying out any works on or over or under a place;

(c) subdivision or consolidation of land comprising, a place, including the structures or airspace of a place;

(d) constructing or putting up for display signs or hoardings;

(e) any change to the natural or existing condition or topography of land; and

(f) any removal or destruction of trees, or removal of vegetation or topsoil; object that is specifically designated by that state as being of importance.

“grave” means a place of interment and includes the contents, headstone or other marker of such a place, and any other structure on or associated with such place.

“heritage resource” means any place or object of cultural significance.

“heritage resources authority” means the South African Heritage Resources Agency, or in respect of a province, a provincial heritage resources authority.

“heritage site” means a place declared to be a national heritage site by SAHRA or a place declared to be a provincial heritage site by a provincial heritage resources authority.

“improvement”, in relation to heritage resources, includes the repair, restoration and rehabilitation of a place protected in terms of Act 25 of 1999.

“living heritage” means the intangible aspects of inherited culture, and may include—

- (a) cultural tradition;
- (b) oral history;
- (c) performance;
- (d) ritual;
- (e) popular memory;
- (f) skills and techniques;
- (g) indigenous knowledge systems; and
- (h) the holistic approach to nature, society and social relationships.

“local authority” means a municipality as defined in section 10B of the Local Government Transition Act, 1993 (Act No. 209 of 1993).

“management”, in relation to heritage resources, includes the conservation, presentation and improvement of a place protected in terms of Act 25 of 1999.

“meteorite” means any naturally-occurring object of extraterrestrial origin.

“object” means any movable property of cultural significance which may be protected in terms of any provisions of Act 25 of 1999, including—

- (a) any archaeological artefact;
- (b) palaeontological and rare geological specimens;
- (c) meteorites; and
- (d) other objects.

“palaeontological” means any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains or trace.

“place” includes—

- (a) a site, area or region;
- (b) a building or other structure which may include equipment, furniture, fittings and articles associated with or connected with such building or other structure;
- (c) a group of buildings or other structures which may include equipment, furniture, fittings and articles associated with or connected with such group of buildings or other structures;
- (d) an open space, including a public square, street or park; and
- (e) in relation to the management of a place, includes the immediate surroundings of a place.

“presentation” includes—

- (a) the exhibition or display of;
- (b) the provision of access and guidance to;
- (c) the provision, publication or display of information in relation to; and
- (d) performances or oral presentations related to, heritage resources protected in terms of Act 25 of 1999.

“public monuments and memorials” means all monuments and memorials—

- (a) erected on land belonging to any branch of central, provincial or local government, or on land belonging to any organisation funded by or established in terms of the legislation of such a branch of government; or
- (b) which were paid for by public subscription, government funds, or a public-spirited or military organisation, and are on land belonging to any private individual.

“site” means any area of land, including land covered by water, and including any structures or objects thereon.

“structure” means any building, works, device or other facility made by people and which is fixed to land, and includes any fixtures, fittings and equipment associated therewith.

“victims of conflict” means—

(a) certain persons who died in any area now included in the Republic as a direct result of any war or conflict as specified in the regulations, but excluding victims of conflict covered by the Commonwealth War Graves

Act, 1992 (Act No. 8 of 1992);

(b) members of the forces of Great Britain and the former British Empire who died in active service in any area now included in the Republic prior to 4 August 1914;

(c) persons who, during the Anglo-Boer War (1899-1902) were removed as prisoners of war from any place now included in the Republic to any place outside South Africa and who died there; and

(d) certain categories of persons who died in the “liberation struggle” as defined in the regulations, and in areas included in the Republic as well as outside the Republic.

EXECUTIVE SUMMARY

This project may impact on any types and ranges of heritage resources that are outlined in Section 3 of the National Heritage Resources Act (Act 25 of 1999). Consequently a Heritage Impact Assessment was commissioned by Bokamoso Environmental and conducted by Leonie Marais-Botes.

It is important to note that all graves and cemeteries are of high significance and are protected by various laws. Legislation with regard to graves includes the National Heritage Resources Act (Act 25 of 1999) whenever graves are 60 years and older. Other legislation with regard to graves includes those when graves are exhumed and relocated, namely the Ordinance on Exhumations (no 12 of 1980) and the Human Tissues Act (Act 65 of 1983 as amended).

1.1 INTRODUCTION

The proposed project is for the establishment of the **Greengate Extension 59 Township** which will include Residential, Special (for dwelling units, offices, retail activities, storage facilities, guest house, tea garden, private road and access purposes) and Private Open Space.

1.2 LOCATION AND STUDY AREA

The proposed development will be located in the Tembisa Esselen Park area, north from Link Road about 600m from the R25 crossing.

Figure 1: Locality Map

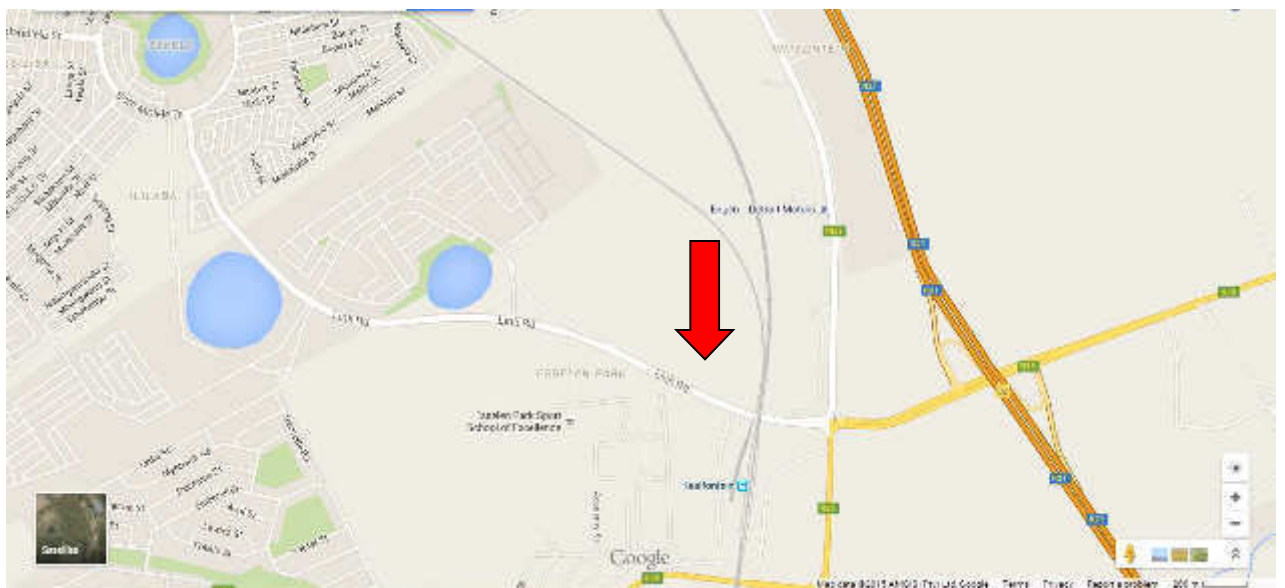


Figure 2: Aerial Map



1.3 METHOD

The objective of this Phase 1 Heritage Impact Assessment (HIA) was to gain an overall understanding of the heritage sensitivities of the area and indicate how they may be impacted on through development activities. The survey took place on 1 June 2015.

In order to establish heritage significance the following method was followed:

- Investigation of primary resources (archival information)
- Investigation of secondary resources (literature and maps)
- Physical evidence (site investigation)
- Determining Heritage Significance

1.4 BACKGROUND HISTORY OF THE GREATER STUDY AREA

Kepton Park is situated on the railway between Johannesburg and Pretoria, named after Kempton in Germany, though mis-spelt. Manufacturing industries, including the Modderfontein Dynamite Factory are situated nearby, also the Oliver Tambo International Airport¹.

1.5 PHOTOGRAPHIC RECORD OF AREA EARMARKED FOR DEVELOPMENT

Figure 3: Eastern section of site earmarked for development.



¹ E. Rosenthal (Editor), Encyclopaedia of Southern Africa, p. 292.

Figure 4: Western section of site earmarked for development.



Figure 5: Centre section of site earmarked for development.



Figure 6: The western and centre section of the site earmarked for development are used as a dumping site.



Figure 7: The western and centre section of the site earmarked for development are used as a dumping site.



2. FINDINGS

2.1 PRE-COLONIAL HERITAGE SITES

Possibilities: Greater study area taken into account.

Stone Age

The Stone Age is the period in human history when stone material was mainly used to produce tools². In South Africa the Stone Age can be divided in three periods³;

- Early Stone Age 2 000 000 – 150 000 years ago
- Middle Stone Age 150 000 – 30 000 years ago
- Late Stone Age 40 000 years ago - +/- 1850 AD

Iron Age

The Iron Age is the period in human history when metal was mainly used to produce artefacts⁴. In South Africa the Iron Age can be divided in three periods;

- Early Iron Age 250-900 AD
- Middle Iron Age 900-1300 AD
- Late Iron Age 1300-1840 AD⁵

There are no pre-colonial heritage sites evident in the study area.

2.2 HISTORICAL PERIOD HERITAGE SITES

Possibilities: Greater study area taken into account.

- Pioneer sites (Voortrekker sites cc 1836-1850's)
- Anglo-Boer War (1899-1902) sites.
- Structures older than 60 years.
- Graves.

There are no historical period sites situated on the site earmarked for development.

2.3 ORIGINAL LANDSCAPE

Previous farming and other infra-structure development activities have altered the original landscape considerably.

² P. J. Coertze & R.D. Coertze, Verklarende vakwoordeboek vir Antropologie en Argeologie.

³ S.A. Korsman & A. Meyer, Die Steentydperk en rotskuns in J.S. Bergh (red) Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies.

⁴ P.J. Coertze & R.D. Coertze, Verklarende vakwoordeboek vir Antropologie en Argeologie.

⁵ M.M. van der Ryst & A Meyer. Die Ystertydperk in J.S. Bergh (red) Geskiedenisatlas van Suid-Afrika. Die vier noordelike provinsies and T.N Huffman, A Handbook to the Iron Age: The Archaeology of Pre-Colonial Farming Societies in Southern Africa.

2.4 INTANGIBLE HERITAGE

The intangible heritage of the greater study area can be found in the stories of past and present inhabitants.

3 CATEGORIES OF HERITAGE VALUE (ACT 25 OF 1999)

The National Heritage Resources Act (Act 25 of 1999) identifies the following categories of value under section 3(1) and (2) of the Act under the heading "National Estate":

- "3 (1) For the purpose of this Act, those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.
- (2) Without limiting the generality of subsection (1), the national estate may include-
- (a) places, buildings, structures and equipment of cultural significance;
 - (b) places which oral traditions are attached or which are associated with living heritage;
 - (c) historical settlements and townscapes;
 - (d) landscapes and natural features of cultural significance;
 - (e) geological sites of scientific or cultural importance;
 - (f) archaeological and palaeontological sites;
 - (g) graves and burial grounds, including-
 - (i) ancestral graves;
 - (ii) royal graves and graves of traditional leaders;
 - (iii) graves of victims of conflict;
 - (iv) graves of individuals designated by the Minister by notice in the Gazette
 - (v) historical graves and cemeteries; and
 - (vi) other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
 - (h) sites of significance relating to the history in South Africa;
 - (i) movable objects, including-
 - (i) objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
 - (ii) objects to which oral traditions are attached or which are associated with living heritage;
 - (iii) ethnographic art and objects;
 - (iv) military objects
 - (v) objects of decorative or fine art;
 - (vi) objects of scientific or technological interests; and
 - (vii) books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section I (xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).
- (3) Without limiting the generality of the subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of-
- (a) Its importance in the community, or pattern of South Africa's history;
 - (b) Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;

- (c) Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- (d) Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural objects;
- (e) Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- (f) Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- (g) Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- (h) Its strong or special association with the life and work of a person, group or organisation of importance in the history of South Africa; and
- (i) Sites of significance relating to the history of slavery in South Africa.”

3.1 HERITAGE VALUE OF WEIGHED AGAINST CULTURAL SIGNIFICANCE CATEGORIES

3.1.1 Spiritual value

During the site visit/field work no indication of any spiritual activity was observed on/near the proposed site. Thus no sites of spiritual value will be impacted on by the proposed project.

3.1.2 Scientific value

No sites of scientific value was observed on or near the site earmarked for development.

3.1.3 Historical value

No historical value associated with the proposed site could be found in primary and secondary sources.⁶

3.1.4 Aesthetic value

No heritage item with exceptional aesthetic (architectural) value was identified in the study area.

3.1.5 Social value

Social value is attributed to sites that are used by the community for recreation and formal and informal meetings regarding matters that are important to the community. These sites include parks, community halls, sport fields etc. Visually none of the above is evident in the study area.

⁶ Standard Encyclopaedia of Southern Africa and the Transvaalse Argiefbewaarplek (TAB) database at the National Archives, Pretoria;
 J.S. Bergh (red), Geskiedenisatlas van Suid-Afrika: Die Vier Noordelike Provinsies.

3.2 SPECIFIC CATEGORIES INVESTIGATED AS PER SECTION 3 (1) AND (2) OF THE NATIONAL HERITAGE LEGISLATION (ACT 25 OF 1999)

3.2.1 Does the site/s provide the context for a wider number of places, buildings, structures and equipment of cultural significance?

The study area does not provide context for a wider number of places, buildings, structures and equipment of cultural significance. The reason is the low density of heritage structures/sites in the study area, near or on the proposed site.

3.2.2 Does the site/s contain places to which oral traditions are attached or which are associated with living heritage?

Places to which oral traditions are attached or associated with living heritage are usually found in conjunction with traditional settlements and villages which still practise age old traditions. None of these are evident near or on the proposed site.

3.2.3 Does the site/s contain historical settlements?

No historical settlements are located on or near the proposed site.

3.2.4 Does the site/s contain landscapes and natural features of cultural significance?

Due to previous infra-structure development activities the original character of the landscape have been altered significantly in the greater study area. In the specific study area some remnants of the original landscape are still evident.

3.2.5 Does the site/s contain geological sites of cultural importance?

Geological sites of cultural importance include meteorite sites (Tswaing Crater and Vredefort Dome), fossil sites (Karoo and Krugersdorp area), important mountain ranges or ridges (Magaliesburg, Drakensberg etc.). The proposed site is not located in an area known for sites of this importance.

3.2.6 Does the site/s contain a wide range of archaeological sites?

The proposed site does not contain any surface archaeological deposits.

The possibility of sub-surface findings always exists and should be taken into consideration in the Environmental Management Plan.

If sub-surface archaeological material is discovered work must stop and a heritage practitioner preferably an archaeologist contacted to assess the find and make recommendations.

3.2.7 Does the site/s contain any marked graves and burial grounds?

The site does not contain marked graves. The possibility of graves not visible to the human eye always exists and this should be taken into consideration in the Environmental Management Plan.

It is important to note that all graves and cemeteries are of high significance and are protected by various laws. Legislation with regard to graves includes the National Heritage Resources Act (Act 25 of 1999) whenever graves are 60 years and older. Other legislation with regard to graves includes those when graves are exhumed and relocated, namely the Ordinance on Exhumations (no 12 of 1980) and the Human Tissues Act (Act 65 of 1983 as amended).

If sub-surface graves are discovered work should stop and a professional preferably an archaeologist contacted to assess the age of the grave/graves and to advice on the way forward.

3.2.8 Does the site/s contain aspects that relate to the history of slavery?

This is not an area associated with the history of slavery like the Western Cape Province.

3.2.9 Can the place be considered as a place that is important to the community or in the pattern of South African history?

In primary and secondary sources the proposed site is not described as important to the community or in the pattern of South African history.⁷

3.2.10 Does the site/s embody the quality of a place possessing uncommon or rare endangered aspects of South Africa's natural and cultural heritage?

The proposed site does not possess uncommon, rare or endangered aspects of South Africa's natural and cultural heritage. These sites are usually regarded as Grade 1 or World Heritage Sites.

3.2.11 Does the site/s demonstrate the principal characteristics of South Africa's natural or cultural places?

The proposed site does not demonstrate the principal characteristics of South Africa's natural or cultural places. These characteristics are usually associated with aesthetic significance.

3.2.12 Does the site/s exhibit particular aesthetic characteristics valued by the community or cultural groups?

This part of the greater study area does not exhibit particular aesthetic characteristics valued by the community or cultural groups. The reason being the low density of heritage buildings and structures located in the greater study area.

⁷ Standard Encyclopaedia of Southern Africa and the Transvaalse Argiefbewaarplek (TAB) database at the National Archives, Pretoria.

J.S. Bergh (red), Geskiedenisatlas van Suid-Afrika. Die Vier Noordelike Provinsies.

3.2.13 Does the site/s contain elements, which are important in demonstrating a high degree of creative technical achievement?

The site does not contain elements which are important in demonstrating a high degree of creative technical achievement. Reason being none of the above evident on site.

3.2.14 Does the site/s have strong and special associations with particular communities and cultural groups for social, cultural and spiritual reasons?

The proposed site does not have a strong or special association with particular communities and cultural groups for social, cultural and spiritual reasons, the reason being that the particular site is located on mainly developed land and it is evident that the site is not utilised for social, cultural or spiritual reasons.

3.2.15 Does the site/s have a strong and special association with the life or work of a person, group or organisation?

The site does not have a strong and special association with the life or work of a person, group or organisation.

4. OPPORTUNITIES, RESTRICTIONS, IMPACTS

- There are no visible restrictions or negative impacts in terms of heritage associated with the site. In terms of heritage this project can proceed.
- 3.2.6 and 3.2.7 must be taken into account in the Environmental Management Plan.

5. THE WAY FORWARD

- **Submit this report as a Section 38 application to the Gauteng Heritage Resources Authority (PHRAG) for comment/approval.**

Memorandum



Appendix G7

PROPOSED DIVISION OF
**PORTION 67 OF THE FARM
WITFONTEIN NO 15 IR**
AND INCORPORATION OF THE AMENDED
ZONING

SUBMITTED IN TERMS OF

SECTION 6 (1) (b) OF THE DIVISION OF
LAND ORDINANCE, 1986 (ORDINANCE 20
OF 1986) AND INCORPORATION OF
ZONING INTO THE EKURHULENI TOWN
PLANNING SCHEME, 2015 IN TERMS OF
SECTION 125 (1) (e) OF THE TOWN
PLANNING AND TOWNSHIPS ORDINANCE,
1986 (ORDINANCE 15 OF 1986)

TEMBISA LICENCING HUB

JULY 2015

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1 INTRODUCTION

Gant Project management on behalf of the Ekurhuleni Metropolitan Municipality appointed Urban Dynamics Gauteng Inc. to compile and submit an application to obtain the necessary approval from the Ekurhuleni Metropolitan Municipality (Kempton Park) for the division of land and to incorporate the zoning as described below:

The division of Portion 67 of the Farm Witfontein No 15 IR into two (2) portions to be known as:

- Portion 137 of the Farm Witfontein No 15 IR and;
- The Remaining Extent of Portion 67 of the Farm Witfontein No 15 IR

in terms of section 6 (1) (b) of the Division of Land Ordinance, 1986 (Ordinance 20 of 1986) and the incorporation of the zoning of Portion 137 into the Ekurhuleni Town Planning Scheme, 2014 vide Section 125 of the Town Planning and Townships Ordinance, 15 of 1986.

The division is required to create a separate portion (Portion 137) for the proposed Tembisa Licencing Hub and subsequently to incorporate the zoning of the Licencing Hub (“Social Services”) into the Ekurhuleni Town Planning Scheme, 2014. The Remaining Extent of Portion 67 of the Farm Witfontein is the road reserve for the K60 Provincial Road.

The report firstly seeks to provide information pertaining to the subject site and its surrounding areas. The property is further described in terms of its locality, size, zoning, surrounding development trends, environmental conditions, engineering services and various other applicable site characteristics.

A motivation is provided proving the merit of the proposed division and incorporated rezoning of land in terms of the need and desirability relating to the applicable legislative and policy frameworks governing the said site.

2 BACKGROUND

The project is in line with the Integrated Development Plan and Ekurhuleni Metropolitan Municipality’s objective of establishing Motor Vehicle Registration Authority (MVRA) facilities and Drivers Licencing Testing Centres (DLTC) throughout the municipal area.

The said division of land (Portion 67 of the Farm Witfontein No 15 IR) and incorporation of the zoning relates to a tender which was awarded to Gant Project Management by Ekurhuleni Metropolitan Municipality for the construction of the Tembisa Licencing Hub on Portion 67 of the Farm Witfontein No 15 IR. It was then found that Portion 67 of the Farm Witfontein No 15 IR wasn’t zoned for the construction of the Tembisa Licencing Hub and that half the site was affected by the K60 provincial road.

Ekurhuleni Metropolitan Municipality has decided to build the new Licensing hubs in the previously disadvantaged areas (such as Tembisa) because all the existing centres are situated in the historical town centres. According to an article written by Lehlohonolo Tau (timeslive on 22 July 2014). It was reported that the spokesman for the municipality Themba Gadebe said that the municipality wants to reduce the average waiting period for those who are trying to obtain learners or driver licenses by building licencing hubs at “township” areas. The testing hubs are going to be constructed in Tsakane, Katlehong and Tembisa and will make the services more easily accessible to township residents. In building the Tembisa Licencing Hub the Ekurhuleni Metropolitan Municipality will bring services closer to the people.



The Division of Land and Rezoning application will allow the creation of a separate farm portion (Portion 137) which is situated outside the K60 road reserve and which could be zoned to “Social Services” for the construction of the Tembisa Licencing Hub.

3 THE APPLICATION

Application is hereby made:

1. In terms of Section 6 (1) (b) of the Division of Land Ordinance, 1986 (Ordinance 20 of 1986), as read with the Ekurhuleni Town Planning Scheme (2014) for the division of Portion 67 of the Farm Witfontein No 15 IR into two (2) portions.
2. In terms of Section 125 (1) (e) of the Town Planning and Townships Ordinance, 1986 (Ordinance 15 of 1986) which allows for incorporation of the newly created land portion into the Ekurhuleni Town Planning Scheme, 2014, with an allocated zoning, as per the motivation for the division.

The Ekurhuleni Metropolitan Municipality wishes to divide the said site to create two (2) separate cadastral entities in order for the proposed Portion 137 of the Farm Witfontein No 15 IR to be incorporated into the Ekurhuleni Town Planning Scheme (2014) as “Social Services” for the construction of the Tembisa Licencing Hub. The Remaining Extent of Portion 67 of the farm Witfontein No 15 IR will remain zoned “Roads”. The table below indicates the proposed Portions:

Table 1: Proposed Portions of Portion 67 of the Farm Witfontein No 15 IR

PORTION DESCRIPTION	SIZE (ha)	CURRENT USE	PROPOSED USE
Portion 137 (a portion of portion 67) of the Farm Witfontein No 15 IR	3,5762ha	Vacant	Tembisa Licencing Hub
Remaining Extent of Portion 67 of the Farm Witfontein No 15 IR	3,5176ha	Sam Molele Drive	Sam Molele Drive / Proposed K60 Provincial Road
Total	7,0938ha		

The table below indicates the proposed incorporation of a “Social Services” zoning for the proposed Portion 137 of the Farm Witfontein No 15 IR into the Ekurhuleni Town Planning Scheme (2014), see **Annexure J** attached for the **Annexure to the Ekurhuleni Town Planning Scheme**:

Table 2: Proposed Zoning of Portion 137 (a portion of portion 67) of the Farm Witfontein No 15 IR

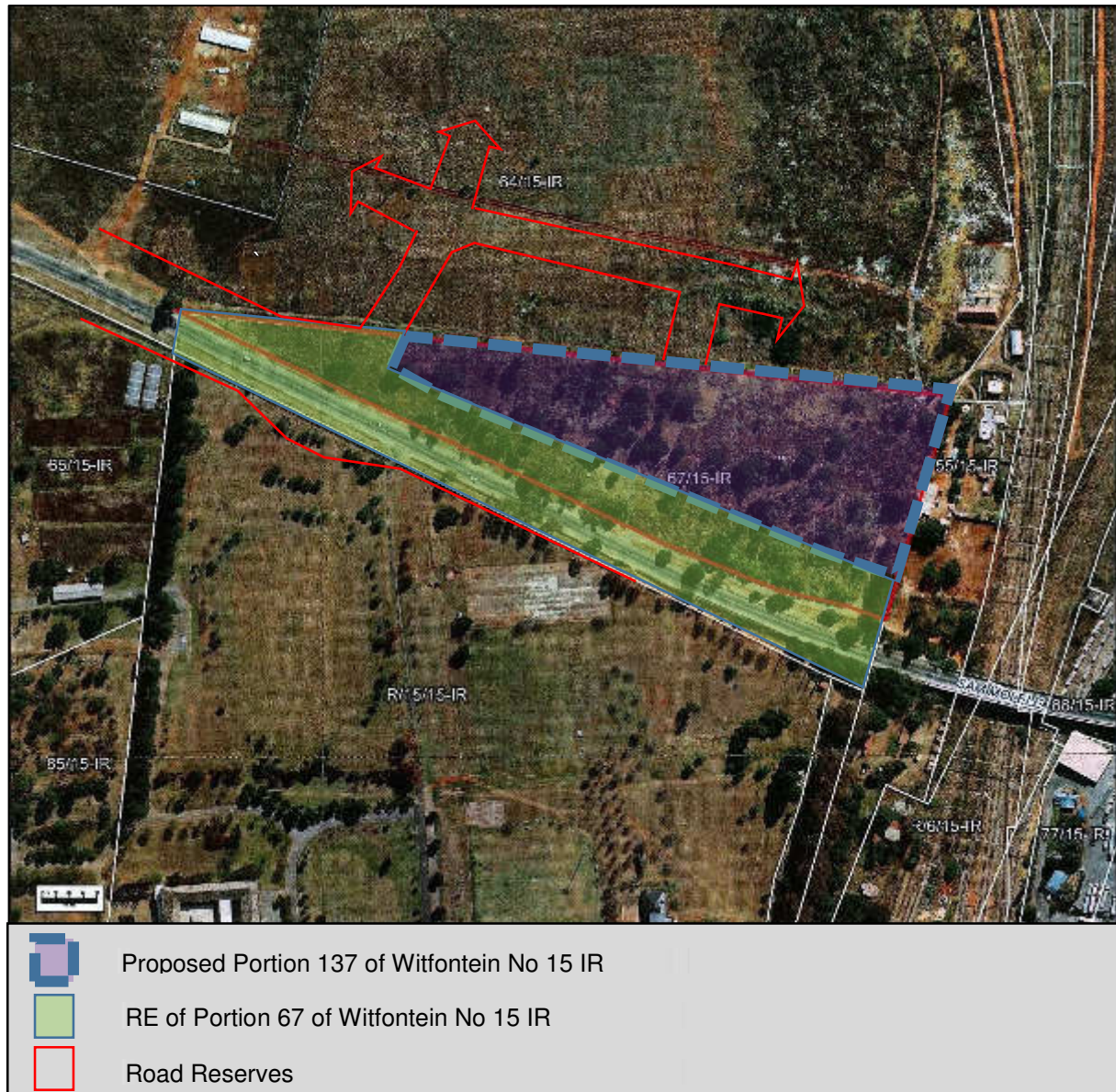
CURRENT ZONING		PROPOSED ZONING	
ZONING	“Roads”	ZONING	“Social Services”
DENSITY	N/A	DENSITY	N/A
HEIGHT	As determined by the Municipality	HEIGHT	2 Storeys
FAR	Null	FAR	0.1
COVERAGE	As determined by the Municipality	COVERAGE	20%
BUILDING LINES	Table A or B	BUILDING LINES	16m along the K60 8m along the eastern boundary 5m on all other boundaries
PARKING	Table E	PARKING	144 parking bays

The proposed Portion 137 of the Farm Witfontein No 15 IR was created in a way that would not affect any of the physical or legal barriers attributed to the land. The K60 road reserve and



access configuration was used to shape proposed Portion 137 (The K60 reserve was basically excluded from the proposed development). See Figure 1 below for an illustration of the proposed division. Additionally; please see the **Divisional Plan** attached hereto as **Annexure D**.

Figure 1: Schematic Divisional Plan



4 PROPERTY PARTICULARS

This section of the motivating memorandum contains all the relevant information with regards to the property and its surrounds. Reference will be made to documents such as the Title Deed and the Zoning Certificate in the annexures to this report.

The objective of this section is to provide a summary and overview of the supplied and gathered information and therefore assimilate the information for ease of reference and to create a better understanding of the issues at hand.

This section is divided into the following sub-sections relating to the following:

- Legal Information;



- Physical Information and Site Context;
- Environmental Information and;
- Engineering Services.

4.1 LEGAL INFORMATION

4.1.1 Property Description, Ownership and Size

The subject property is registered as Portion 67 of the Farm Witfontein No 15 IR, is owned by the Ekurhuleni Metropolitan Municipality and measures 7.0938 (Eight comma five six three four) Hectares. The property is held vide **Deed of Transfer** number **T33564/2001** attached hereto as **Annexure A**.

4.1.2 Current Town Planning and Legal Status

Portion 67 of the Farm Witfontein No 15 IR represents land which is zoned “Roads” (see the **Zoning Certificate** attached hereto as **Annexure G**) and which has partly been used for Sam Molele Drive on the proposed Remaining Extent of Portion 67 of the Farm Witfontein No 15 IR. The said portion of land affected by this application has not been subjected to any previous development applications. Thus, the land has no proclaimed development rights nor is currently being subjected to any known application process, with the exception of this application in terms of Section (6)(1)(b) of the Division of Land Ordinance, 1986 (Ordinance 20 of 1986). The following status is noted:

<u><i>Town Planning Status:</i></u>	The land is currently zoned Use Zone 20: “Roads” (see the Zoning Certificate attached hereto as Annexure G). The purposes for which the land may be used include Streets/Roads, Private Roads, Toll Gates, Weigh bridges, Parking, Cycle Lanes, Bus Lanes, Municipal services and infrastructure. This application will serve to divide the land to separate the existing road from the land upon which the Licensing Hib is proposed. The application also intends to incorporate the zoning of Portion 1 as “Social Services” into the Ekurhuleni Town Planning Scheme, 2014.
<u><i>Environmental Status:</i></u>	The land does not fall within any protected areas. However; a low to medium risk exists for small to medium size sinkhole formation.
<u><i>Development Status:</i></u>	Proposed Portion 1 of the land is currently vacant and has no formal development status. The remaining extent of Portion 67 has a formal road, which will be protected vide this division of land application.
<u><i>Legal Status:</i></u>	The land is registered vide the Transfer Deed T33564/2001 in favour of the Ekurhuleni Metropolitan Municipality.

4.1.3 Power of Attorney

The application for the division of Portion 67 of the Farm, Witfontein No. 15 IR is made on behalf of the Ekurhuleni Metropolitan Municipality.

See the **Special Power of Attorney** authorising Urban Dynamics Gauteng Inc. to act on their behalf for the division and incorporated rezoning of the land, which can be found attached hereto as **Annexure C**.



4.1.4 Mineral Rights and Related Issues

According to the Mineral and Petroleum Resources Development Act, 2002 (No 28 of 2002) the state is the custodian of all mineral resources. The application will be submitted to the Department of Minerals and Energy for their comment.

4.1.5 Mortgage Bonds

With reference to the Title Deed, there are no Mortgage Bonds registered against the property title. Consent from Mortgage lenders is therefore not required for the division of the subject land.

4.1.6 Servitudes

In accordance with the Title Deed, there are no servitudes affecting Portion 67 of the Farm Witfontein No 15 IR.

4.1.7 Title Conditions

With reference to the Title Deed, all title conditions (a-j) for Title Deed T26/1979 were removed vide notice 30/2000 in terms of Section 10 of Act 3 of 1996(Gauteng), in July 2000 (see page 1 of the **Title Deed**, attached hereto as **Annexure A**).

4.2 PHYSICAL INFORMATION AND SITE CONTEXT

4.2.1 Regional and Local Context

Portion 67 of the Farm Witfontein No 15 IR is located immediately north of Sam Molele Drive which is an extension of the R25 to the east and provides access to the R21 which is situated 1,6km east of the site. Transnet's Esselen Park Training Complex is located opposite the site to the south of Sam Molele Drive. Towards the west Sam Molele Drive provides access to Esselen Park and Tembisa ($\pm 2,9$ km west of the site). The site is situated immediately west of the Transnet / Prasa Railway line and approximately 300m north of the Kaalfontein Station. The site is situated approximately 10km north of the Kempton Park CBD. See the **Locality Plan** attached hereto as **Annexure F**.

Figure 2: Locality Map



4.2.2 Topography

There is no clearly defined water course on the site. The site has a fairly flat natural fall towards the north east in the direction of the railway line with a gradient of approximately 1 to 2%. (see Figure 3).

Figure 3: Contours on the subject site



4.2.3 Existing Structures and Current Utilisation of the Land

There are not any existing structures on the site except for two concrete slabs. The land seems to be used for illegal dumping of building rubble and general domestic waste. On the eastern boundary of the site there is a narrow surfaced road used by Transnet / Prasa to access the railway line. Some of the fences around their buildings also extends onto the site. In general the land are currently not utilised for any activity.



Figure 4: The site as seen from the south west (Sam Molele Drive in the foreground)



4.2.4 Existing and Proposed Road Infrastructure

The site is bound by Sam Molele Drive in the south which forms the future K60 Road Reserve. The reason for the division is to create a separate portion for the Tembisa Licencing Hub and a separate portion for the K60 Road Reserve.

Access to the site will be taken of Sam Molele Drive. The position of the new access will be directly across the access gate (on the southern side of Sam Molele Drive) to the Esselen Park Training Complex situated immediately south of the road. The new access road to the site from Sam Molele Drive will provide access to not only the site but the entire sub area. The access road will provide access to the site from its northern boundary.

The division has made provision for a 62m wide road reserve for Sam Molele Drive / future K60.

4.2.5 Surrounding Land Use

The surrounding land uses have an “Industrial” nature. The surrounding area generally consist of large tracts of land, each parcel accommodating a different use. The area immediately north of the site is vacant. Immediately east of the site is the railway line with the Lafarge Cement factory to the east of the railway line. Sam Molele Drive is located immediately south of the site with Transnet’s Esselen Park Training Facility immediately south of the road. Kaalfontein Station is also situated approximately 300m south of the road. A “chicken farm” which forms part of an LED project is located immediately west of the site. The **Surrounding Land Use Plan** attached hereto as **Annexure H**.

4.2.6 Surrounding Zoning

The area surrounding the site is mostly zoned “Agricultural”. The area below the site as well as the railway line east of the site is zoned for “Railway” purposes while the area immediately east of the railway line is zoned for “Industrial” use. The site itself is zoned “Roads”. See **Annexure I** for the **Surrounding Zoning Plan**.



4.3 ENVIRONMENTAL CONSIDERATIONS

Bokamoso Environmental Consultants has been appointed to conduct the environmental investigation and to apply for a Basic Assessment to GDARD.

There preliminary investigations found that there are no wetlands or watercourses on site and that there are no sensitive fauna or flora present on the site. It was also found that the site has a low Agricultural Soil Potential.

4.4 GEOLOGY

A **Geotechnical Investigation** dated May 2015 was done by JC Geotechnical Services CC and is attached hereto as **Annexure M1**.

The land is dolomitic and a **Dolomite Stability Report** dated August 2014 was prepared by Blue Rain Consultants and is attached hereto as **Annexure M2**.

- **Site Description**

The vegetation on the site comprises thick veld grass with dense shrubs and some blue-gum and wattle trees. Occasional shallow borrow pits have been formed across the site and are partially filled with rubble.

- **Site Geology**

According to the dolomite stability investigation carried out by Blue Rain Consultants “the site is underlain by chert-rich dolomite of the Monte Christo Formation of Malmani Subgroup of the Chuniespoort Group, Transvaal Super-group”.

The information provided by our field work shows that the site is covered by a 1.0 to 3.0m thick reddish orange and loose colluvial topsoil overlying shallow occurring and highly variable chert rich dolomitic residuum interspersed with syenite dyke intrusions. The colluvial silty sand deposit has an open voided and collapsible grain structure.

The stability investigation also showed that “the site is characterised by relatively shallow dolomite bedrock”. Moderately to slightly weathered sound dolomite rock was encountered from depths in the range 15m and 31m.

- **Stability Risk Classification**

According to Blue Rain Consultants ” the entire site generally constitutes Risk Class 1/3/4 for both a non-dewatering and dewatering scenario (NHBRC Class D3) due to the thick layer of wad present above the dolomite bedrock. The classification indicates that there is a low to medium risk for the development of small to medium sized sinkholes as well as doline formation in both a non-dewatering and watering scenario. Dewatering the site will therefore not influence the stability of the site”.

The site also has a sub area classification of C2/D3 which means that potentially collapsible soils are present and overly the dolomite.

- **Recommendations**

The major foundation problems associated with this site relates to the collapsible and highly variable nature of the transported soils that occur to a depth of 3.0m and the low to medium risk of sinkhole formation.

1. Earthworks: Due to the gently sloping nature of the site significant earthworks are not envisaged. However, it is recommended that the general site levels or building platforms be raised as the site is low lying and could become waterlogged during periods of heavy rainfall.



2. Foundations: The surface deposits are generally fine to medium grained with a collapse potential of between 8 and 21% and should be avoided as a founding medium.

-A) Soil Raft: A soil mattress or raft will, provide the most suitable and economical foundation solution for both lightly and moderately loaded buildings. The in-situ transported soils should be removed to a suitable depth and replaced with an imported G5 material placed to allow the construction of an overall 1.5m thick engineered soil blanket. Compaction of the G5 soil should be carried out in 150mm layers to a minimum of 95% Mod AASHTO dry density. The ferruginised soils present below 1.0m can be used for this purpose, in the lower one third of the mattress, provided they are stabilized with at least 4% cement. Once the earthworks has been completed conventional strip and/or spread foundations can be installed within the fill and dimensioned using an allowable bearing pressure of 150 kPa.

-B) Stiffened or Cellular Raft: Consideration can be given to the construction of concrete rafts to support the proposed buildings. However, they will have to be designed to span a 5.0m loss of support. The construction of large and heavily reinforced concrete rafts is expected to be very costly and therefore economically less attractive. Bearing pressures will also have to be limited to 50 kPa and it will be necessary to place the raft on at least 0.6m of either imported & well compacted G5 soils or stabilized and re-compacted transported soils.

-Road Pavement and Parking Areas: For roadways and parking areas the uppermost 300mm of in-situ colluvial soil (sub-grade) must be ripped and re-compacted after removal of the vegetation and fill soils. A 300mm thick sub-base layer must then be placed and compacted in 150mm layers using a G5 fill. Both the lower sub-grade and imported sub-base layers must be compacted to 93% of the modified AASHTO dry density.

-Risk Management Plan: Given sufficient time and the correct triggering mechanisms, instability in dolomite areas may occur naturally but it can be greatly increased by human activities. The primary triggering mechanisms in such instances include the ingress of water from leaking water-bearing services, poorly managed surface water drainage and groundwater level drawdown. It is therefore of utmost importance that the precautions as set out in section 10 of the dolomite stability report be incorporated in the construction specifications and also be included in a Risk Management Plan.

4.5 FLOODLINES AND WETLANDS

There are not any wetlands or floodlines present on the site.

4.6 ENGINEERING SERVICES

An Outline Scheme Report, dated June 2015 was prepared by Gant Project Management Consulting Engineers and deals with water, sewer and stormwater. The Civil Engineerin Services - **Outline Scheme Report** is attached hereto as **Annexure K**.

4.6.1 Water Supply

The closest existing potable water service for the site is available at Eighteenth Street in Esselen Park Ext 1. The existing service is an existing 100mm class 16 uPVC pipe that runs on the northern side of Eighteenth Street.

The internal water network will consist of a 110mm diameter HDPE “bulk internal water” system which will serve both domestic and firefighting requirements. It is recommended that this pipeline be a 110mm diameter and of made of HDPE pipes to account for the dolomitic nature of the soil.



- **External Services**

The existing municipal water network for the site is available at the intersection of Nineteenth Street and Eighteenth Street. It is proposed that a new 110mm diameter class 16 HDPE pipe be constructed from the site's west boundary up to the connection point in Eighteenth Street.

4.6.2 Sanitation Service

The site of the proposed Licensing Hub is not connected to an existing waterborne sewage network. The proposed sewer connection point is situated at the corner of Eighteenth Street and Fourteenth Street of Esselen Park Ext 1. This proposed connection point is approximately 6 metres above the site's lowest point. A pump station will be required on site to transfer the sewerage to the connection point.

A new 160mm diameter sewage pipe will be suitable for this development, which will be constructed to link the proposed Licensing Hub to the existing municipal sewage network located along Fourteenth Street of Esselen Park Ext 1. The sewage pipe that runs along Fourteenth Street is 1000mm in diameter according to Ekurhuleni Metropolitan Municipality's GIS portal.

- **External Services**

An existing 1000mm diameter sewer is located on Fourteenth Street. The additional flow generated by the proposed Licensing Hub has an adjusted peak flow of 0.533 l/s which will have a minimal effect on the existing sewer network and the capacity of the existing pipe which this will connect to.

- **Pump Station**

There will be a pump station on site to transfer sewerage to the existing municipal sewer network. The pump station is positioned at the lower side of the site (north eastern corner) to allow drainage of at least 80% of the whole site. A dry well pump station was considered feasible for the proposed Tembisa Licensing Hub development because of its ease of maintenance and its ease of operation.

There will be an emergency tank to store sewerage during times when the pump is not operational due to power failure or maintenance. The capacity of the emergency tank was designed to take 48 hours of sewerage at the average flow rate when the pump is not operational.

4.6.3 Stormwater

The site drains towards the railway line on the eastern boundary of the site with the lowest point lying between the substation and Sam Molele Drive. The storm water from the Licensing Hub site will be directed to an existing storm water culvert which lies adjacent to the railway and north of the bridge on Sam Molele Drive. The culvert is blocked and will be cleaned to allow the passage of storm water.

There will be an increased flood discharge by the development due to increase of impervious surfaces which reduces infiltration and increases runoff. The peak discharge from the developed site will be managed for the 1:5 year Return Interval (RI), as well as the 1:25 year RI. It is required to reduce the post development runoff so that it does not increase the load on the existing municipal storm water system. A storm water attenuation pond is proposed to control the outflow from the Licensing Hub development site.

The storm water attenuation pond model comprises a 2.2m deep 580m² pond, a 125mm diameter outlet pipe and a weir at 1.6m above the pond base. The weir operates during high



flows. The storm water control model effectively attenuates the storm water to peak flows that are slightly less than the pre development peak flows.

The entire development will be landscaped to facilitate good drainage and prevent the ponding of surface water against structures. All water courses and road surfaces shall be sealed and rendered impervious.

A new 450mm dia, class 4 HDPE pipe will connect the storm water outflow from the attenuation to the existing 900mm dia concrete pipe at the railway line.

4.6.4 Electrical Supply

The site falls under Eskom's Area of Supply. There is an existing 88kV substation (Kaalfontein Substation) on the northeastern boundary of the site.

4.7 TRAFFIC IMPACT STUDY

A **Traffic Impact Study**, dated 26 June 2015 was conducted by Corli Havenga Transportation Engineers and is attached hereto as **Annexure L**.

The report makes the following conclusions and recommendations:

- Access to the site will be off Sam Molele Drive. Sam Molele Drive is part of the provincial road network becoming K60 in future. Access approval will be required from Gautrans. There is no Preliminary Design available for this section. In terms of the Gauteng Transport Infrastructure Act 2001 a Section 7 report is required (this was completed and is included in Annexure L).
- The access to the development off Sam Molele Drive will need to comply with the minimum requirements set by Gautrans. The detail design will need to be done in consultation with Gautrans and wayleave will be required from Gautrans. The following will (amongst others) be required:
 - Minimum of 100m measured from the proposed road reserve of the future K60 (the existing Sam Molele Drive will become the southern lane of the future dual carriage-way) to the centre line of proposed access off the new access road.
 - The proposed new access off the future K60 should serve the area and not only the proposed development.
 - The existing access off Sam Molele Drive to Esselen Park Sport Ground should be located directly opposite the proposed new access.
- The expected traffic demand from the proposed facility was obtained from a survey done at a similar facility in Centurion.
- The proposed development is supported from a traffic flow point of view. It is further recommended that:
 - Access will be off Sam Molele Drive directly opposite the access to Esselen Park Sports Complex;
 - Provision is made for the following in the layout in terms of the Section 7 report:
 - Future road reserve of K60;
 - 25m access road from the K60 opposite the Esselen Park Sports Complex's access; and
 - 15m x 45m splays at the intersection on K60.
 - In terms of the Gauteng Transport Infrastructure Act the road reserve of K60 is excluded from the application;
 - Provision is made to reinstate access to Transnet via the new access on K60 and the access to the development; and
 - The applicant implement the new access on Sam Molele Drive with the following minimum upgrades (subject to approval from Gautrans):
 - Stop control on access road;
 - 60m right turn lane on eastern approach; and



-60m left turn lane on western approach.



5 MOTIVATION

5.1 NEED

5.1.1 Create Separate Transferable Land Parcels for Specific Use

It is the intention of Ekurhuleni Metropolitan Municipality, to divide the subject portion, for the respective portions to be legally used for their intended uses. As mentioned above, the proposed division of land is aimed at creating two (2) separate cadastral entities. The proposed Portion 137 (a portion of Portion 67 of the farm Witfontein 15 IR) will be utilised for the proposed Tembisa Licensing Hub. The Remaining Extent will be used for the future expansion of Sam Molele Drive (K60) and remain zoned for "Roads".

5.1.2. Incorporation into the Ekurhuleni Town Planning Scheme

The Proposed Portion 137 (a Portion of Portion 67) of Witfontein 15 IR, has been proposed for a Licensing Hub to service the Tembisa Area. This division and incorporation of the zoning into the Ekurhuleni Town Planning Scheme, 2014 will drive governments mandate to take services closer the people. The portion is currently zoned "Roads", thus the rezoning of the proposed Portion 137 is necessary to enable the portion to be utilised for its intended use. The section of the site which is to be rezoned to "Social Services" is not required for the future K60.

5.2 DESIRABILITY

As part of the motivating memorandum, it is important to investigate the compliance of the application with the Town Planning Policies that apply in the area. This will also prove that the proposed use is desirable and won't have any undesirable effects on the surrounding area. The applications desirability will be assessed in terms of the land development policy of the **Ekurhuleni Metropolitan Regional Spatial Development Framework (2011)**.

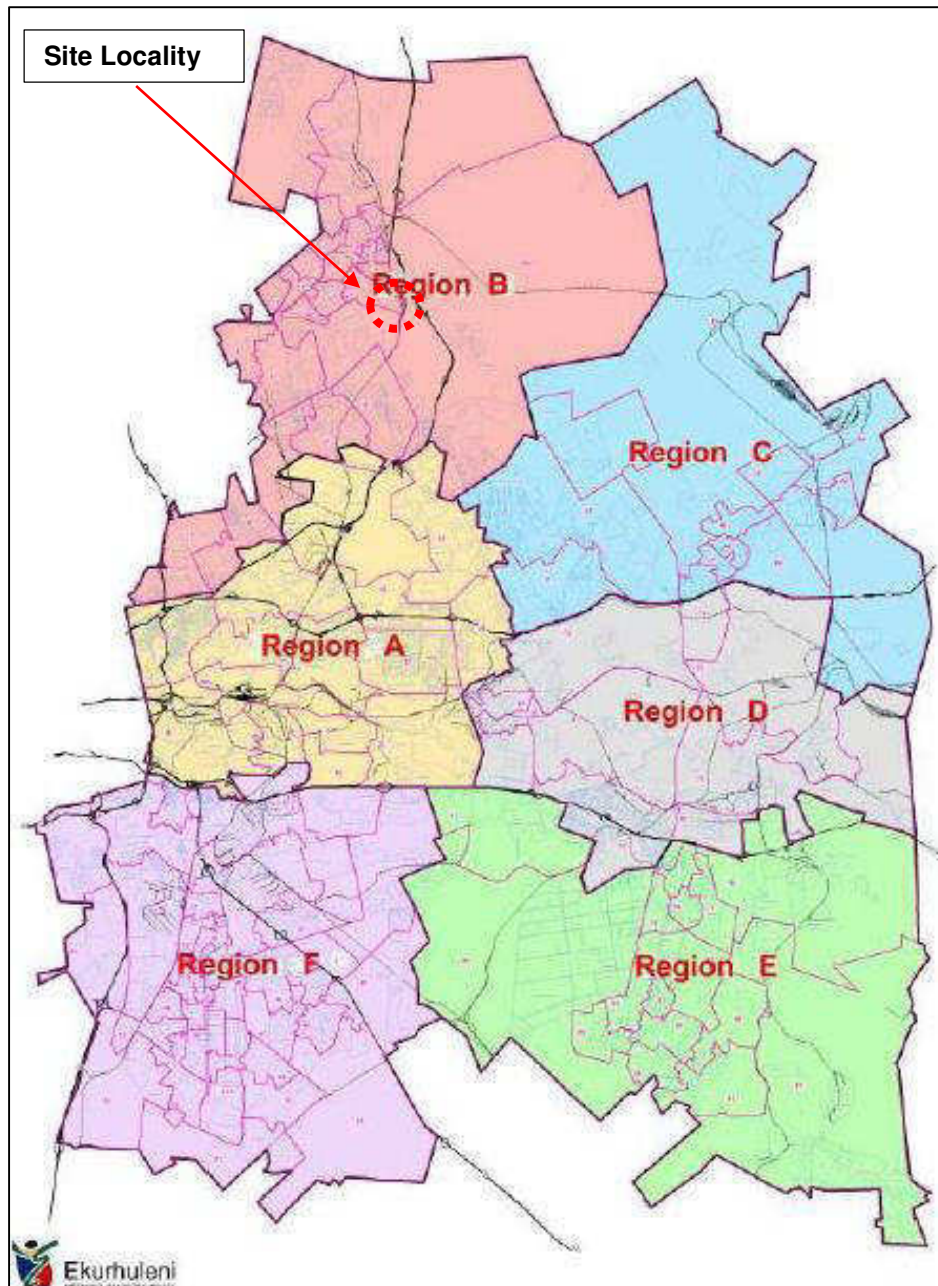
***Note:** The **Regional Spatial Development Framework** for Ekurhuleni Metropolitan is currently under review. Thus, the **Metropolitan Spatial Development Framework (2011)** will be used to motivate the desirability of the proposed division of land and incorporated zoning.

5.2.1 Ekurhuleni Metropolitan Spatial Development Framework (MSDF): 2011

In terms of the Ekurhuleni Metropolitan Municipalities Spatial Development Framework, the proposed division of land is located in **Administrative Region B**. An excerpt is taken from the Ekurhuleni MSDF for Region B below:



Figure 6: Regions within the Ekurhuleni Metropolitan Municipality



REGION B

'This is the north–west region (see Figure 6) and it comprises the area which was part of the Khayalami metro. The region is the only area that went through the first and second phases of local government transition and if well supported should develop critical mass on the basis of the economy of the region. This critical mass can be attained and built on the backbone of the industrial developments in Clayville, the proposals for the development of Albertina Sisulu (R21) Corridor, as well as the high income areas of Midstream, Serengeti and Edenvale town as well as the northern areas of Kempton Park. The critical mass should assist in the planning and urban management proposed for focus in Tembisa in terms of the Tembisa Masterplan as pronounced by the Premier in the Gauteng State of the Province address of 2011. The residents of this region also benefit from the developments taking place in the adjoining metros of Johannesburg and Tshwane and alignment is very important.'



The MSDF (2011), sets out a planning approach for the Ekurhuleni Metropolitan, the relevant points for effective planning of the region will be discussed in more detail below:

- **An Effective Response to Rural Poverty**

The proposed Licensing Hub, which will service Tembisa and the surrounds, will alleviate the pressure on surrounding Licensing Hubs. Also, the focused investment will ensure that the Critical Masses, spoken of within the MSDF (2011), will be accommodated and receive efficient and effective licensing services.

- **Linking disadvantaged communities to the Core Area**

The subject site is bordered by the outer suburbs of Tembisa - one of the identified disadvantaged communities within the Ekurhuleni Metropolitan earmarked for various economic and social upliftment projects. Additionally, the subject site is located within an area that is reserved for future industrial expansion and growth. With a subsequently increased workforce, there will be an increased need for governmental services that will maintain this community. The proposed Tembisa Licensing Hub will provide a required government service near the Clayville/Olifantsfontein Industrial Zone, where employment generation and subsequently population densities are high.

- **Protecting existing industrial areas from the potential adverse effects of informal settlements located in close proximity thereof.**

The industrial areas of Ekurhuleni, generate the bulk of employment and economic activity in Ekurhuleni. These areas should, therefore, be protected from potential negative influences such as informal settlements established near the industrial zones. The available land should then be developed, ideally, as social services. The subject property is located in the vicinity of the Clayville Industrial Hub and the Tembisa Informal Township. Thus, the land could be at risk of further invasion from informal settlers. It can then be concluded, that it would be a matter of urgency and prove desirable that the land be divided for development.

- **Tightening and enforcing the Urban Edge**

The MSDF determines a more accurate and better defined urban edge so as to exclude as much land as possible. A tighter urban edge increases development pressure on land within the edge, such as that of the subject site, resulting in speeding the process of infill development and optimal utilisation of resources. This would have positive spin-offs relating to increasing service delivery of the Ekurhuleni Metropolitan Municipality.

- **Services and Infrastructure**

It is critical that the services, infrastructure and high levels of access be maintained to ensure that this identified development area can maximise its economic potential. It is also noted that Region B has existing high levels of services and infrastructure in the following manner:

Roads

- The site is situated on Sam Molele Drive; the site will gain access via a proposed access gate off Sam Molele Drive and not affect any traffic directly off the said Drive.
- The site falls between two main freeways: The N1 and the R21. As the site is in close proximity to the R21, accessibility is maximised to the proposed Tembisa licensing hub.

Water

- The majority of the region is well serviced by water infrastructure.

Waste Management

- The developed areas are served by a formal waste collection service.
- Street clearing within the economic nodes is of an adequate standard.
- The Interwaste Landfill Site services the region.

Electricity

- City Power and Eskom are the suppliers of electricity to the region.

Stormwater

- The region does not have constraints in relation to stormwater.

It is clear from the above that there is an adequate supply of services and maintenance of infrastructure that will not negatively impact on future development of the site, after the division.

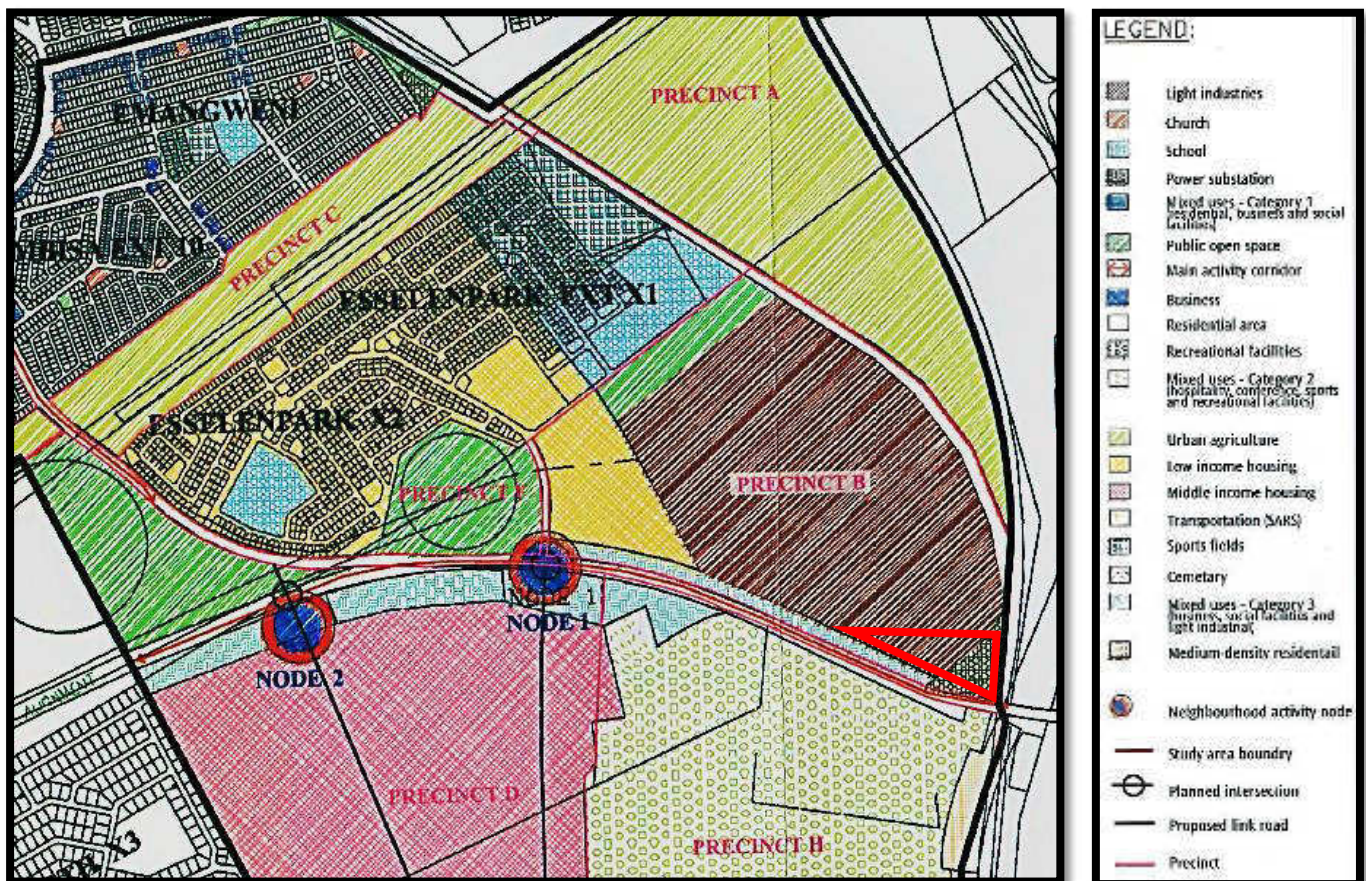


The adequacy of infrastructure and services will, therefore, allow the expansion of the existing industrial node for development. The provision of the licensing hub would be highly beneficial to this expanding and highly accessible node.

5.2.2 Esselen Park Local Integrated Development Plan

The Esselen Park Local Integrated Development Plan is an enabling framework based on current, desired and anticipated development trends, existing constraints and development opportunities. The main purpose of the plan is to guide public investments, which will set the context for private development initiatives. An extract from the Esselen Park Local Integrated Development Plan can be seen below:

Figure 7: Extract from the Esselen Park LIDP



SAM MOLELE DRIVE

‘A strip including business, social facilities and light industrial development should be permitted along this corridor. The business uses envisaged in this area are filling stations, offices, and retail and entertainment facilities. Most of these businesses are geared towards the needs of local residents, residents of Tembisa, and passing traffic.’

The proposed division of Portion 67 of Witfontein 15 IR for the proposed Tembisa Licensing Hub will fall within Precinct B of the LSDF. Precinct B has been earmarked for light industrial use.

Due to the nature of a License testing station, it can be said that the proposed use will integrate into the light industrial proposition. In addition to this, the LSDF outlines that Sam Molele Drive should accommodate a strip of business, social facilities and light industrial uses. The



proposed Tembisa Licensing hub could be partly considered as a light industrial use as well as a Social Facility. It can then be said that the proposed facility is not in contradiction with the LSDF for Esselen Park and will further advance the objectives of the Plan, to ensure the needs of local residents are met within the Local Area.

5.2.3 Division of the Land

The proposed Portion 137 of the land was divided in a way that would not affect any of the physical or legal barriers attributed to the property.

The cadastral boundary for the northern and western side of the proposed Portion 137 is created by the proposed roads that will provide access to the site. The southern boundary is informed by the proposed expanded Sam Molele Drive and the eastern boundary by the original farm portion boundary.

6 SUMMARY AND CONCLUSION

The memorandum has provided all vital information regarding the current status of the site, zoning and legal documentation. In the light of the motivation offered in this report, the application for Division of Portion 67 of the Farm Witfontein No 15 IR in terms of Section 6 (1)(b) of the Division of Land Ordinance, 1986 (Ordinance 20 of 1986) into 2 portions (Portion 137 and RE of Portion 67) as well as the incorporation of Portion 137 into the Ekurhuleni Town Planning Scheme, 2014 in terms of Section 125 (1)(e) of the Town Planning and Townships Ordinance, 1986 (Ordinance 15 of 1986) is desirable and can be supported based on the following:

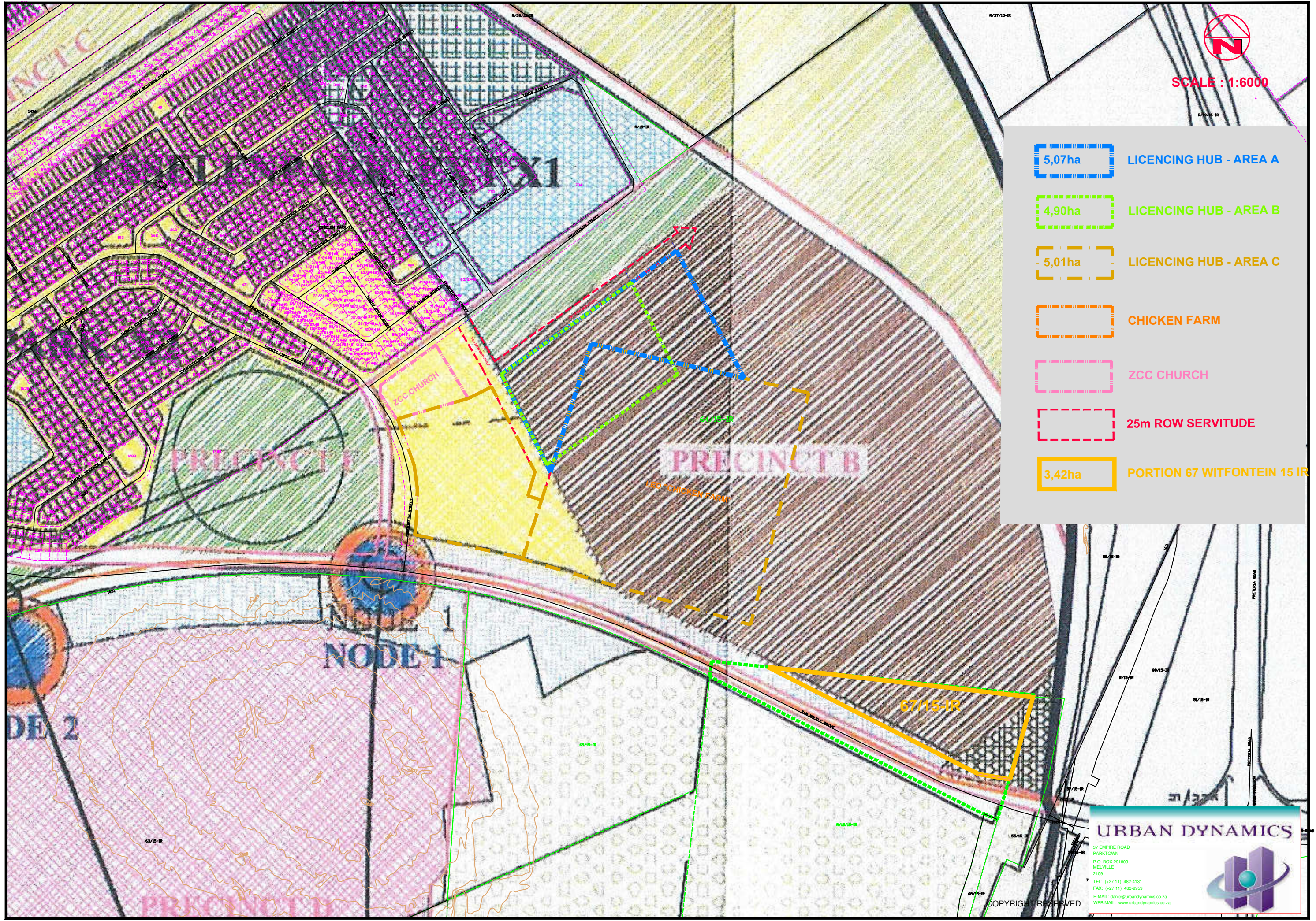
- The proposed division is in accordance with the Ekurhuleni Metropolitan Spatial Development Framework of 2011
- There are no legal or technical impediments to the division
- Bulk services are already in place on/bordering the property and can be made available for the Tembisa Licencing Hub
- The proposed division can be considered as necessary and desirable from a town planning point of view
- The proposed division will promote the provision of an essential governmental service and alleviate the pressure on surrounding Licensing Hubs.

It can, therefore, be concluded that this application is desirable and that it will be in the interest of the broader public. The favourable consideration of this division of land application is therefore respectfully requested.



SCALE : 1:6000

- 5,07ha LICENCING HUB - AREA A
- 4,90ha LICENCING HUB - AREA B
- 5,01ha LICENCING HUB - AREA C
- CHICKEN FARM
- ZCC CHURCH
- 25m ROW SERVITUDE
- 3,42ha PORTION 67 WITFONTEIN 15 IR



URBAN DYNAMICS

37 EMPIRE ROAD
 PARKTOWN
 P.O. BOX 291803
 MELVILLE
 2109
 TEL: (+27 11) 482-4131
 FAX: (+27 11) 482-9959
 E-MAIL: danie@urbandynamics.co.za
 WEB MAIL: www.urbandynamics.co.za



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Services Report



Appendix G8

Portion 67 of Witfontein 15IR: Tembisa Licensing Hub

CIVIL ENGINEERING SERVICES OUTLINE SCHEME REPORT

June 2015

Draft 1-1

PREPARED BY:

Gant Project Management
Consulting Engineers
PO Box 81317
Parkhurst
2120
Contact J.P.L. Cloete Pr. Eng
Tel: 011 792 2359
Fax: 086 552 6086
E-mail: pieter@gant.co.za

JHB Office

Bush Hill Office Park, Unit 2, Ostrich Street, Bromhof, 2154
P.O. Box 81317, Parkhurst, 2120
T: 011 792 2359 F: 086 552 6086

CPT Office

Unit 10, The Village Place, 3 Erica Road, Kommetjie, 7975
P.O. Box 48425, Kommetjie, 7976
T: 021 783 5720

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APPENDICES

APPENDIX A1	Locality Plan
APPENDIX A2	Draft Site Development Plan
APPENDIX B1	Dolomite Stability and Soils Investigation Report
APPENDIX B2	Geotechnical Investigation Report
APPENDIX C	Proposed Sewer Layout
APPENDIX D	Proposed Water Layout
APPENDIX E1	Proposed Storm Water Management report
APPENDIX E2	Proposed Storm Water Layout
APPENDIX E3	Proposed Storm Water Attenuation pond
APPENDIX F	Typical Dry-Well Pump Station
APPENDIX G	Traffic Impact Study Report

1. APPOINTMENT AND TERMS OF REFERENCE

Gant Project Management (Pty) Ltd, Consulting Engineers, was appointed by the Ekurhuleni Metropolitan Municipality for the Engineering Design of Civil Services (Water, Sanitation, and Storm water) for the proposed new Licensing Hub, situated on Portion 67 of the Farm Witfontein 151R.

The project is in line with the Integrated Development Plan and EMM's objective of establishing Motor Vehicle Registration Authority (MVRA) and facilities and Drivers Licensing Testing Centre (DLTC) throughout the EMM.

The land is currently zoned as agricultural land and is currently vacant. There are no engineering services (water, sewer and storm water) in the close vicinity of the site. The area of the proposed new Licensing Hub site is 3.5762ha. The following proposed site development controls will be applied for:

- Zoning: Social Services
- FAR: 0.1
- Coverage: 20%
- Building height: 2 storeys

2. SITE LOCALITY AND DESCRIPTION

The site is currently described as Portion 67 of the Farm Witfontein 15IR. The site is situated on the northern boundary of Sam Molele Drive north of Esselen Park and is on the west of the railway at the intersection of Pretoria Road and Sam Molele Drive. The site is nearly triangular in shape and it is 3.2 ha.

The site is currently vacant and it is covered with grass, weeds and trees. There is no clearly defined water course on the site. The site has a fairly flat natural fall towards eastern direction with a gradient approximately 1-2%.

Please refer to Appendix A1 of this report for a Locality Plan.

Please refer to Appendix A2 of this report for a draft Site Development Plan.

3. GEOLOGY

Blue Rain Consultants was appointed by EMM to carry out a dolomite stability study and soils investigation for the proposed Licensing Hub site. Please refer to Annexure B of this report for the dolomite stability and soils investigation report.

From the report, it was confirmed that the site is underlain by chert-rich dolomite of the Monte Christo Formation of Malmani Subgroup of the Chuniespoort Group. The dolomite rocks are covered by layers of collapsible/compressible hillwash/colluvium.

It was found that the site generally constitutes Risk Class 1/3/4 (NHBRC Class D3). This classification indicates that there is a low to medium risk for the development of small to medium sized sinkholes and doline formation in both a non-dewatering and dewatering scenario.

The report concluded that the properties of the blanketing layer within the site is fairly competent and that it is suitable for the proposed Licensing Hub development provided that the stringent water precautionary measures are implemented according to PW 344 for D3 classification and SANS 1936-2.

The site has an average slope of 1-2% and it is most likely that there will be no significant bulk earthworks needed.

Standard precautionary measures regarding wet services specifications and storm water management for dolomite areas designated as Risk Class 3 and 5 (NHBRC Class D3) will be adhered to.

All water, sewer and storm water pipe materials will be of HDPE quality materials and with flexible joints to be used to account for the dolomitic nature of the site soil. Furthermore, the storm water attenuation pond will be concrete lined to control the seepage of stored water into the ground

Wet services specifications to account for dolomitic nature of underlying soil

- All water and sewer system materials will be of HDPE quality materials and with flexible joints to be used.
- No plumbing and drainage pipes shall be placed under the floor slabs.
- Rodding eyes will be provided on the sewer line.
- Pressure leaking system will flow directly into the sewer system.

Storm water management precautionary measures to account for dolomitic nature of underlying soil.

- The entire development should be landscaped to facilitate good drainage and prevent the ponding of surface water against structures. All water courses and road surfaces shall be sealed and rendered impervious.
- The site should be inspected immediately after a heavy downpour to assess the drainage of the site. If ponding is visible it should be noted and be corrected as soon as possible to prevent any ponding in the future. Ponding should be prevented at all times.
- A minimum gradient of 1:15 should be maintained along site storm water systems.
- Down pipe guttering should be discharged into a pre-cast furrow, which will remove the water from the structure on a sealed surface.
- Paving immediately against the buildings, should be shaped to fall in excess of 75mm over the first 1,0m beyond the perimeter of the building.

4. SANITATION SERVICES (Waterborne Sanitation Guide, 2011)

The site of the proposed Licensing Hub is not connected to an existing waterborne sewage network. The proposed sewer connection point is situated at the corner of Eighteenth Street and Fourteenth Street of Esselen Park Ext 1. This proposed connection point is approximately 6 metres above the site's lowest point. A pump station will be required on site to transfer the sewerage to the connection point.

A new 160mm diameter sewage pipe will be suitable for this development, which will be constructed to link the proposed Licensing Hub to the existing municipal sewage network located along Fourteenth Street of Esselen Park Ext 1. The sewage pipe that runs along Fourteenth Street is 1000mm in diameter according to EMM's GIS portal and the correctness of this will have to be confirmed from the respective As-Built drawings.

The internal reticulation of the proposed Tembisa Licensing Hub will be constructed to the details of the appointed civil engineer and to EMM's standards.

Sewer flow for the proposed Licensing Hub site was determined using the following formulae:

Sewer discharge calculation:

- Design Flow:
 - General Business with an FSR (per 100m²)
 - 0.8 kl/unit/day - as per Waterborne Sanitation Design Guide Table 3.5 (WRC, 2003)
 - Floor area to be developed is 3 600 m²
 - Equivalent 100 m² units = 36
 - 36 x 800 = 28 800 l/day
 - 28 800 l/day = 0.333 l/s
 - Allow 15% for extraneous flow
 - $0.333 \times 1.15 = 0.383$ l/s
 - Peak Factor = 2.5
 - Peak Flow
 - $0.383 \times 2.5 = 0.958$ l/s
 - Adjust peak flow to 80% of water demand as calculated below
 - Adjusted Peak design flow = 80% x 0.667 l/s = 0.533 l/s < 0.958 l/s
 - Sewer flow cannot be greater than water supply, therefore, let the peak sewer discharge = peak water demand = 0.533 l/s.
 - Assume that average sewer flow = average water demand.
 - Average sewer flow = 0.167 l/s.
 - Allow 15% for extraneous flow
 - Adjusted Average sewer flow = $0.167 \times 1.15 = 0.192$ l/s.

External Services

An existing 1000mm diameter (size still to be confirmed from As-Built drawings) sewer is located on Fourteenth Street. The additional flow generated by the proposed Licensing Hub has an adjusted peak flow of 0.533 l/s which will have a minimal effect on the existing sewer network and the capacity of the existing pipe which this will connect to.

A 160mm diameter HDPE pipe will be sufficient to carry the sewerage at the flow rate calculated above.

Refer to the attached Appendix C for the proposed sewer connection and internal sewer layout. All sewer mains and manholes are to be constructed to EMM specification and standard details.

Pump Station

There will be a pump station on site to transfer sewerage to the existing municipal sewer network. The pump station is positioned at the lower side of the site (north eastern corner) to allow drainage of at least 80% of the whole site. A dry well pump station was considered feasible for the proposed Tembisa Licensing Hub

development because of its ease of maintenance and its ease of operation. The wet well volume was designed to limit the number of pumping cycles (pump “on” and “off”) to four times per hour during peak hours.

- Peak Sewer flow into wet well per hour = $0.533 \text{ l/s} \times 3600 \text{ s} = 1918.8 \text{ l} = 1.92\text{m}^3$.
- For design, use wet well volume of 2 m^3 .

There will be an emergency tank to store sewerage during times when the pump is not operational due to power failure or maintenance. The capacity of the emergency tank was designed to take 48 hours of sewerage at the average flow rate when the pump is not operational.

- The average sewer flow $0.192 \text{ l/s} \times 3600\text{s} \times 48 = 33178 \text{ l} = 33.2 \text{ m}^3$.
- For design, use emergency storage volume of 34m^3 .

Dry-well pump station and Emergency storage design

Sewerage flows into the wet-well from the gravity pipeline. The wet-well and dry-well are separated by a concrete wall. A pump sits on the dry-well and is connected to the wet-well with a suction pipe. When a certain sewerage level is reached in the wet-well, the pump starts running and pumps the sewer out to the rising main. When the pump fails or stops working, the wet-well will fill up and overflows into the emergency storage through the overflow weir. When the pump is repaired and resumes working, the valve located at the base of the emergency storage is opened to allow the sewerage to flow into the wet-well and then pumped out. Alternatively, the sewerage in the emergency storage can be collected (pumped out) through the access manhole. The benching on the emergency storage allows the sewerage to flow into the wet-well freely. Please refer to Appendix F for the typical layout of a dry-well pump station.

5. WATER SERVICES

The closest existing potable water service for the site is available at Eighteenth Street in Esselen Park Ext 1. The existing service is an existing 100mm class 16 uPVC pipe (size still to be confirmed from As-Built drawings) that on the northern side of Eighteenth Street.

Water Demand Calculations

- Water Demand:
 - Government and Municipal – demand per 100m^2 of gross floor area
 - 400 l/unit/day (as per Guidelines for Human Settlement Planning and Design Table 9.14)
 - Gross floor area to be developed is $3\,600 \text{ m}^2$
 - Equivalent 100 m^2 units = 36
 - $36 \times 400 = 14\,400 \text{ l/day}$
 - $14\,400 \text{ l/day} = 0.167 \text{ l/s}$
 - Peak Factor = 4
 - $0.167 \times 4 = 0.667 \text{ l/s}$

- Fire Fighting
 - A fire risk assessment will have to be carried out by a specialist along with a suitable reticulation for the approval of the local authority for a zoning specifically assigned for the development to comply with SANS 10400 and SANS 090. Pressure test will need to be undertaken at the time of the detail design to confirm the pressure in the system and if a booster will be required.

The internal water network will consist of a 110mm diameter HDPE “bulk internal water” system which will serve both domestic and firefighting requirements.

We recommend that this pipeline be a 110mm diameter and of made of HDPE pipes to account for the dolomitic nature of the soil.

External Services

The existing municipal water network for the site is available at the intersection of Nineteenth Street and Eighteenth Street. It is proposed that a new 110mm diameter class 16 HDPE pipe be constructed from the site’s west boundary up to the connection point in Eighteenth Street.

Once the Outline services report has been approved by EMM, detailed design drawings will be prepared for the approval of the new water pipe and water connection (and water meter) to service the site. The size of the water connection is to be 110mm diameter.

Please refer to Appendix D for the proposed water reticulation layout for the proposed development.

6. STORM WATER EVALUATION

The site drains towards the railway line on the east boundary of the site with the lowest point lying between the substation and Sam Molele Drive. The storm water from the Licensing Hub site will be directed to an existing storm water culvert which lies adjacent to the rail way and north of the bridge on Sam Molele Drive. The culvert is blocked and will be cleaned to allow the passage of storm water.

Storm water runoff calculations were carried out and compiled an “Internal Storm Water Management Report” for the proposed Licensing Hub. It was found that the pre-development flood peaks are as follows:

Rational method:

- Pre-development (1:5 year) 0.0449 m³/s
- Pre-development (1:25 year) 0.1135 m³/s

Kinetic wave equation:

- Pre-development (1:5 year) 0.0720 m³/s

- Pre-development (1:25 year) 0.1954 m³/s

With the proposed development the calculated runoff was based on the following

- 40% Landscaping
- 5% Building Coverage
- 55% Roads/paving

This report addresses the storm water management of the development proposed for the site. The main concern is the increase of flood discharge by the development due to increase of impervious surfaces which reduces infiltration and increases runoff. The objective was to manage the peak discharge from the developed site for the 1:5 year Return Interval (RI), as well as the 1:25 year RI. It is required to reduce the post development runoff so that it does not increase the load on the existing municipal storm water system. A storm water attenuation pond was proposed to control the outflow from the Licensing Hub development site.

The storm water attenuation pond model comprises a 2.2m deep 580m² pond, a 125mm diameter outlet pipe and a weir at 1.6m above the pond base. The weir operates during high flows. From the results tabulated below, it can be seen that the storm water control model effectively attenuates the storm water to peak flows that are slightly less than the pre development peak flows.

The results of the storm water modeling are as follows:

Tembisa Licensing Hub site			
Flood Return Period	Pre-development flood peak (m ³ /s)	Post-development flood peak (m ³ /s)	Attenuated Flood peak (m ³)
5 Years	0,0449m ³ /s	0,039m ³ /s	842 m ³
25 Years	0,1135m ³ /s	0,113m ³ /s	1204 m ³

Please refer to Appendix E1 for the storm water report, Appendix E2 for the storm water layout and Appendix E3 for the attenuation dam layout.

The entire development will be landscaped to facilitate good drainage and prevent the ponding of surface water against structures. All water courses and road surfaces shall be sealed and rendered impervious.

A new 450mm dia, class 4 HDPE pipe will connect the storm water outflow from the attenuation to the existing 900mm dia concrete pipe at the railway line as indicated in Appendix E2

7. TRAFFIC IMPACT STUDY

Corli Havenga Transportation Engineers was appointed as the traffic engineer. The traffic Engineer carried out a traffic impact study for the proposed Tembisa Licensing Hub site. Refer to Appendix G for the draft traffic impact study report.

From the report, it was confirmed that:

- There is a future provincial road K60 that will run on the alignment of Sam Molele Drive. A section 7 report need therefore be submitted to Gautrans in terms of the Infrastructure Act
- In terms of provincial access policy, an access off a provincial road should serve the area and not only an individual development. The proposed access off Sam Molele Drive should therefore be constructed in such a way to provide access to the remaining land north of Sam Molele Drive.
- The proposed access road to the proposed Licencing Hub off Sam Molele Drive is directly opposite the Esselen Park Sports complex's approved access. This access is about 800m from the bridge on Sam Molele Drive and about 730m from Ninetheenth Street. Refer to Annexure C of Appendix G for layout of the proposed access road.
- A proposed access off the new access road is required to be at least 100m from the proposed road reserve of the future K60 (the existing Sam Molele Drive will become the southern lane of the future dual carriage-way).
- The demand does not warrant the provision of public transport facilities at this stage.

The proposed road improvements to account for the new Licensing Hub development are listed below. The final design will be determined after consultation with Gautrans and the approval of the section 7 report that is to be submitted to Guatrans and may be significantly different than the proposed minimum requirements as set out below and as being proposed to Gautrans:

- Stop control on access road;
- 60m right turn lane on eastern approach; and
- 60m left turn lane on western approach.

Refer to section 8 of Appendix G for the layout of the proposed intersection of Sam Molele Drive and the proposed access road.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. Dolomite Stability

- The site generally constitutes Risk Class 1/3/4 (NHBRC Class D3). A low to medium risk exists for small to medium size sinkhole formation in a non-dewatering and dewatering scenario for the site. A medium to high risk exists for doline formation, particularly with ingress of surface water.
- Standard precautionary measures regarding wet services specifications and storm water management for dolomite areas designated as Risk Class 3 and 5 (NHBRC Class D3) will be adhered to.

8.2. Sewer connection and internal sewer system

- The proposed sewer connection will be made at the corner of Eighteenth Street and Fourteenth Street in Esselen Park Ext 1. An alternative connection point is at the corner of Nineteenth Street and Eighteenth Street.
- All sewer system materials will be of HDPE quality materials and with flexible joints to be used.
- A dry-well pump station will be installed on site to get the sewerage through the rising main into the existing municipal sewer network. A 34 m³ emergency storage will be constructed together with the wet-well.

8.3. Water connection and internal water system

- The proposed water connection will be made at Eighteenth Street in Esselen Park Ext 1.
- All water system materials will be of HDPE quality materials and with flexible joints to be used.

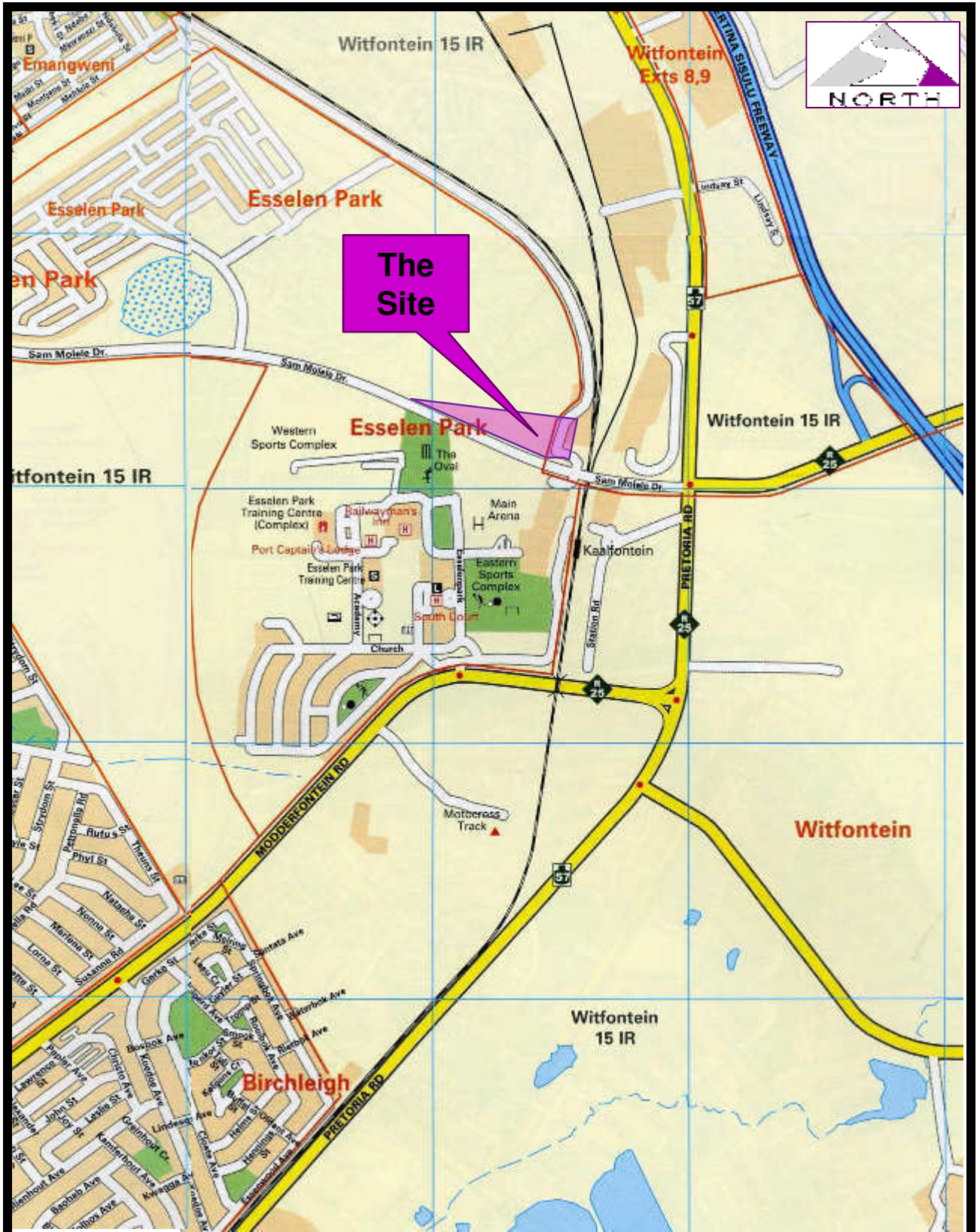
8.4. Storm water management

- An attenuation pond of 580m² and 2.2m in depth will be constructed at the north eastern corner of the site. This pond is sufficient in reducing the post development out flow to below the pre development flow. A 450mm diameter HDPE pipe connects the attenuation pond to an existing storm water culvert near the bridge in Sam Molele Road.

8.5. Traffic Engineering

- The proposed access road off Sam Molele Drive is directly opposite the Esselen Park Sports complex's approved access.
- The proposed minimum upgrades at intersection of Sam Molele Drive and the proposed access road are as follows (this must however still be confirmed by Gautrans):
 - Stop control on access road;
 - 60m right turn lane on eastern approach; and
 - 60m left turn lane on western approach.

APPENDIX A1 - Locality Plan



**TRAFFIC IMPACT STUDY
PORTION 67 OF FARM WITFONTEIN NO. 15 IR**

FIGURE 1: SITE LOCATION PLAN

SCALE : N/A

PP21125

APPENDIX A2 – Draft Site Development Plan

APPENDIX B1 - Dolomite Stability and soils investigation report

APPENDIX B2 – Geotechnical investigation report

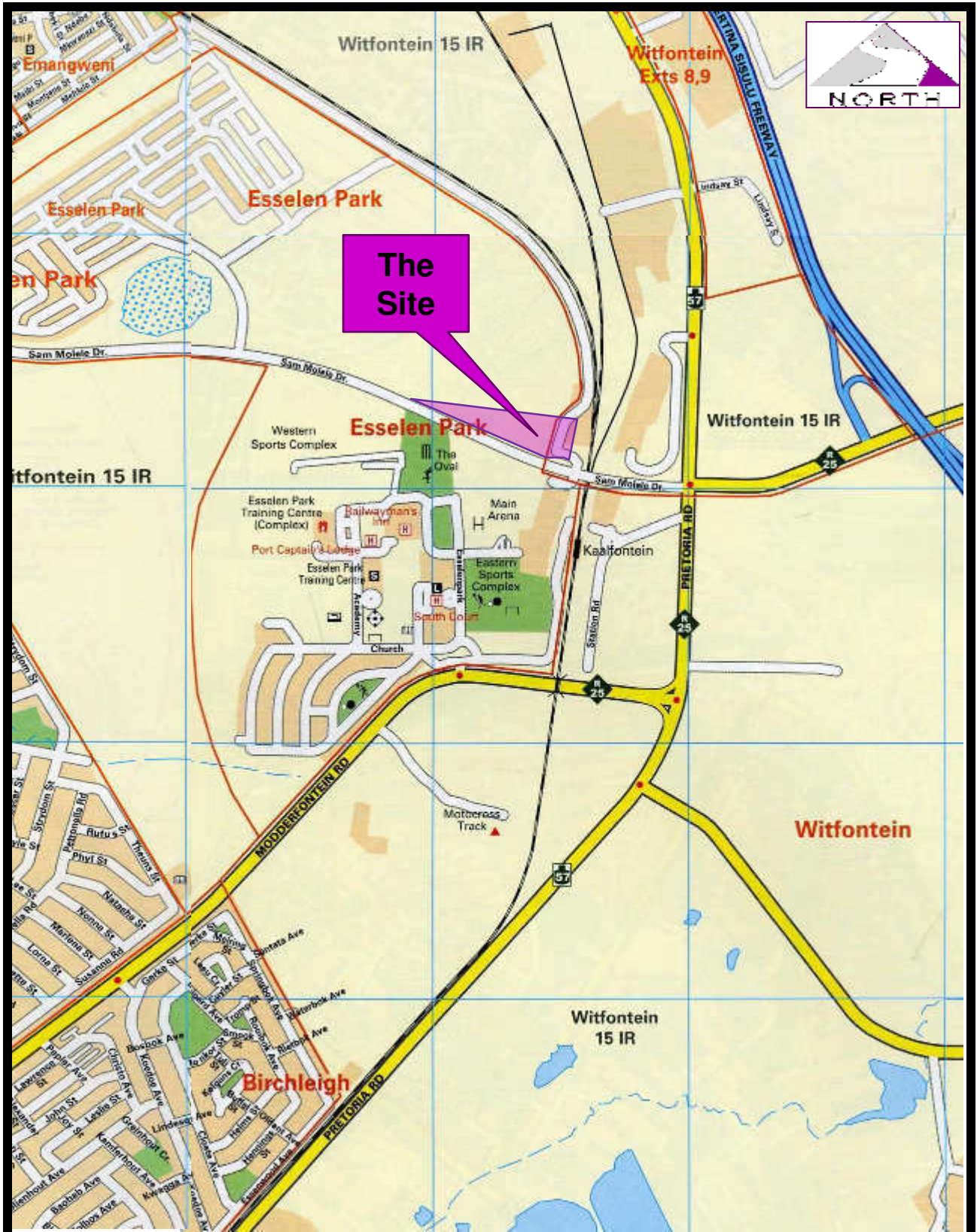
APPENDIX C - Proposed Sewer Layout

APPENDIX D - Proposed Water Layout

APPENDIX E - Internal Storm Water Management Plan

APPENDIX F – Typical Wet-Well Pump Station with an emergency storage

ANNEXURE A

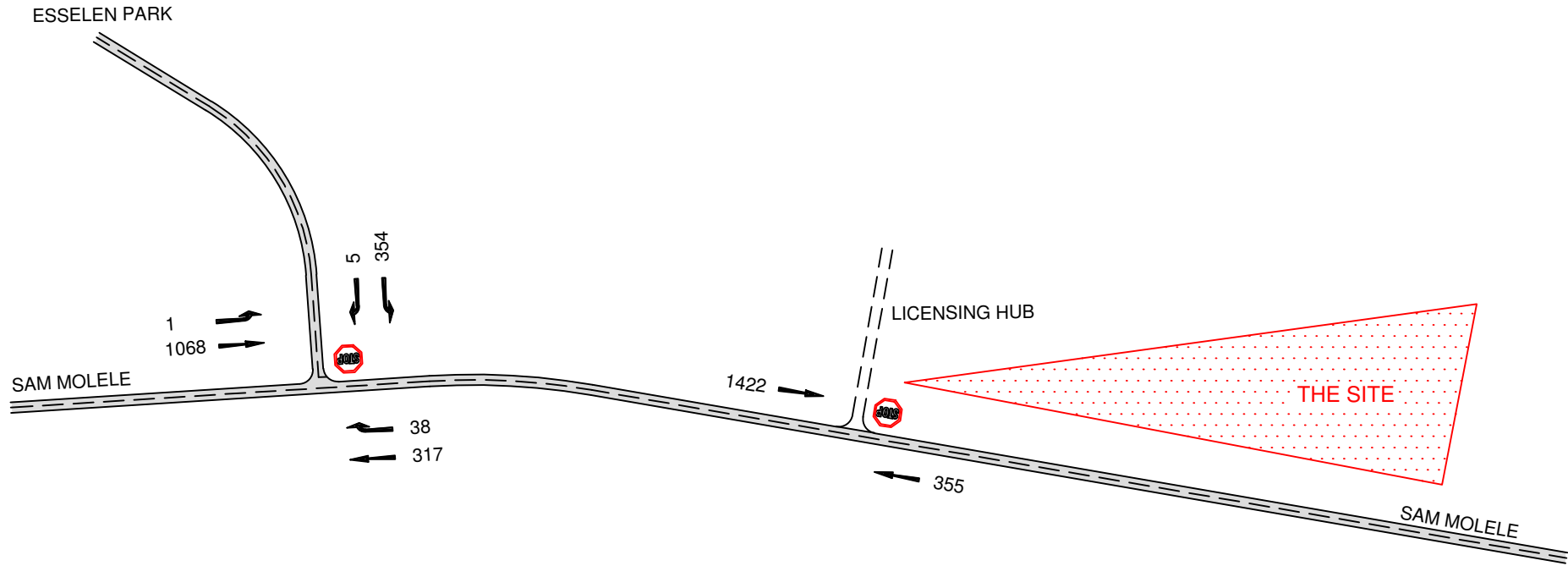


**TRAFFIC IMPACT STUDY
PORTION 67 OF FARM WITFONTEIN NO. 15 IR**

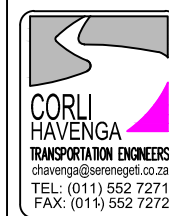
FIGURE 1: SITE LOCATION PLAN

SCALE : N/A

PP21125



NOTES:
7
FIGURES DEPICT ALL VEHICLES
7 - WEEKDAY A.M. PEAK HOUR TRAFFIC FLOW



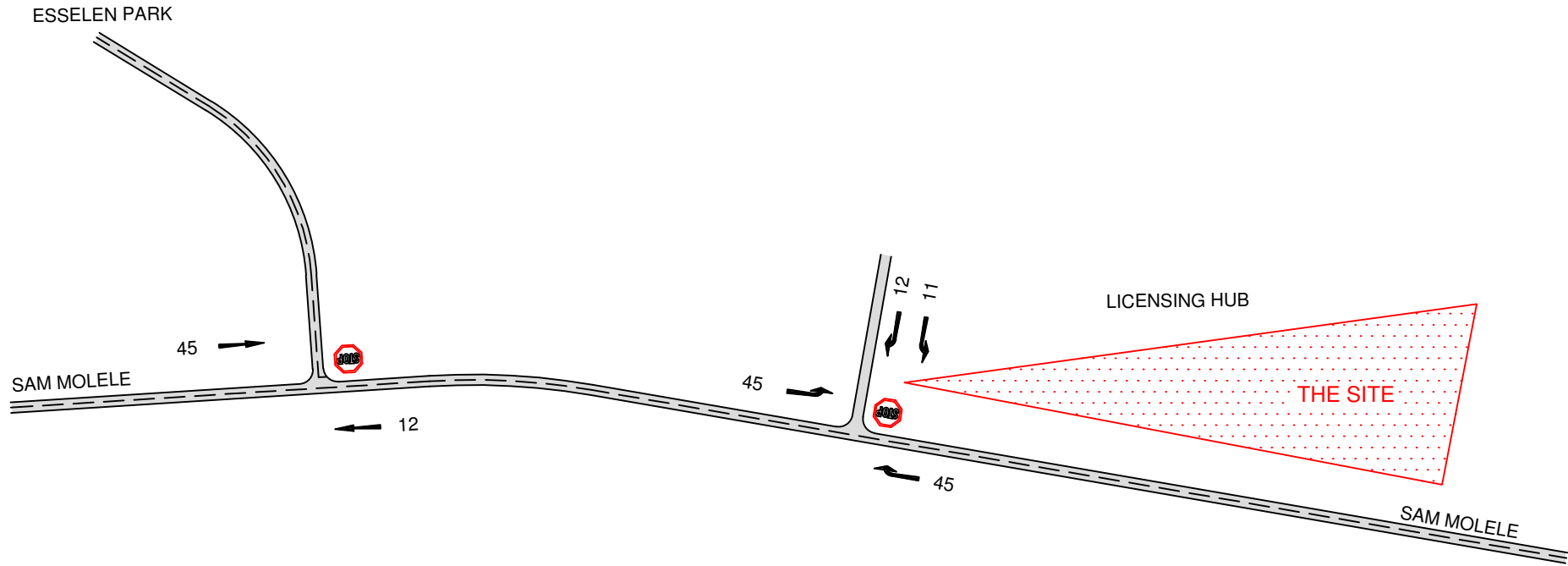
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GANT PROJECT MANAGEMENT (PTY) LTD.

TITLE:
TRAFFIC IMPACT STUDY
EMM LICENSING HUB

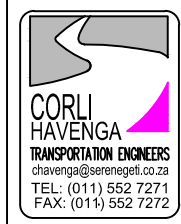
EXISTING PEAK HOUR
TRAFFIC DEMAND
SCENARIO 1

SCALE: NA PP21125

FIGURE: 2



NOTES:
7
FIGURES DEPICT ALL VEHICLES
7 - WEEKDAY A.M. PEAK HOUR TRAFFIC FLOW



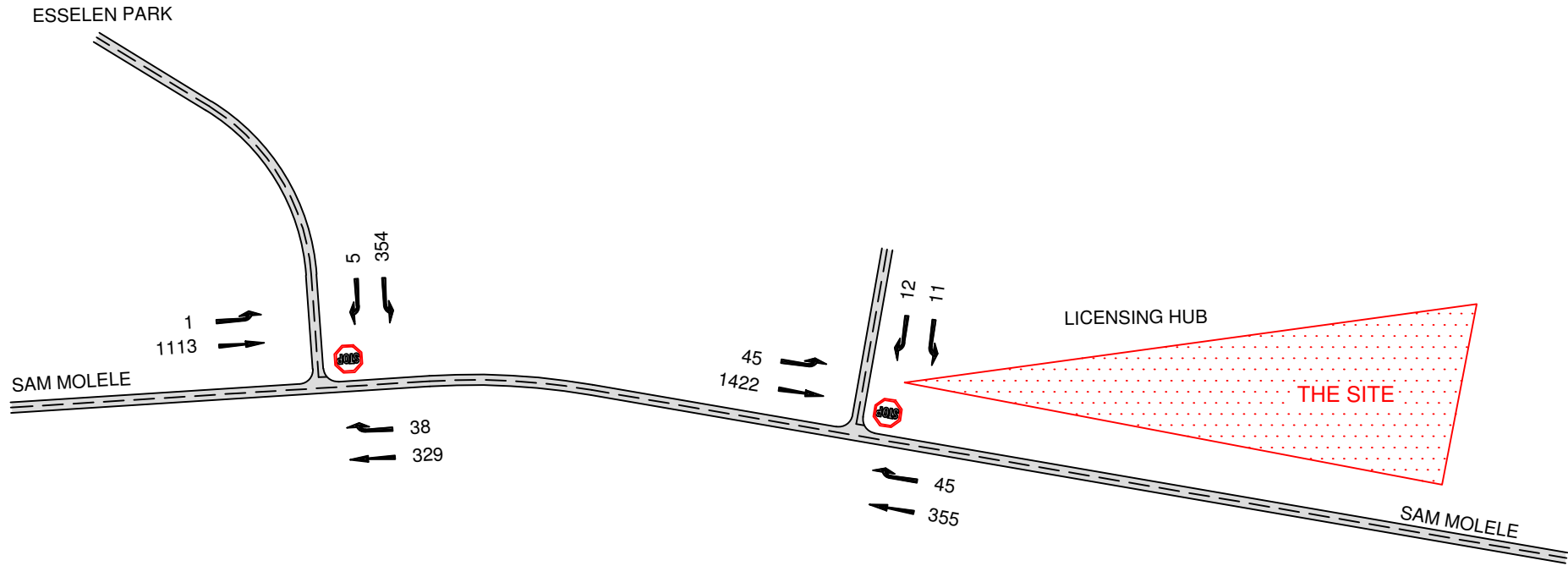
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TITLE:
TRAFFIC IMPACT STUDY
EMM LICENSING HUB

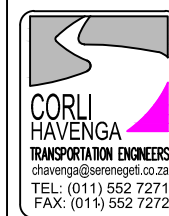
EXPECTED PEAK HOUR
TRIP ASSIGNMENT

SCALE: NA | PP21125

FIGURE: 3



NOTES:
7
FIGURES DEPICT ALL VEHICLES
7 - WEEKDAY A.M. PEAK HOUR TRAFFIC FLOW



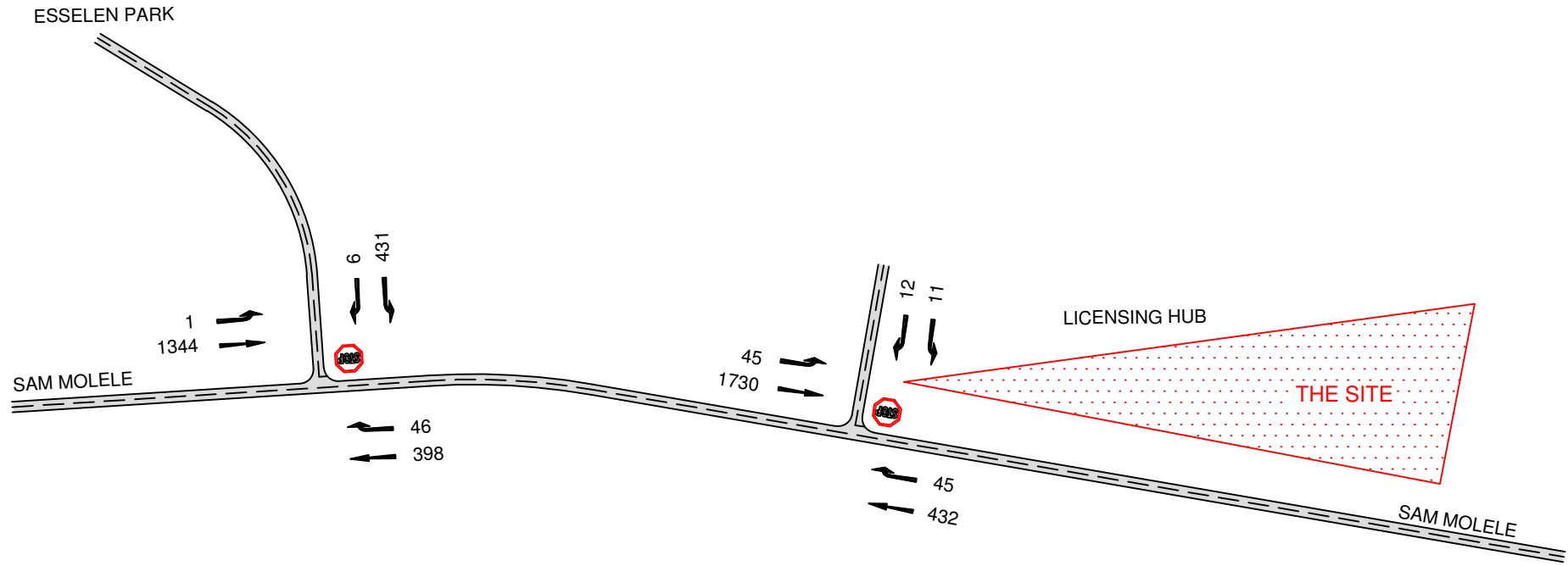
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TITLE:
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EMM LICENSING HUB

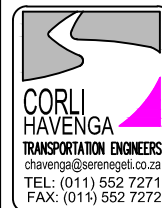
EXPECTED PEAK HOUR
TRAFFIC DEMAND
SCENARIO 2

SCALE: NA PP21125

FIGURE: 4



NOTES:
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 FIGURES DEPICT ALL VEHICLES
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CLIENT:
 GANT PROJECT MANAGEMENT (PTY) LTD.

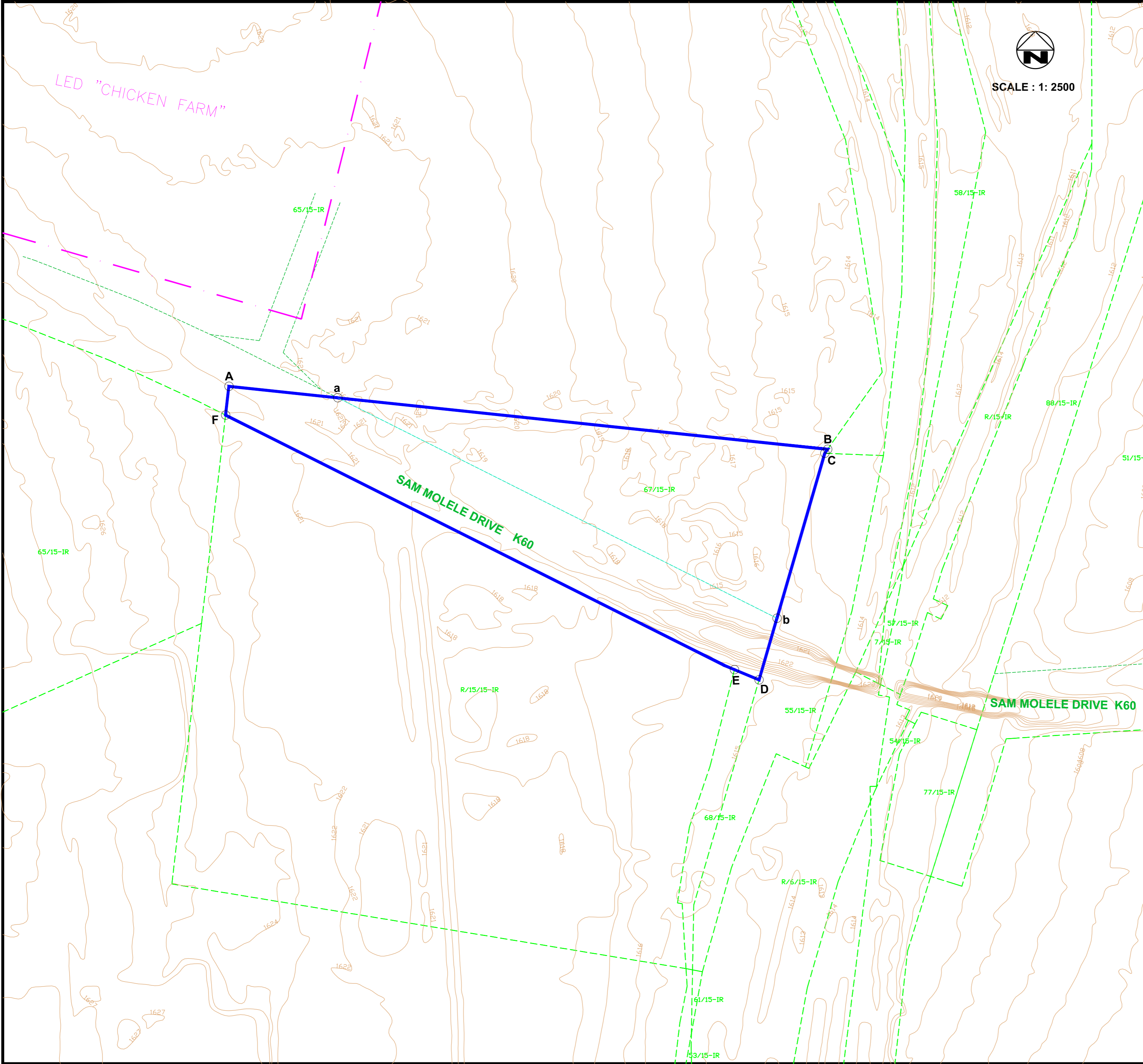
TITLE:
 TRAFFIC IMPACT STUDY
 EMM LICENSING HUB

EXPECTED PEAK HOUR
 TRAFFIC DEMAND
 SCENARIO 3

SCALE: NA | PP21125

FIGURE: 5

ANNEXURE B



PROPOSED DIVISION OF PORTION 67 OF THE FARM WITFONTEIN NO. 15 IR

- THE SITE
- PROPOSED DIVISION BOUNDARY

THE FIGURE ABCDEFA REPRESENTS PORTION 67 OF THE FARM WITFONTEIN NO. 15 IR MEASURING APPROXIMATELY 7,0938ha IN EXTENT WHICH IS PROPOSED TO BE DIVIDED INTO 2 PORTIONS AS DETAILED BELOW:

PROPOSED PORTION	FIGURE	SIZE (ha)	PROPOSED USE/ZONING
RE / 67	AabDEFA	3,3136ha	K60 PROVINCIAL RD
1 / 67	aBCba	3,7802ha	MUNICIPAL LICENCING HUB

PLAN No. xxx xxx G	
REVISION	DATE
1	06.05.2015

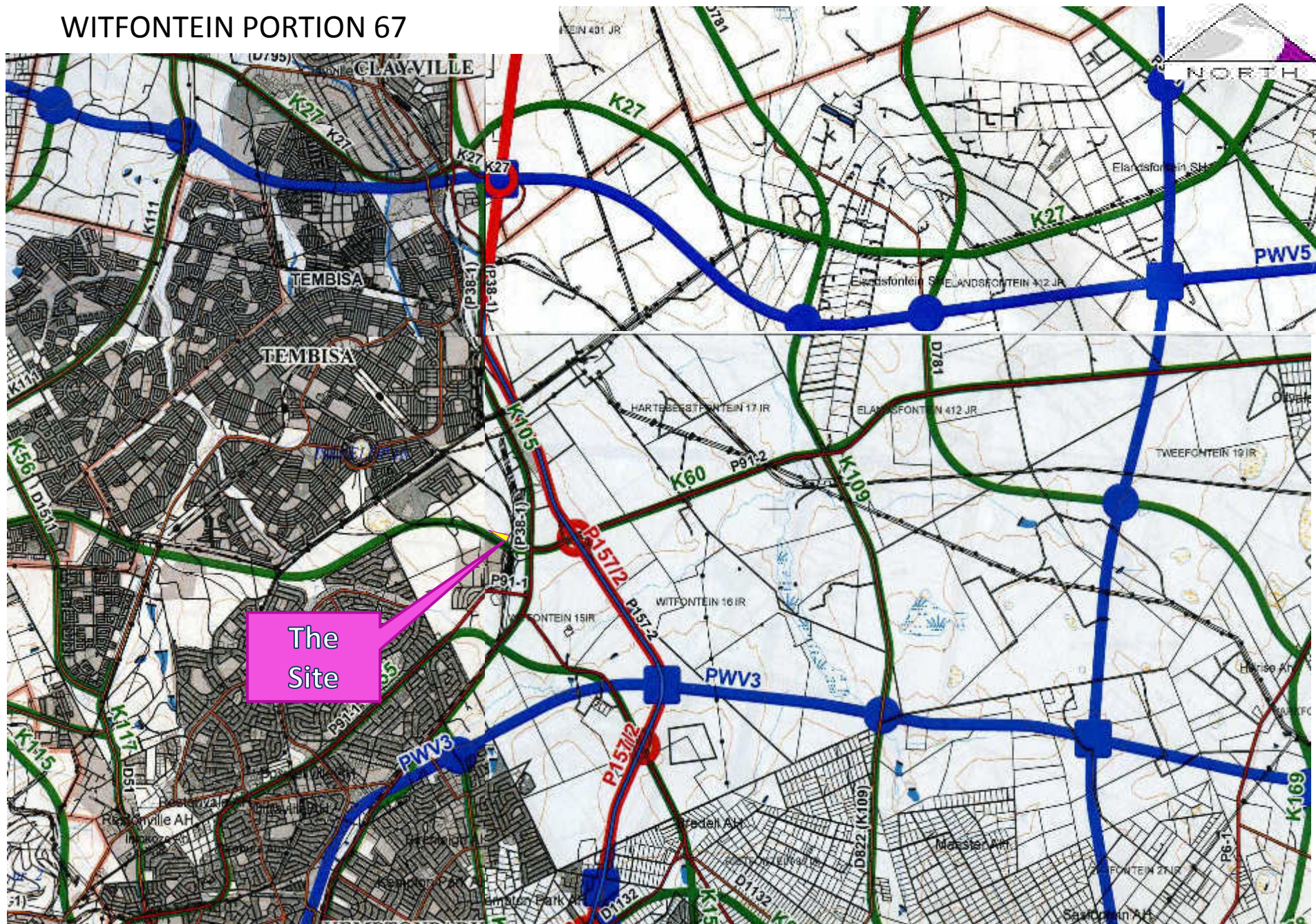
DIMENSION AND SIZES
All dimensions shown on the plan are approximate, scaled in meters and subject to final survey.

URBAN DYNAMICS
 37 EMPIRE ROAD
 FARMTOIN
 P.O. BOX 291803
 MELVILLE
 2108
 TEL: (+27 11) 482-4131
 FAX: (+27 11) 482-9959
 E-MAIL: danie@urbandynamics.co.za
 WEB MAIL: www.urbandynamics.co.za



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WITFONTEIN PORTION 67



Extract from Gautrans Strategic Road Network Planning

ANNEXURE C

**DEPARTMENT OF PUBLIC TRANSPORT
ROADS AND WORKS**

Private Bag X83
Marshalltown
2107

Date: 24 June 2015

**Attention: Mr. M. Mogane
Mr. K. Govender**



CC Reg No 91/30938/23

91 Tinderwood Cresc
Sand River Camp
WITFONTEIN X25
PO Box 133, SERENGETI, 1642
E-mail: chavenga@serengeti.co.za

Tel: +27(011) 552 7271
Fax: +27(011) 552 7272
Cell: 083 284 2860 (Corli)
Cell: 083 458 0066 (Cobus)

**SECTION 7 REPORT:
EKURHULENI LICENSING HUB ON PORTION 67 (A PORTION OF PORTION 15) OF THE FARM
WITFONTEIN 15-IR**

A new licensing hub is planned for the Ekurhuleni Metropolitan Municipality similar in size to the licensing hub in Centurion of the City of Tshwane. The development will be located on Portion 67 (a portion of Portion 15) of the farm Witfontein 15-IR. The site is located next to and on the northern side of Sam Molele Drive (P91-2) east of Pretoria Road (P38-1) and just east of the railway line as depicted in Figure 1. The site location is depicted in Figure 1 and also on the extract from the Gautrans Strategic Road Network Plan.

Sam Molele Drive is also the future K60 for which only a route determination is available, Report No 773B. In terms of the Gauteng Transport Infrastructure Act the K-route is a listed route with an accepted route determination. In terms of the ACT the points are addressed as follows:

7(a) (i) This section of K60 has an accepted route which follows more or less the alignment of Sam Molele Drive along the proposed development. From an access point of view there is an existing access to Esselen Park Sports Complex which, as far as we could determine, is an approved access point. In terms of access spacing and the rail crossing the access spacing is as follows:

P38-1(K105) to the access:	±800m
Access to existing access road to Esselen Park:	±730m

In terms of access spacing requirements the Esselen Park Sports Complex's access comply with the access spacing requirements of Gautrans and an access opposite this access is therefore proposed for this development.

The existing access to Esselen Park is depicted in the photos below.



Sam Molele Dr direction east at gate to Esselen Park Sports Complex



The Site - Sam Molele Dr direction north opposite gate to Esselen Park Sports Complex



Sam Molele Dr direction west at gate to Esselen Park Sports Complex

There are no sight distance issues at this point. From a road planning point of view we will use the existing alignment of Sam Molele Drive as one carriageway of the future K60 and calculate the road reserve around this. The following was used for the purpose of determining the road reserve for the future K60:

- 62m road reserve
- The existing road centre line, 12.7m from the future centre line of K60
- Road reserve widening 18,3m towards Esselen Park Sports Complex
- 43,7m towards the proposed development's side

In terms of Gautrans design standards the access must serve the area and not only the proposed development. There are also a small access road to Transnet between the proposed access and the railway line. The aerial photo and photo below indicate the access road.



Transnet access road



Transnet road next to Sam Molele Drive

This Transnet road falls within the future K60 road reserve and in terms of access spacing cannot be accommodated in the current position. Provision is made to reinstate this access in future.

The proposed alignment of K60 and the proposed access is depicted in Figure 2. In terms of the ACT the road reserve of K60 is excluded from the application.

A Traffic Impact Study was conducted for this development and subject to approval from Gautrans. The final geometric layout to be determined at wayleave application stage. The cost of implementing the new access on Sam Molele Drive will be for the applicant's account.

- 7(a) (ii) The route is not affected.
- 7(a) (iii) No other routes are affected.
- 7(b) No amendment of the route is required.
- 7(c) Not applicable at this stage.
- 7(d) Not applicable.

IN SUMMARY:

The proposed development will be affected by the future K60 planning. In terms of the planning the existing Sam Molele Drive alignment was used as one of the future carriageways of K60. The future road reserve was determined with a road reserve widening of 43,7m towards the development's side and 18,3m towards the opposite side for a future 62m road reserve.

Access to be located directly opposite the existing access to the Esselen Park Sports Complex on the southern side of Sam Molele Drive.

Provision to be made to reinstate access in future to the Transnet buildings along the railway line.

In terms of the ACT the road reserve of K60 is excluded from the application and the cost of implementing the new access on Sam Molele Drive will be for the applicant's account.

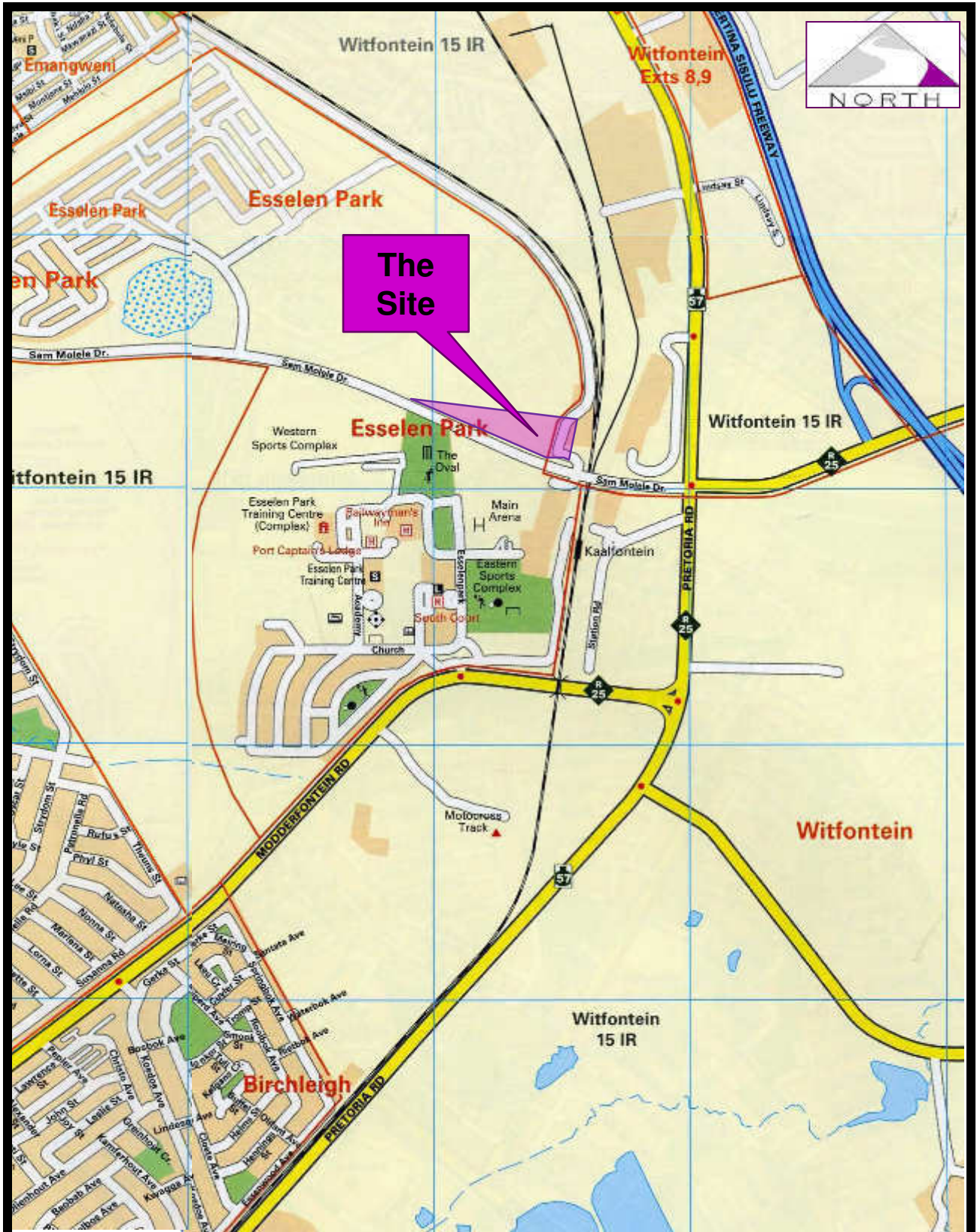
The application can be supported in terms of Section 7 of the Act with the proposed access and K60 alignment as depicted in Figure 2.

We trust that this will meet your requirements.

Regards



Cobus Havenga Pr Eng



**SECTION 7 REPORT
PORTION 67 OF FARM WITFONTEIN NO. 15 IR**

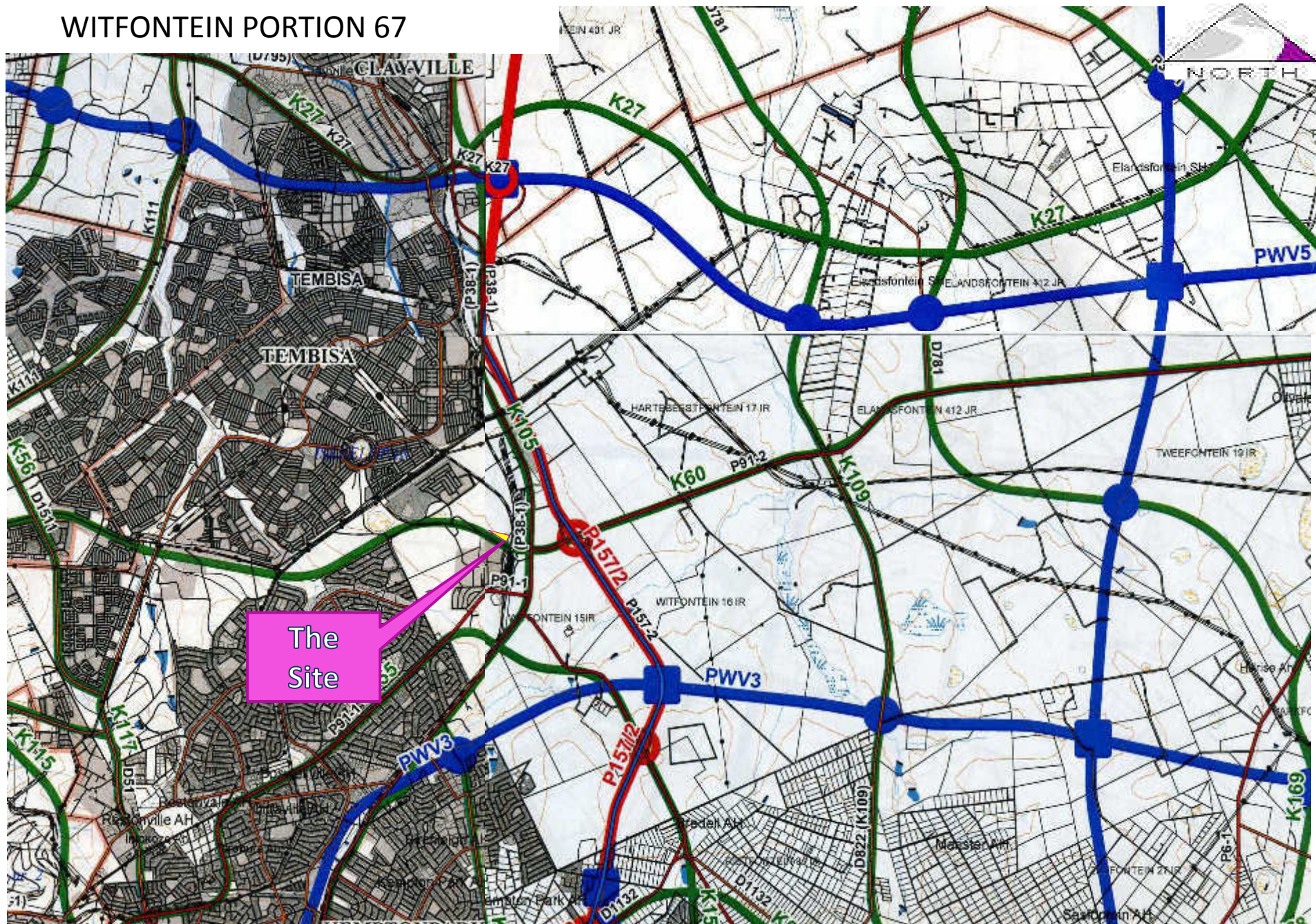
FIGURE 1: SITE LOCATION PLAN



SCALE : N/A

PP21125

WITFONTEIN PORTION 67



Extract from Gautrans Strategic Road Network Planning



Stormwater Report



Appendix G9

**APPENDIX E1 - Proposed Storm Water Management
report**

Portion 67 of Witfontein 15IR: Tembisa Licensing Hub

INTERNAL STORMWATER MANAGEMENT REPORT

June 2015

PREPARED BY:

Gant Project Management
Consulting Engineers
PO Box 81317
Parkhurst
2120
Contact J.P.L. Cloete Pr. Eng
Tel: 011 792 2359
Fax: 086 552 6086
E-mail: pieter@gant.co.za

GANT PROJECT MANAGEMENT (PTY) Ltd. VAT no.:4740242500 www.gantprojects.co.za

J.P.L Cloete Director Pr.Eng. Pr.CPM. E: pieter@gant.co.za G.M Nkwane Director E: godfrey@gant.co.za

JHB Office

Bush Hill Office Park, Unit 2, Ostrich Street, Bromhof, 2154
P.O. Box 81317, Parkhurst, 2120
T: 011 792 2359 F: 086 552 6086

CPT Office

Unit 10, The Village Place, 3 Erica Road, Kommetjie, 797
P.O. Box 48425, Kommetjie, 7976
T: 021 783 5720

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2.2 Existing Stormwater

2.3 Site Characteristics

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2.4 Site Geology

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3.1.2 Generation of Hydrographs

3.1.3 Sizing of Attenuation Pond & Outlet Pipe Diameter

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Appendices

Appendix A Locality plan

Appendix B Stormwater Hydrographs

Appendix E2 Stormwater Layout Drawings

1. Introduction

Gant Project Management (Pty) Ltd, Consulting Engineers, was appointed by the Ekurhuleni Metropolitan Municipality for the Engineering Design of Civil Services (Water, Sanitation, and Storm water) for the proposed new licensing hub, situated on Portion 67 of the Farm Witfontein 15IR.

This report addresses the stormwater management of the proposed development located on the above-mentioned site. The main concern is the increase of flood discharge caused by the proposed development and the management thereof. The objective is to manage the peak discharge from the site for the 1:5 year Return interval (RI), as well as the 1:25 RI; and to return the run-off into the existing municipal stormwater system in an acceptable manner.

Flood Return Period	Pre-development flood peak (m ³ /s)	Post-development flood peak (m ³ /s)	Attenuated Flood peak (m ³)
5 Years	0,0449m ³ /s	0,039m ³ /s	842m ³
25 Years	0,1135m ³ /s	0,113m ³ /s	1204m ³

2. Site Description

2.1 Locality

The site is currently described as Portion 67 of the Farm Witfontein 15IR. The site is situated on the northern boundary of Sam Molele Road north of Esselen Park and is on the west of the railway at the intersection of Pretoria Road and Sam Molele Road. The site is nearly triangular in shape and it is 3.2 ha.

The site is currently vacant and it is covered with grass, weeds and trees. There is no clearly defined water course on the site. The site has a fairly flat natural fall towards eastern direction with a gradient approximately 1-2%.

The rainfall characteristics for this site have assumed a mean annual precipitation of 750 mm per annum and fall within an inland rainfall region.

2.2 Existing Stormwater

The site drains towards the railway line on the east boundary of the site with the lowest point lying between the substation and Sam Molele Road. There is currently no functional storm water management system for the site on the EMM database. The storm water from the licensing hub site will be directed to an existing storm water culvert which lies adjacent to the rail way and north of the bridge on Sam Molele Road. The culvert is blocked and will be cleaned to allow the passage of storm water.

2.3 Site Characteristics

2.3.1 Topography

The site drains towards the railway line on the east boundary of the site with the lowest point lying between the substation and Sam Molele Road. The proposed development will cover the entire site and will convert a large portion of the stand to an impermeable surface, thus decreasing storm water infiltration and increasing the storm water runoff.

The site has an average slope of 1-2% that falls in a north-easterly direction. The proposed development will cover the whole site area.

2.4 Site Geology

A dolomite stability study and soils investigation for the proposed licensing hub site was carried out by Blue Rain Consultants and a report was compiled. From the report, it was confirmed that the site is underlain by chert-rich dolomite of the Monte Christo Formation of Malmani Subgroup of the Chuniespoort Group. The dolomite rocks are covered by layers of collapsible/compressible hillwash/colluvium.

It was found that the site generally constitutes Risk Class 1/3/4 (NHBRC Class D3). This classification indicates that there is a low to medium risk for the development of small to medium sized sinkholes and doline formation in both a non-dewatering and dewatering scenario.

All storm water pipes will be of HDPE quality material to account for the dolomitic nature of underlying soils.

3. Modelling

3.1 Model Selection

3.1.1 Rational Method

The Rational method has been used to design the flood peaks. The variables for the formula are discussed below:

Factors that influence the run-off are the slope, permeability and vegetation of the catchment. These factors and their values are discussed in 3.2.1 Pre-Development Modelling Parameters

Time of concentration (T_c) is the time required for run-off from the farthest point of the catchment to contribute to the peak discharge. The time of concentration is determined iteratively using the **Kinematic Wave Equation** which explicitly accounts for the rainfall intensity. The formula's used are as follows:

Precipitation Intensity = Regional Factor x Return Period Factor x MAP Factor

$$\text{MAP Factor} = \frac{(18,79 + 0,17MAP)}{100}$$

$$\text{Regional Factor} = \frac{217,8}{(1 + 4,164T_c)^{0,8832}}$$

$$T_c = \frac{0,116 \times L^{0,6} \times n^{0,6}}{i^{0,4} \times S^{0,3}}$$

Where L is the length of the longest water course;
 n is Manning's roughness factor;
 S is the slope of the catchment; and
 i is the rainfall intensity.

The intensity of the storm increases as the Time of Concentration (Tc) of the storm decreases and as the design period becomes longer.

3.1.2 Generation of Hydrographs

Pre-developed and post-developed inflow hydrograph were generated using the method of James and then a routed outflow hydrograph using the Modified Puls method as calculated with CBA Hydrograph generation & Reservoir routing rev I-6 protected.xls spreadsheet. These two methods are also used later when determining the performance of the attenuation pond.

3.1.3 Sizing of Attenuation Pond & Outlet Structure

Using the generated hydrographs and the initial estimate of the attenuation pond area; suitable dimensions and outlet weir are determined for the 1:25 Return interval (The starting depth of the pond is calculated as Site Area (Hectares) x 350 / Ave Pond Stage Area + Freeboard). When suitable pond dimensions are in place the performance of the pond is tested using the catchment characteristics as used in the Rational Method. The outlet pipe diameter, weir width and level were changed until the peak outflow was less than the pre-developed discharge. The maximum depth reached will be used as the 'worst case scenario' and the final pond dimensions can be determined.

3.1.4 Attenuation of the 1:5 Year Storm

With final pond dimensions in place, the performance of the pond can be determined in the case of a 1:5 year storm. If it is found that the total discharge from the proposed system is greater than the pre-development outflow, then the pipe and/wire would need to be made smaller to reduce the post-development discharge to less than the pre-developed discharge. When a suitable diameter is determined, the pond performance is tested in the same way as with the 1:25 year storm to determine the 1:5 year storm attenuation level in the pond. In this particular case, a pipe and a weir combination was used which satisfies the 1:25 year and 1:5 year storm event.

3.2 Pre-Development

3.2.1 Proposed site

3.2.1.1 Pre-Development Modelling Parameters

The following design parameters were applicable and used for the pre-developed site.

Area Distribution

Rural	100%
Urban	0%
Lakes	0%

Type of water flow:

Overland Flow

General overland properties:

Grassland – manning roughness n	= 0,025
Rational constant	= 0,16 (Natural grasslands)
Longest water course	= 440m
Slope of the terrain	= 1.3%
MAP	= 750

3.2.1.2 Pre-Developed Model Results

The time of concentration (Tc) was calculated using the Kinematic Wave Equation as described above. Due to the large catchment area (site area), the time of concentration is relatively long. The Flood routing and peak stormwater discharge was calculated using the Rational method. The results of the calculations are as follows:

Flood Return Period	Time of Concentration	Rainfall Intensity (mm/hour)	Peak Discharge (m ³ /s)
5 Years	40 minutes	65.6mm/hour	0.0449m ³ /s
25 Years	41 minutes	113.5mm/hour	0.1135m ³ /s

3.3 Post-Development

3.3.1 Proposed site

3.3.1.1 Post-Development Modelling Parameters

The following design parameters are applicable and used for the post-developed site:

Area Distribution

Rural	0%
Urban	100%
Lakes	0%

Type of water flow:

Overland Flow

General overland properties:

Interlocking paving – manning roughness n	= 0,015
Rational constant: 40% of the site	= 0,068 (landscaping)
60% of the site	= 0,48 (paving and roof)
Combined	= 0,548
Slope of the terrain	= 2%

3.3.2.1 Post-Developed Model Results

In order to determine the performance of the pond, the storm duration is changed to determine the maximum depth of the pond. The optimum storm

duration will be longer than the peak storm duration calculated using the Kinematic Wave Equation, because the depth and restricted outlet of the pond needs to be incorporated into the calculation. This process is an iterative process where the CBA spreadsheet has been utilized to calculate the hydrographs and the pond depth.

Please refer to Appendix B for the hydrographs and calculation results.

The stormwater attenuation pond will be placed in the north eastern corner of the site.

1:5 Year Storm Event		1:25 Year Storm Event		Outlet pipe dia. (mm)	Outlet weir (mm)
Q _{out} (m ³ /s)	Storage (m ³)	Q _{out} (m ³ /s)	Storage (m ³)		
0.039	842	0.113	1204	125	200

The invert level of the outlet weir is 1.6m and has a free board of 600mm.

The results of the stormwater model is as follows:

The stormwater attenuation pond must be designed to accommodate a 1:25 year storm event, which will require a volume of 1204m³.

3.3.2.2 Attenuation Pond over flow (excess of 1:25 year event)

The stormwater attenuation control will have an overflow to 200mm above the depth required for the 1:25 year event. This will allow an event that exceeds a 1:25 year event to be accommodated.

All work beyond the boundary of the site needs to be done strictly according to EMM standard details.

4. Management Scheme

4.1 Construction Management

Stormwater management and control needs to be exercised during the construction of the proposed development. Prior to the construction of the proposed development, the stormwater attenuation pond with the connection to the municipal network must be completed. As a precaution to the siltation of the pond during construction, the walls of the attenuation pond must be kept, at all times, at least 200mm above the surrounding ground level. This will form a “silt-trap” around the outside faces of the attenuation pond walls.

4.2 Long-term Maintenance

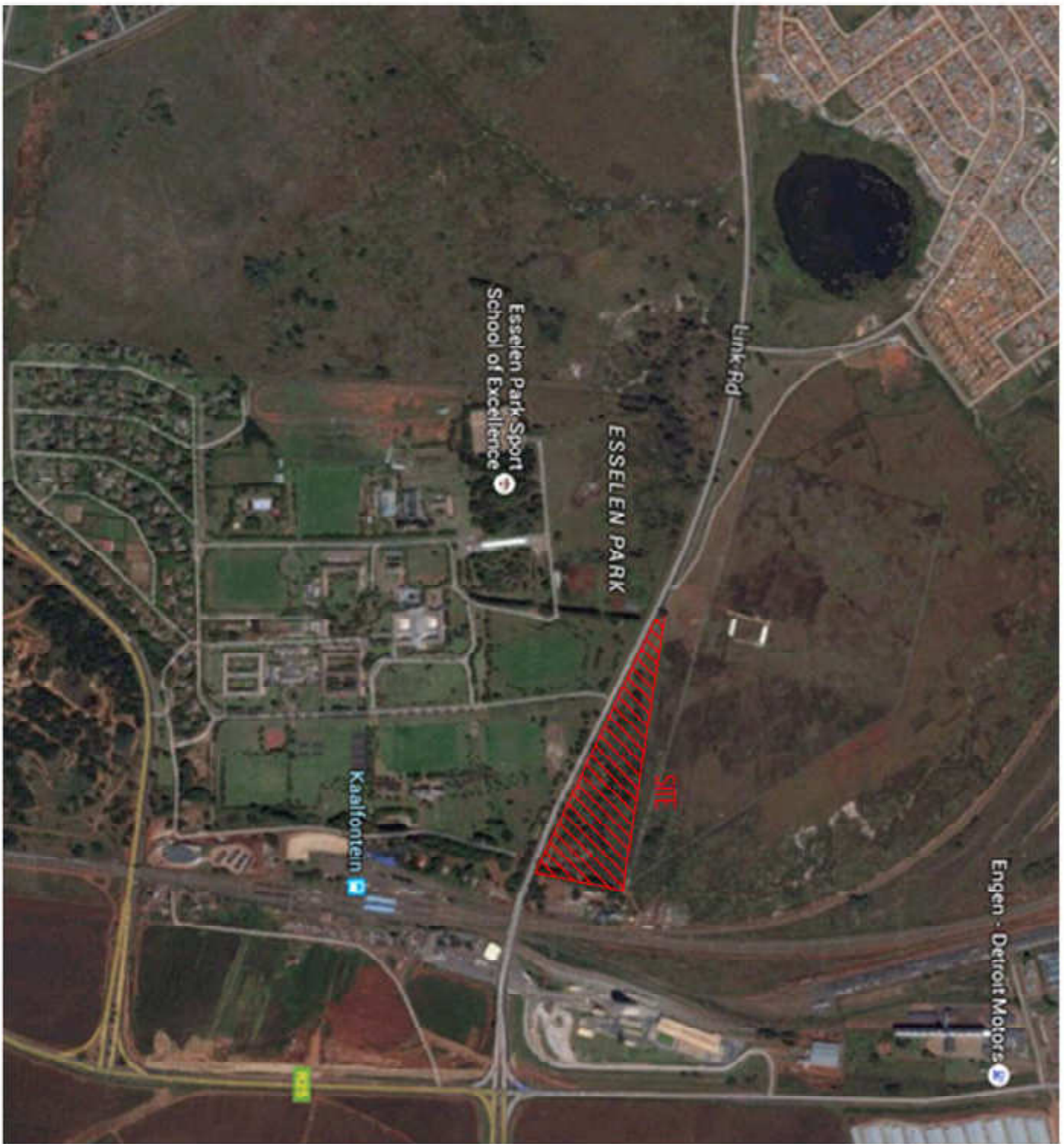
The maintenance of the stormwater infrastructure needs to be regularly maintained in order for the infrastructure to provide the necessary service. The following maintenance schedule is proposed:

1. Once a year, prior to the summer rain season, all weep holes and the attenuation control weir should be checked and cleaned to remove any debris from the restricted flow path.
2. Every 5 years the pipe linking the attenuation pit to the municipal network is to be inspected.

4.3. Storm water management precautionary measures to account for dolomitic nature of underlying soil

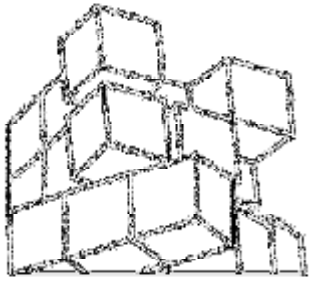
1. The entire development should be landscaped to facilitate good drainage and prevent the ponding of surface water against structures. All water courses and road surfaces shall be sealed and rendered impervious.
2. The site should be inspected immediately after a heavy downpour to assess the drainage of the site. If ponding is visible it should be noted and be corrected as soon as possible to prevent any ponding in the future. Ponding should be prevented at all times.
3. A minimum gradient of 1:15 should be maintained along site stormwater systems.
4. Down pipe guttering should be discharged into a pre-cast furrow, which will remove the water from the structure on a sealed surface.
5. Paving immediately against the buildings, should be shaped to fall in excess of 75mm over the first 1,0m beyond the perimeter of the building.

Appendix A – Locality Plan



GANIT

GRAND HANOVER LTD. LLC.
 6700 W. BROADWAY
 SUITE 2000
 DALLAS, TEXAS 75244



LOT SIZE :
 22,800 SQ FT
 PROJECT 2100
 1010 W. 20th
 ST. DATE :
 12/15/2011
 PROJECT 2100
 1010 W. 20th
 ST. DATE :
 12/15/2011

PROJECT:

NEW LICENSING HUB,
 TERESA

LOCALITY PLAN

TERESA

12/15/2011
 1010 W. 20th
 ST. DATE :
 12/15/2011

DATE :
 12/15/2011

Appendix B – Stormwater Hydrographs

Project **Tembisa licensing hub** 04/06/2015
 Engineer CO Hlongwane

Summary of Results No data input on this sheet

Region	Input	Computed
MAP	750 mm/year	Storm Td 175.5 min 2.9 hr
RI	5 year	= concentration time plus time to start runoff

Catchment	Input	Computed
Area	3.2 ha	<u>Average Rainfall Intensity</u> Op ten Noord & Stephenson Inland
Conc time Tc	165 min	19.2 mm/h
Rational C	0.80	Peak Rainfall Intensity Triangular Hyetograph 38.4 mm/h At time 53 mins

Storm	Input	Computed
Time to peak	0.3 ratio	Runoff Vol 1436 m ³ = C x P x A
Time step	3 min	

Reservoir and Outlet Data

Pipe	U/S	D/S	Tower
No off	1	1 No	Crest Len 2.5 m C _{d(unsub)} 0.75
Dia	0.125	0.45 m	Crest Lvl 2.5 m C _{d(sub)} 0.62
Invert Lvl	0	0 m	C _h 0.85

Spillway	Input	Computed
Cd	1.00 for Q = Cd x L x h ^{0.67}	Cd 1.00 for Q = Cd x L x h ^{0.67}
Width	0.2	Width 2.0
Invert Lvl	1.60	Invert Lvl 2.20
Free board	0.60	Free board 0.20

Reservoir Data

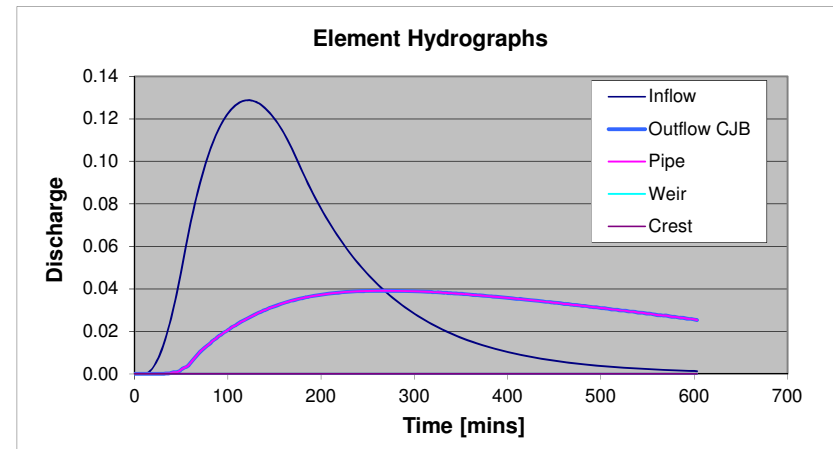
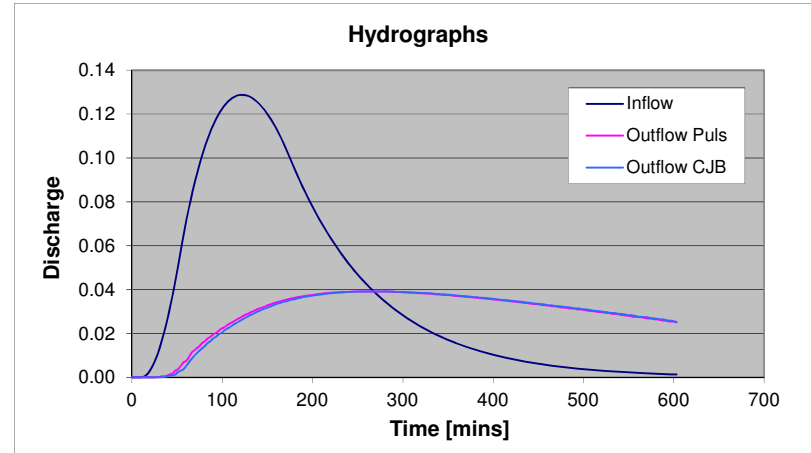
Stage	Depth	Area	Volume
0.00	0.00	580	0
0.50	0.50	580	290
1.00	1.00	580	580
1.50	1.50	580	870
2.00	2.00	580	1160
2.50	2.50	580	1450
3.00	3.00	580	1740
3.50	3.50	580	2030

Initial Conditions
 Stage 0.00 m
 Depth 0.00 m
 Vol 0 m³
 Area 580 m²
 Discharge 0.00 m³/s

Results Summary

Peaks		
Q _{in}	0.129 m ³ /s	
Q _{out} CJB	0.039 m ³ /s	Q _{pipe} 0.039 m ³ /s
Q _{out} Puls	0.039 m ³ /s	Q _{weir} 0.000 m ³ /s
Stage	1.462 m	Q _{crest} 0.000 m ³ /s
Stored Vol	842 m ³	

Developed by Chris Brooker PrEng
 Version 1.6
 Chris Brooker & Associates
cbrooker@iafrica.com



Project **Tembisa licensing hub** 04/06/2015
 Engineer CO Hlongwane

Summary of Results No data input on this sheet

Region	Input	Computed
MAP	750 mm/year	Storm Td 175.5 min 2.9 hr
RI	25 year	= concentration time plus time to start runoff

Catchment	Input	Computed
Area	3.2 ha	<u>Average Rainfall Intensity</u> Op ten Noord & Stephenson Inland
Conc time Tc	165 min	31.1 mm/h
Rational C	0.80	Peak Rainfall Intensity Triangular Hyetograph 62.2 mm/h At time 53 mins

Storm	Input	Computed
Time to peak	0.3 ratio	Runoff Vol 2328 m ³ = C x P x A
Time step	3 min	

Reservoir and Outlet Data

Pipe	U/S	D/S	Tower
No off	1	1 No	Crest Len 2.5 m C _{d(unsub)} 0.75
Dia	0.125	0.45 m	Crest Lvl 2.5 m C _{d(sub)} 0.62
Invert Lvl	0	0 m	C _h 0.85

Spillway	Input	Computed
Cd	1.00 for Q = Cd x L x h ^{0.67}	Cd 1.00 for Q = Cd x L x h ^{0.67}
Width	0.2	Width 2.0
Invert Lvl	1.60	Invert Lvl 2.20
Free board	0.60	Free board 0.20

Reservoir Data

Stage	Depth	Area	Volume
0.00	0.00	580	0
0.50	0.50	580	290
1.00	1.00	580	580
1.50	1.50	580	870
2.00	2.00	580	1160
2.50	2.50	580	1450
3.00	3.00	580	1740
3.50	3.50	580	2030

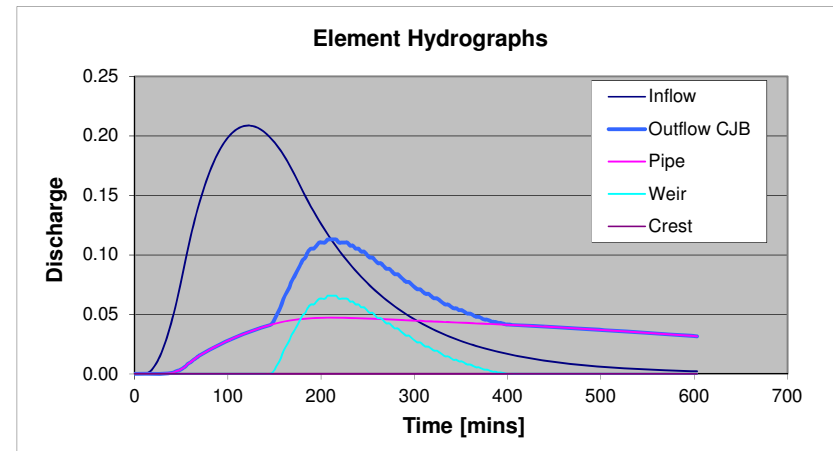
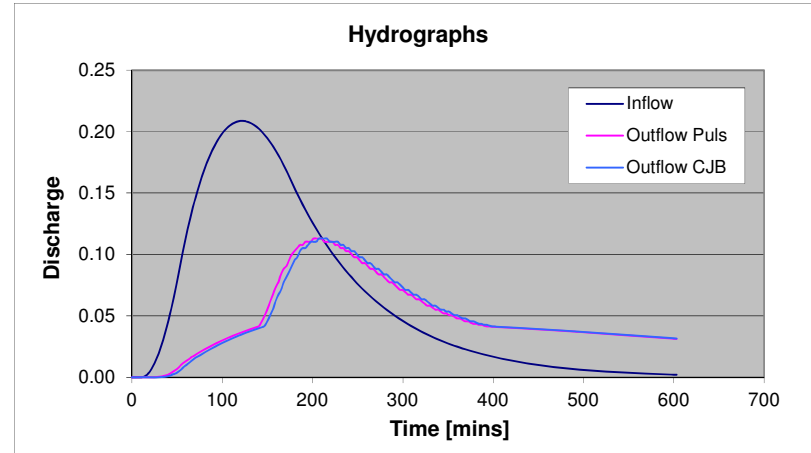
Initial Conditions

Stage	0.00 m
Depth	0.00 m
Vol	0 m ³
Area	580 m ²
Discharge	0.00 m ³ /s

Results Summary

Peaks		
Q _{in}	0.209 m ³ /s	
Q _{out} CJB	0.113 m ³ /s	Q _{pipe} 0.047 m ³ /s
Q _{out} Puls	0.113 m ³ /s	Q _{weir} 0.066 m ³ /s
Stage	2.078 m	Q _{crest} 0.000 m ³ /s
Stored Vol	1204 m ³	

Developed by Chris Brooker PrEng
 Version 1.6
 Chris Brooker & Associates
cbrooker@iafrica.com



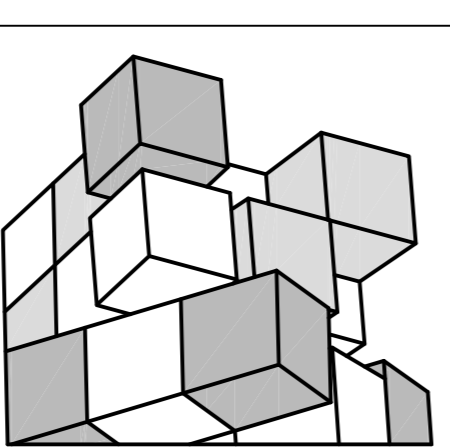
Appendix E2 – Stormwater Layout

REVISIONS:

RE: FIRST ISSUE

NOTES:

- 1) ALL REINFORCEMENT TO BE INSPECTED BY ENGINEER BEFORE CASTING CONCRETE.
- 2) READ ALL DIMENSIONS IN CONJUNCTION WITH ARCHITECT'S PRE-CAST UNITS
- 3) ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE ORDERING COVER TO REINFORCEMENT MUST BE AS FOLLOWS:
 BEAMS 15mm
 SLABS 25mm
 COLUMNS 30mm
 FOUNDATIONS 30mm
- 5) CEMENT FOR MORTAR AND CONCRETE TO BE GRM II/A-S
- 6) FINE AGGREGATES USED IN MORTAR AND CONCRETE SHALL COMPLY WITH THE REQUIREMENTS OF SABS 1083
- 7) WATER USED FOR CONCRETE AND MORTAR SHALL COMPLY FREE OF ANY ORGANIC OR OTHER MATERIALS
- 8) BRICK TO BE USED IN CONSTRUCTION SHALL COMPLY WITH SABS 222. THE BRICKS USED IN THE BUILDING FROM THE FOUNDATION TO THE FIRST FLOOR SLAB SHALL HAVE A STRENGTH OF AT LEAST 25 MPa. THE BRICKS IN THE REST OF THE OF THE BUILDING SHALL HAVE A STRENGTH OF AT LEAST 15 MPa.
- 9) THE MORTAR USED FOR THE CONSTRUCTION FROM THE FOUNDATION TO THE UNDERSIDE OF THE FIRST FLOOR SLAB SHALL BE CLASS 1 (4.5 Mpa) ACCORDING TO SABS 0164. THE REST OF THE MORTAR SHALL BE CLASS II
- 10) MASONRY WALLS SHALL BE BANDAID TOGETHER TO THE SATISFACTION OF THE ENGINEER. BROCKGROCE EVERY FIFTH COURSE WILL BE DEMED SATISFACTION. SPECIAL ATTENTION MUST BE PAID TO CORNERS WHERE A PROPER BOND IN ADDITION TO BROCKGROCE IS REQUIRED
- 11) NO OPENINGS, CHASES OR RECESSES WILL BE ALLOWED IN THE WALLS OTHER THAN THOSE SPECIFIED FOR WINDOWS AND DOORS BY THE ARCHITECT WITHOUT THE WRITTEN CONSENT OF THE ENGINEER. RECESSES MAY BE SUBJECT TO A DECISION BY THE ENGINEER HAVE TO BE BROSSED BY UNITS. ALL RECESSES ARE TO BE BACKFILLED WITH CLASS I MORTAR TO THE SATISFACTION OF THE ENGINEER. NO CHASE OR RECESS WILL BE ALLOWED TO BE CUT IN A WALL WHICH IS LESS THAN 500mm BETWEEN OPENINGS
- 12) THE CONSTRUCTION OF MASONRY WILL BE ACCORDING TO STANDARD BUILDING REGULATIONS OF SABS 0400
- 13) CONCRETE USED FOR FOOTINGS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 25 MPa AT 28 DAYS. ALL OTHER STRUCTURAL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 30 MPa AT 28 DAYS
- 14) ALL STRUCTURAL STEEL TO BE GRADE S355JR
- 15) ALL WORK TO BE IN COMPLIANCE WITH NATIONAL BUILDING REGULATIONS



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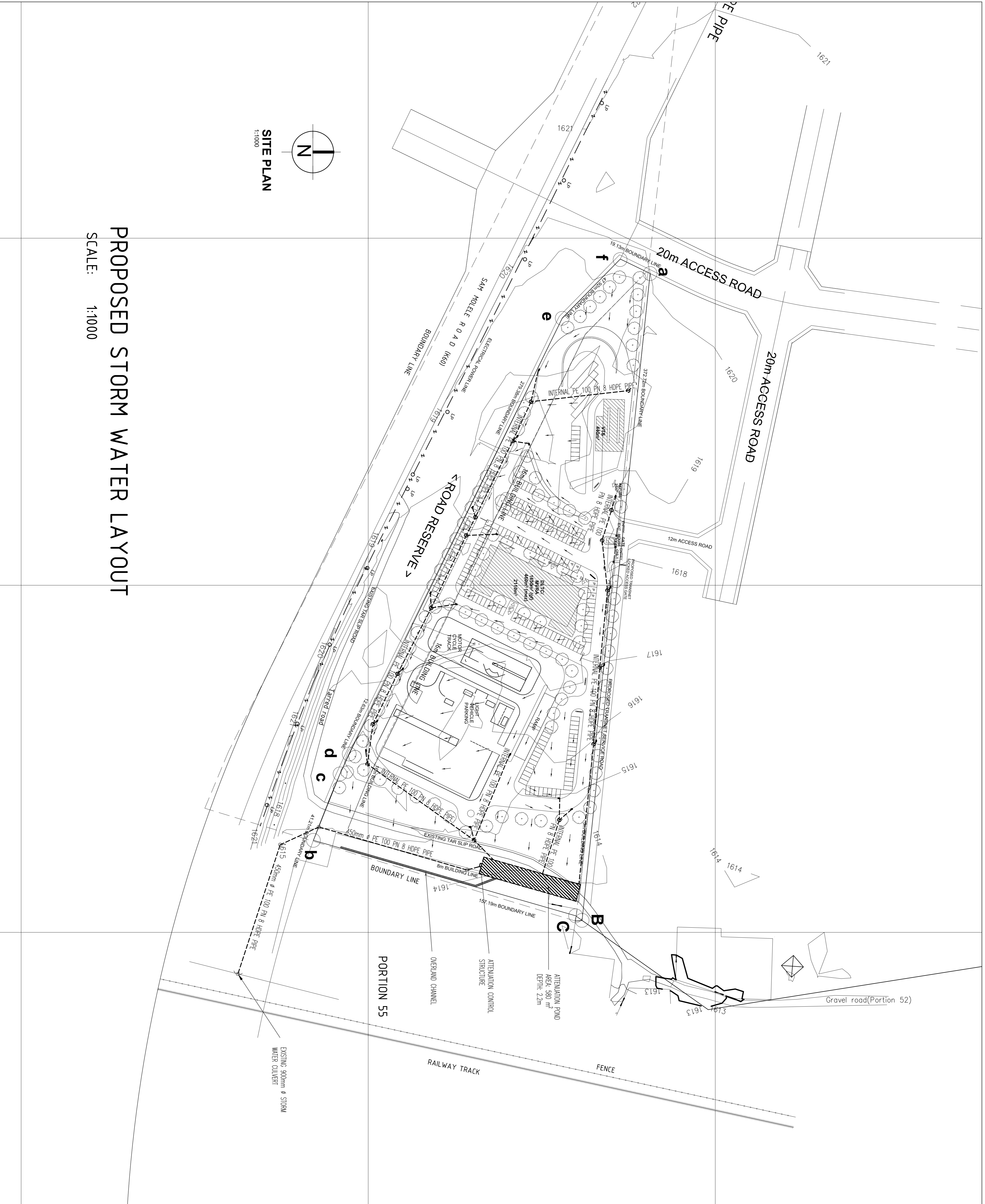
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 PARKROOST 2120
 (011) 792 2399
 OPT OFFICE :
 P.O. BOX 48425
 KOMKLEINE 7916
 (021) 783 5720
 E-mail :
 piet@gnpt.co.za

PROJECT:

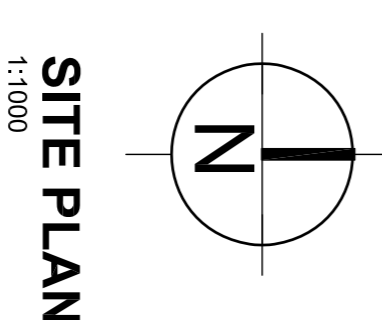
NEW LICENCING HUB, TEMBISA

PROPOSED STORM WATER LAYOUTPROJECT NO:
15.02/02 CLJ P L CLOETE PR ENG
REG. NO 940236DRAWN
C O HLONGWANE
DATE
02/07/2015SCALE
1 : 1000

APPENDIX E2

**PROPOSED STORM WATER LAYOUT**

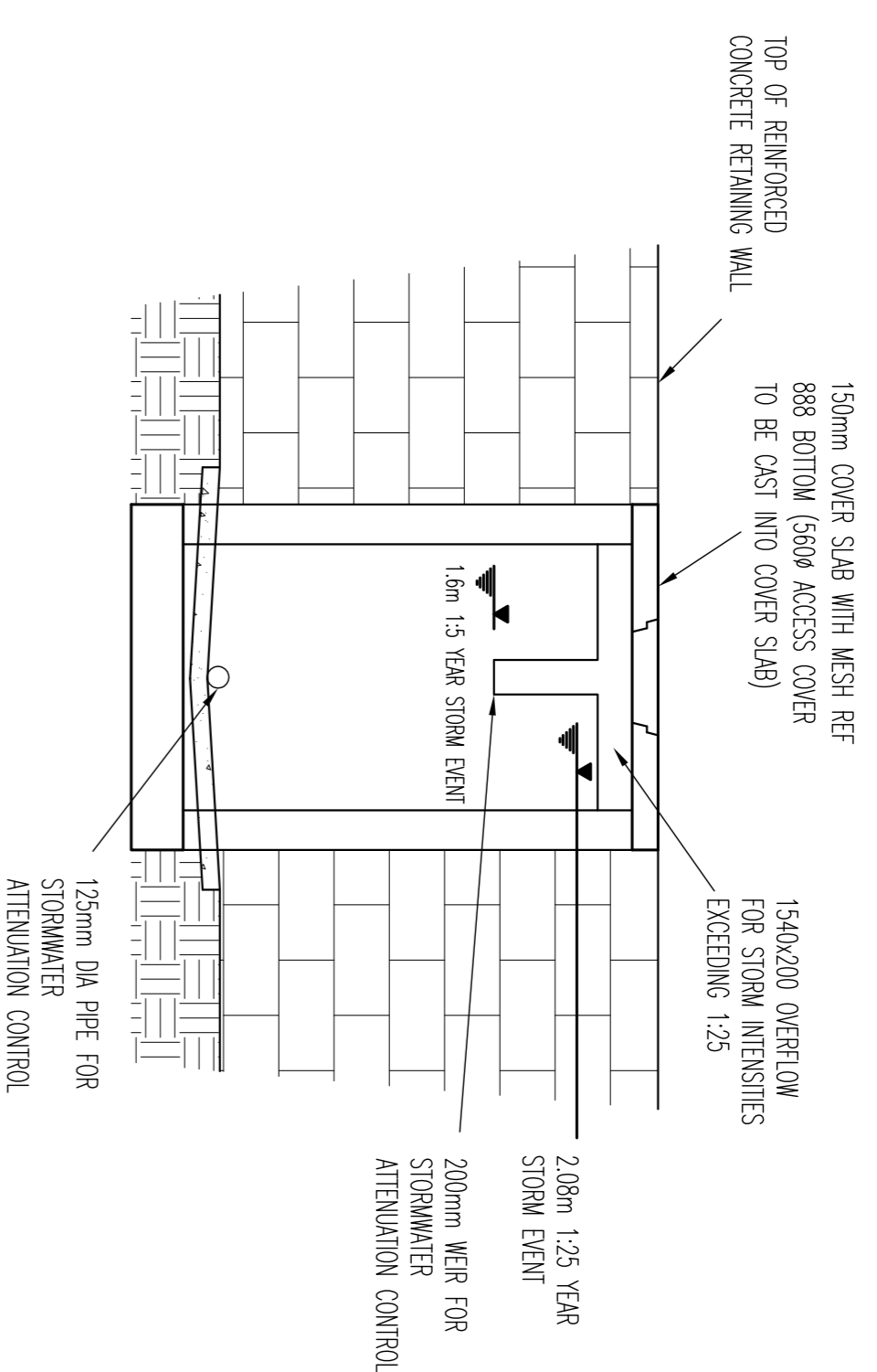
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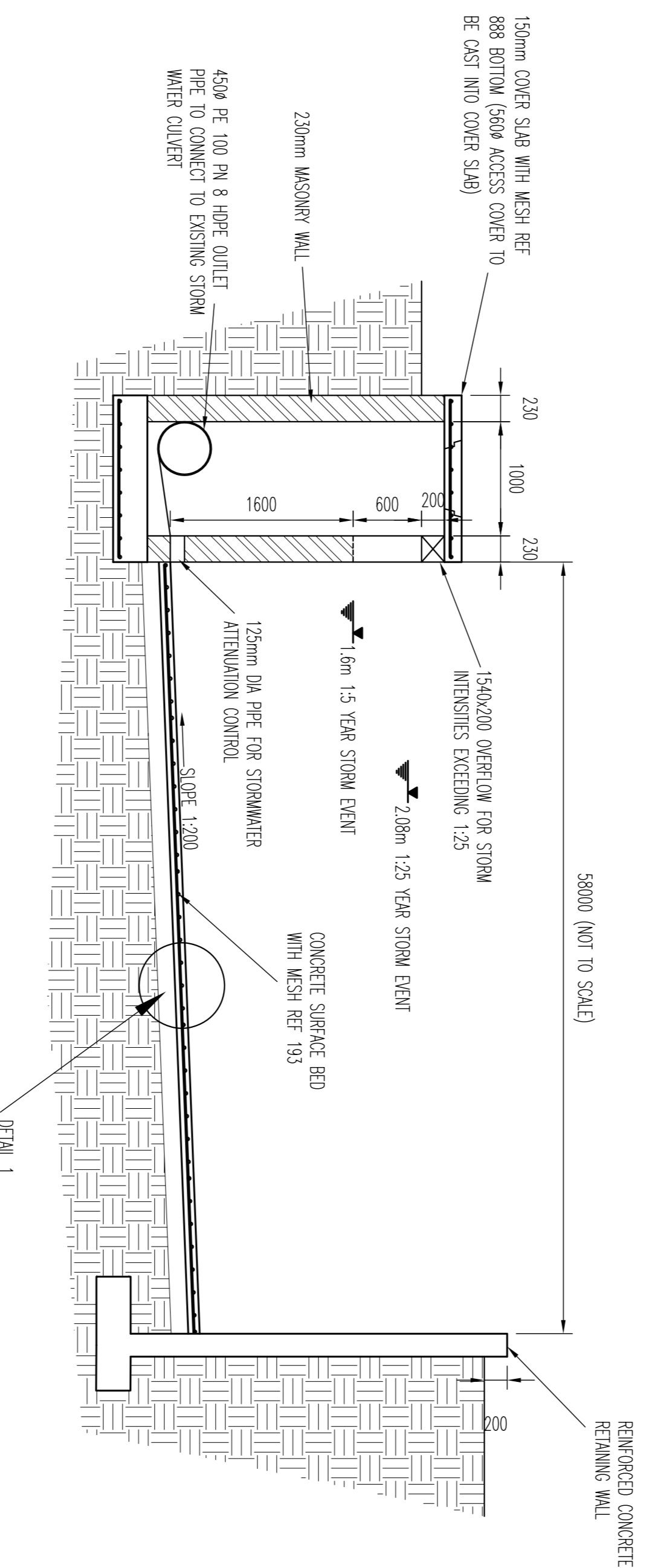
REVISIONS:
FOR ISSUED FOR INFORMATION

NOTES:
ALL WORK TO BE DONE ACCORDING TO SABS 1200 SPECIFICATIONS.
ALL DETAILS TO BE IN ACCORDANCE WITH E.M.M. STANDARD DETAILS.

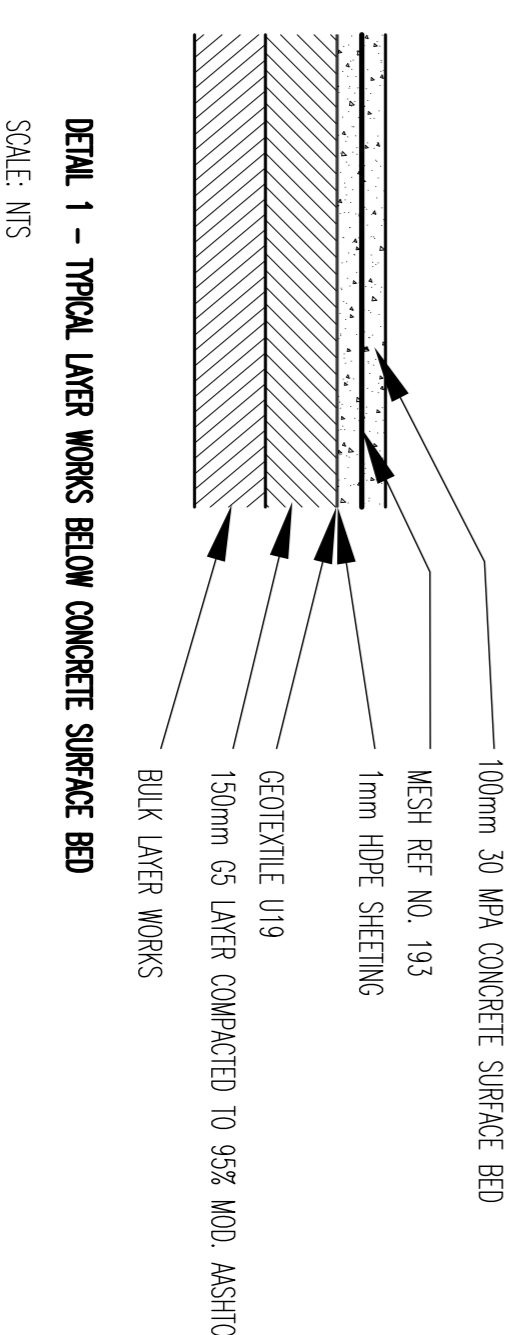
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ELEVATION
ATTENUATION CONTROL STRUCTURE
SCALE: NTS

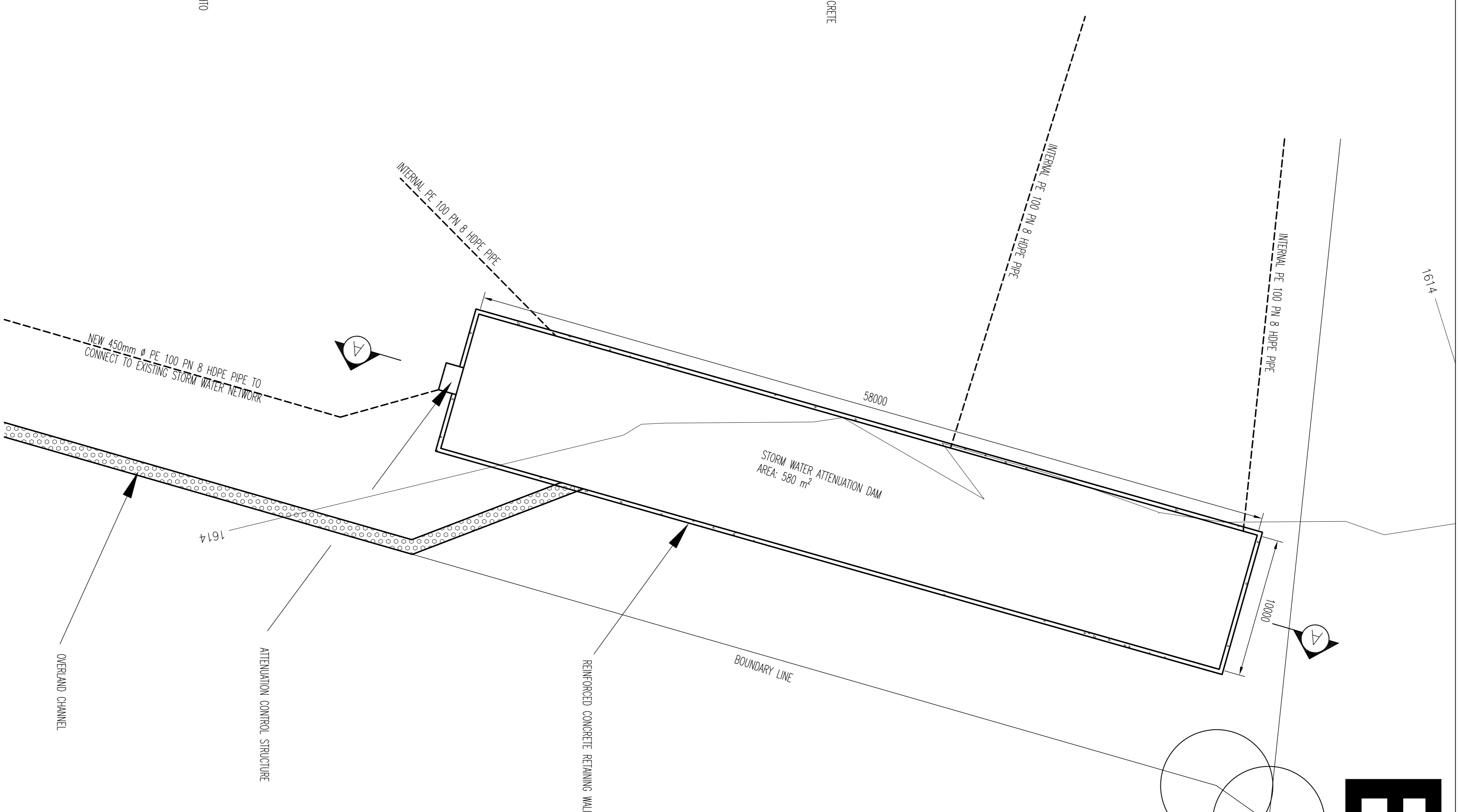


SECTION A-A
ATTENUATION CONTROL STRUCTURE
SCALE: NTS



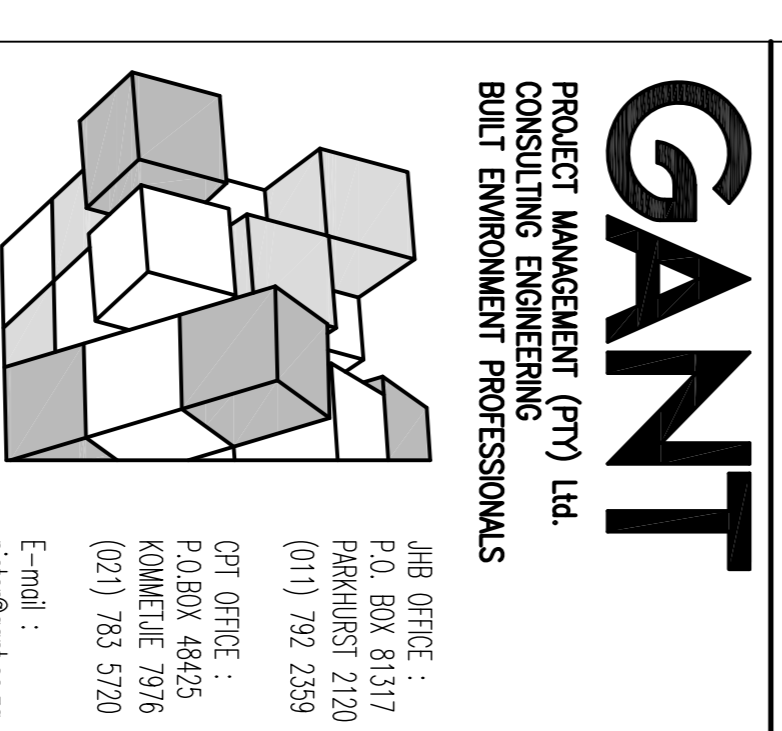
DETAIL 1 - TYPICAL LAYER WORKS BELOW CONCRETE SURFACE BED
SCALE: NTS

STORM WATER CATCHMENT AREA = 32 000m²
STORM WATER ATTENUATION VOLUME = 1276m³
STORM WATER ATTENUATION AREA = 580m²
MINIMUM DEPTH TO ACHIEVE VOLUME REQUIREMENT = 2.2m



LAYOUT - ATTENUATION DAM
SCALE: 1:200

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PROJECT MANAGEMENT (PTY) Ltd.
CONSULTING ENGINEERING
BUILT ENVIRONMENT PROFESSIONALS



E-mail: pieter@ganit.co.za

PROJECT:
NEW LICENSING HUB, TEMBISA

STORM WATER ATTENUATION DAM

COMPUTER ID	
J.P.L. GOETE PR. ENG.	DRAMIN
REG. NO. 940236	CO. HLONGWANE
SCALE AS SHOWN	DATE 02/07/2015

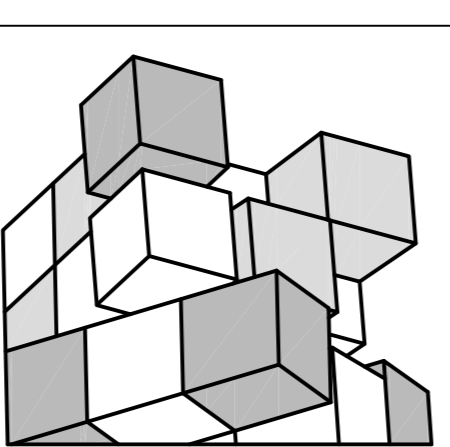
15_02/02 GL

REVISIONS:

RE: FIRST ISSUE

NOTES:

- 1) ALL REINFORCEMENT TO BE INSPECTED BY ENGINEER BEFORE CASTING CONCRETE.
- 2) READ ALL DIMENSIONS IN CONJUNCTION WITH ARCHITECT'S PRE-CAST UNITS
- 3) ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE ORDERING COVER TO REINFORCEMENT MUST BE AS FOLLOWS:
 BEAMS 15mm
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 COLUMNS 30mm
 FOUNDATIONS 30mm
- 5) CEMENT FOR MORTAR AND CONCRETE TO BE GRM II/A-S
- 6) FINE AGGREGATES USED IN MORTAR AND CONCRETE SHALL COMPLY WITH THE REQUIREMENTS OF SABS 1083
- 7) WATER USED FOR CONCRETE AND MORTAR SHALL COMPLY FREE OF ANY ORGANIC OR OTHER MATERIALS
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- 14) ALL STRUCTURAL STEEL TO BE GRADE S355JR
- 15) ALL WORK TO BE IN COMPLIANCE WITH NATIONAL BUILDING REGULATIONS



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 KOMKELINE 7916
 (021) 783 5720
 E-mail :
 pietef@gant.co.za

PROJECT:

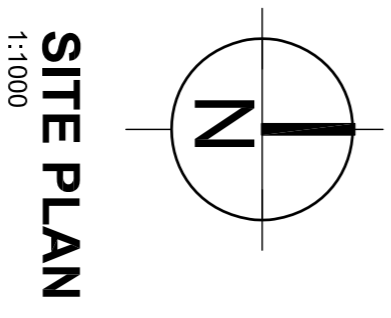
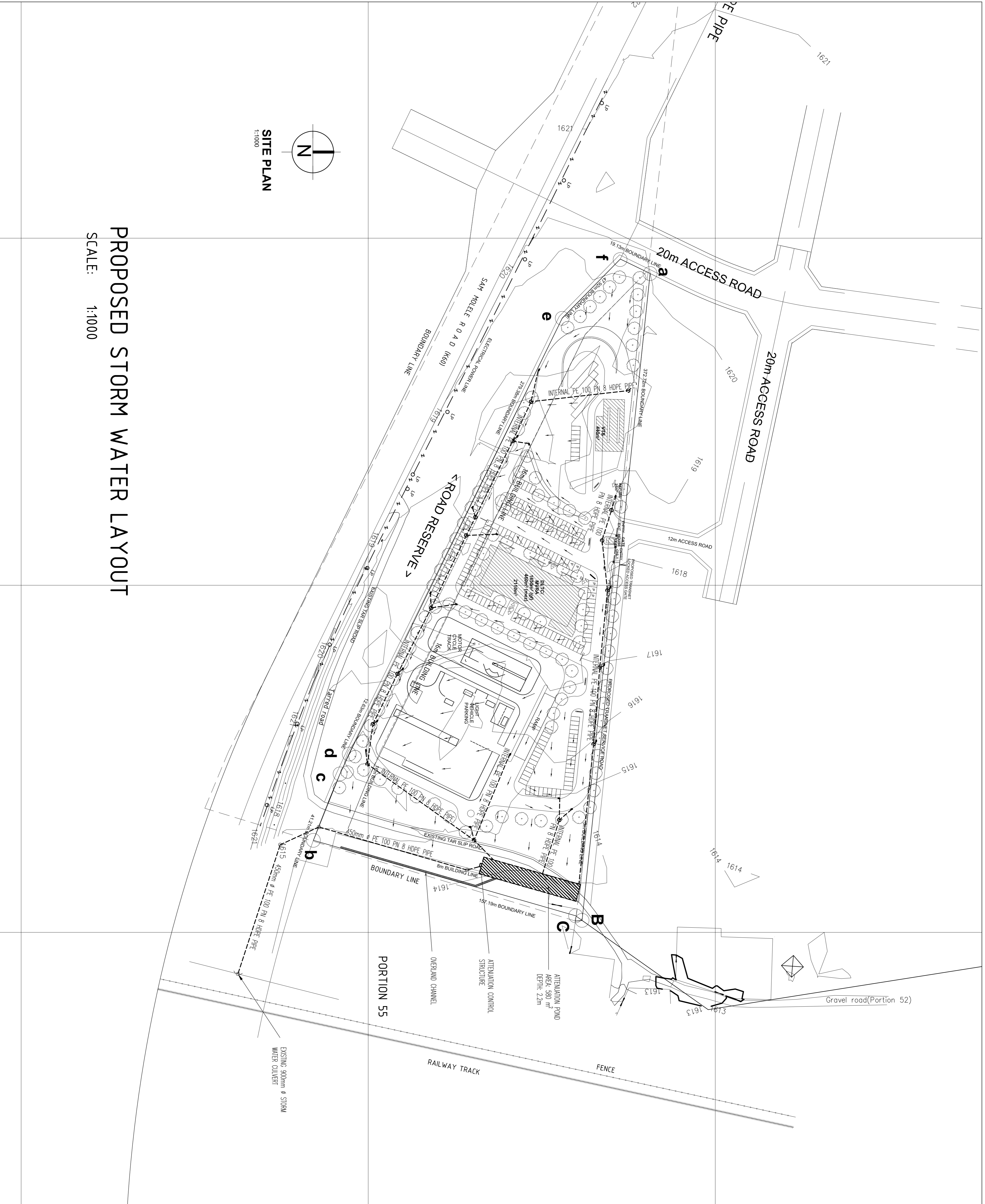
NEW LICENCING HUB, TEMBISA

PROPOSED STORM WATER LAYOUTPROJECT NO:
15.02/02 CL

J P L CLOETE PR ENG	DRAWN
REG. NO 940236	C O HLONGWANE
SCALE	DATE
1 : 1000	02/07/2015

SCALE

DATE

APPENDIX E2

SITE PLAN
 1:1000

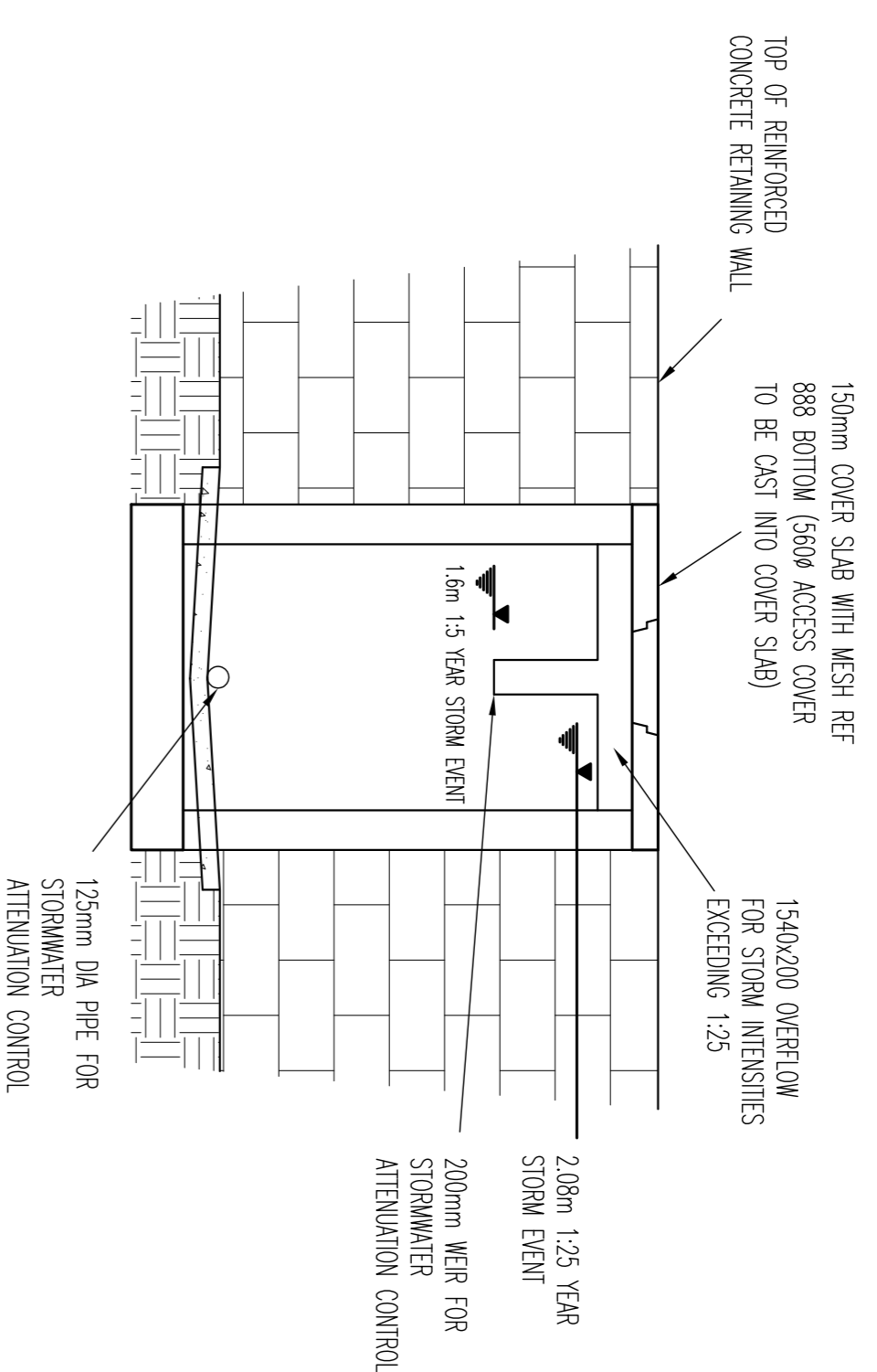
PROPOSED STORM WATER LAYOUT

SCALE: 1:1000

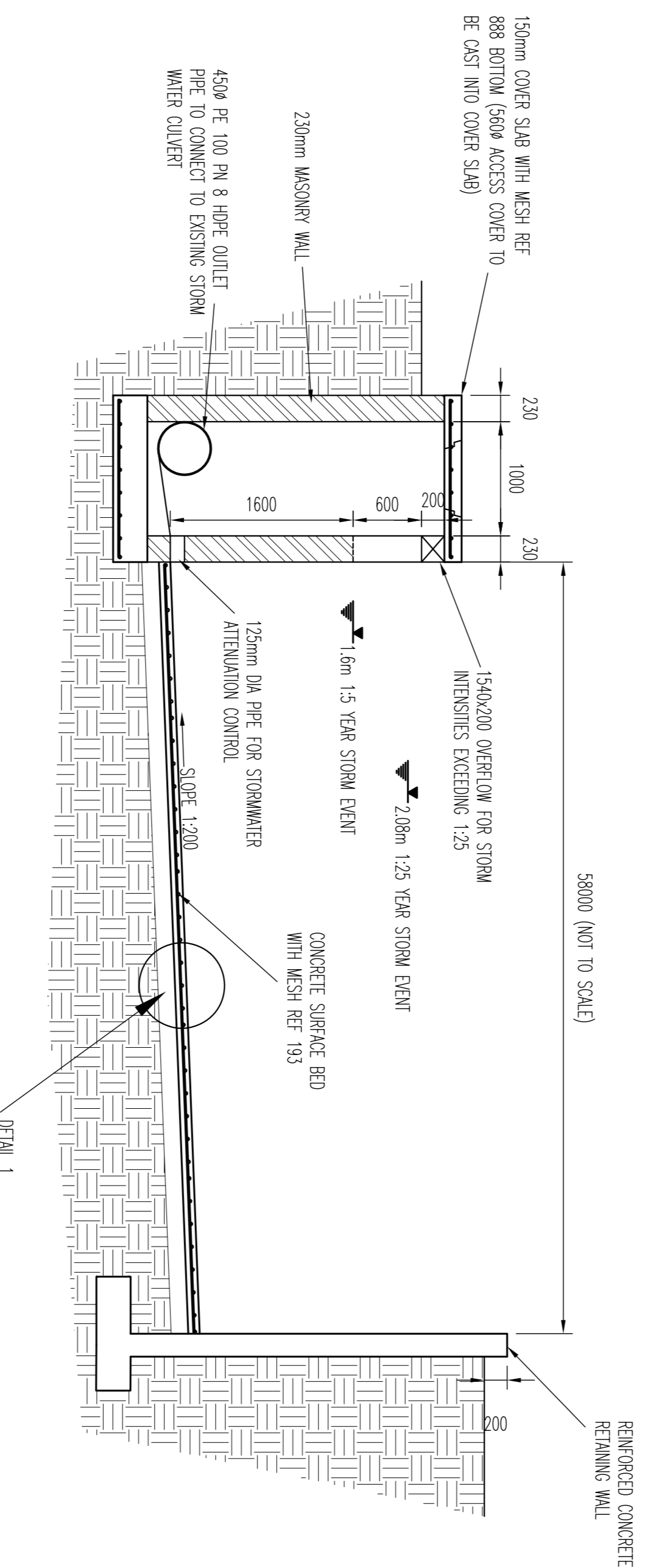
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NOTES:
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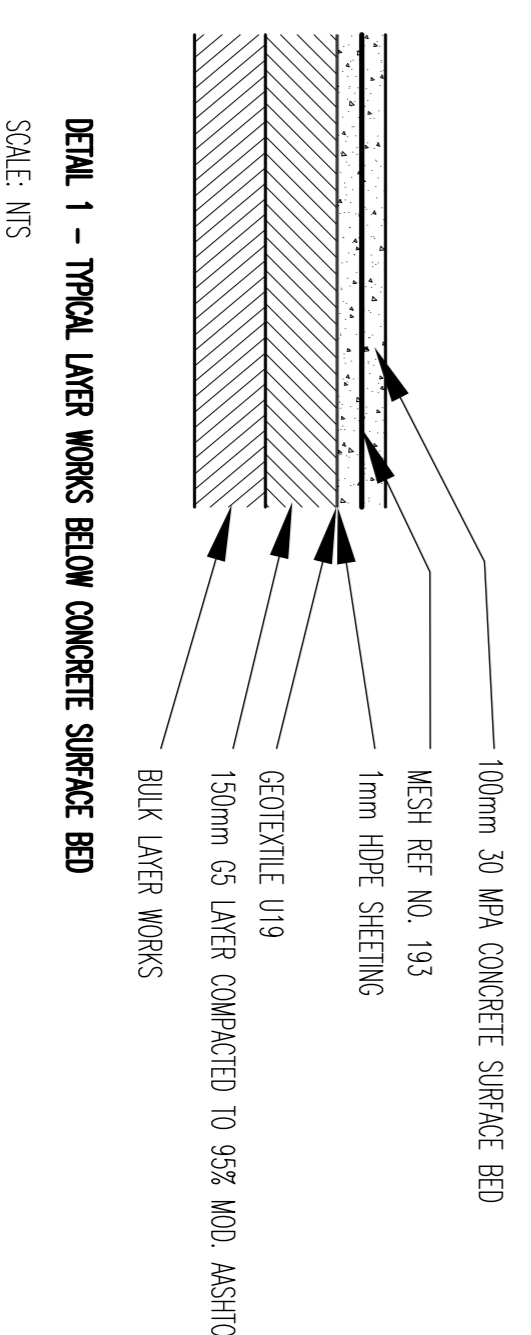
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ELEVATION
ATTENUATION CONTROL STRUCTURE
SCALE: NTS

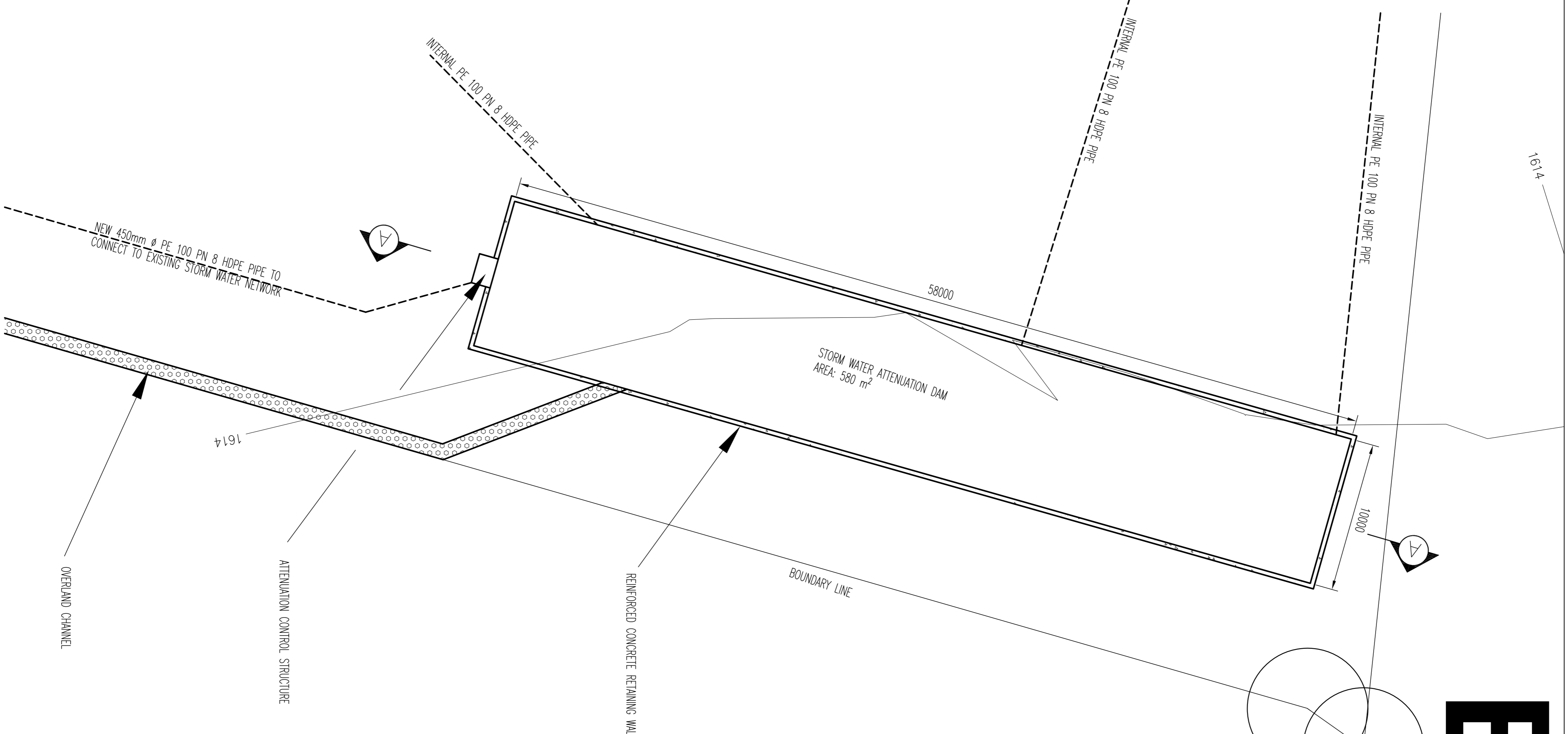


SECTION A-A
ATTENUATION CONTROL STRUCTURE
SCALE: NTS

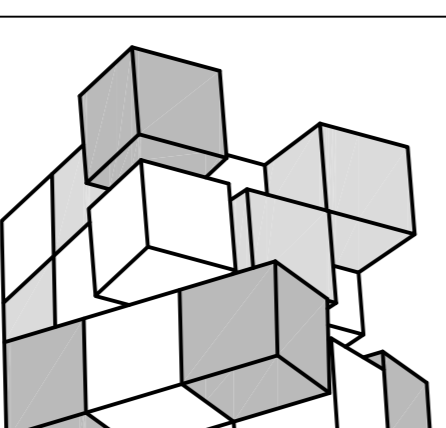


DETAIL 1 - TYPICAL LAYER WORKS BELOW CONCRETE SURFACE BED
SCALE: NTS

STORM WATER CATCHMENT AREA = 32 000m²
STORM WATER ATTENUATION VOLUME = 1276m³
STORM WATER ATTENUATION AREA = 580m²
MINIMUM DEPTH TO ACHIEVE VOLUME REQUIREMENT = 2.2m



LAYOUT - ATTENUATION DAM
SCALE: 1:200



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P.O. BOX 81317
PARKHURST 2120
(011) 792 2599
CPT OFFICE :
P.O. BOX 48405
KOMKLEUR 7976
(021) 783 5720
E-mail :
pieter@gant.co.za

PROJECT:
NEW LICENSING HUB, TEMBISA

STORM WATER ATTENUATION DAM

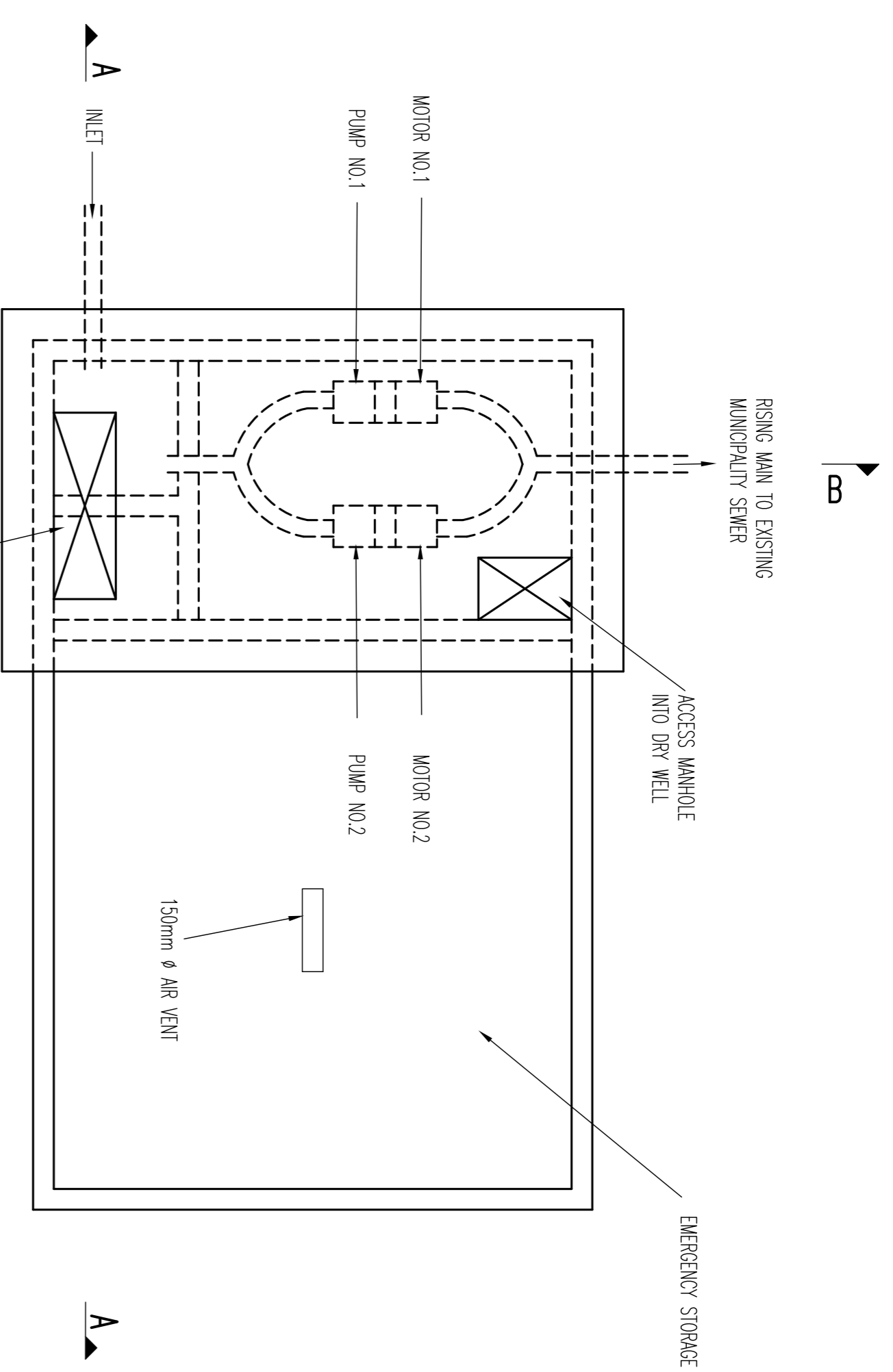
COMPUTER ID	
J.P.L. GOETE PR. ENG.	DRAMIN
REG. NO 940236	CO. HLONGWANE
SCALE	DATE
AS SHOWN	02/07/2015

15_02/02 GL

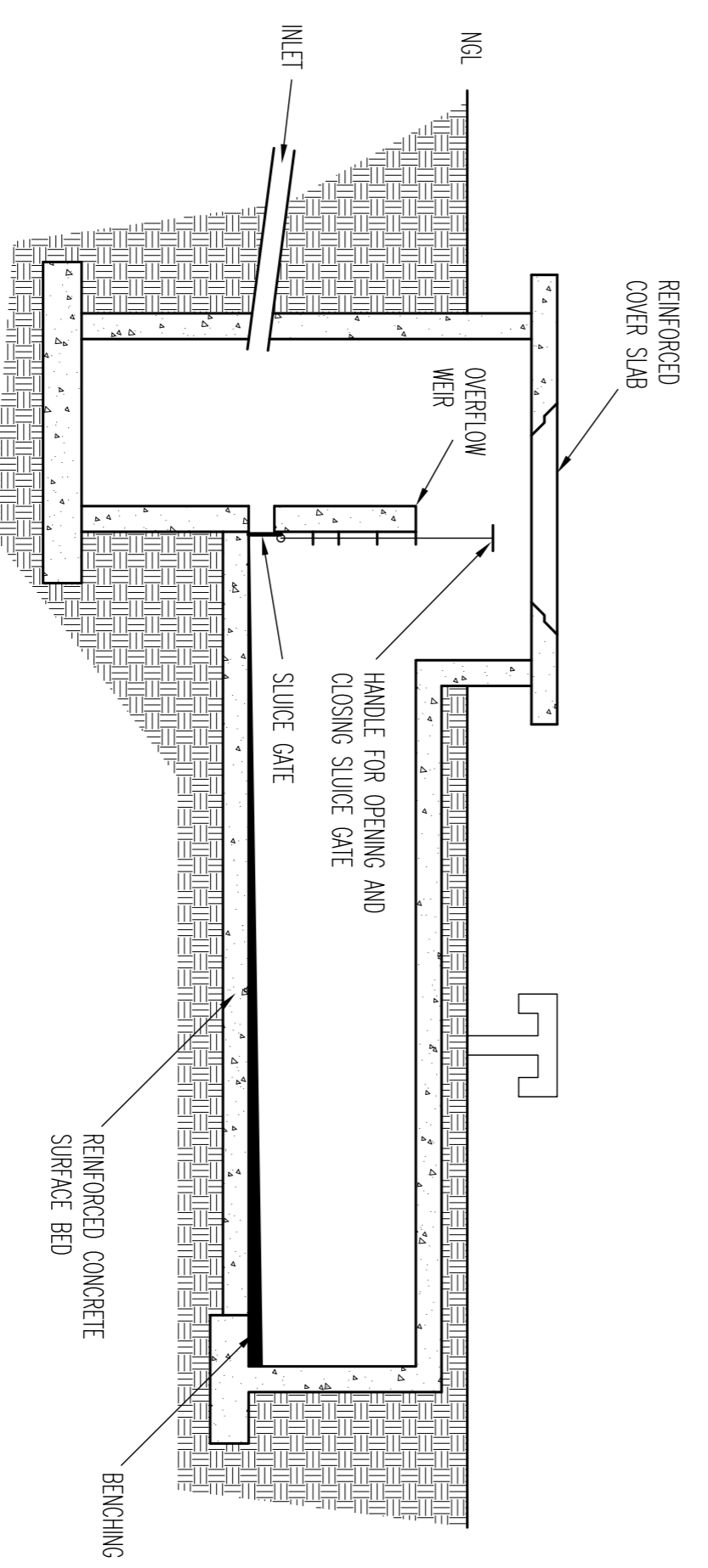
REVISIONS:
R1: ISSUED FOR INFORMATION

NOTES:

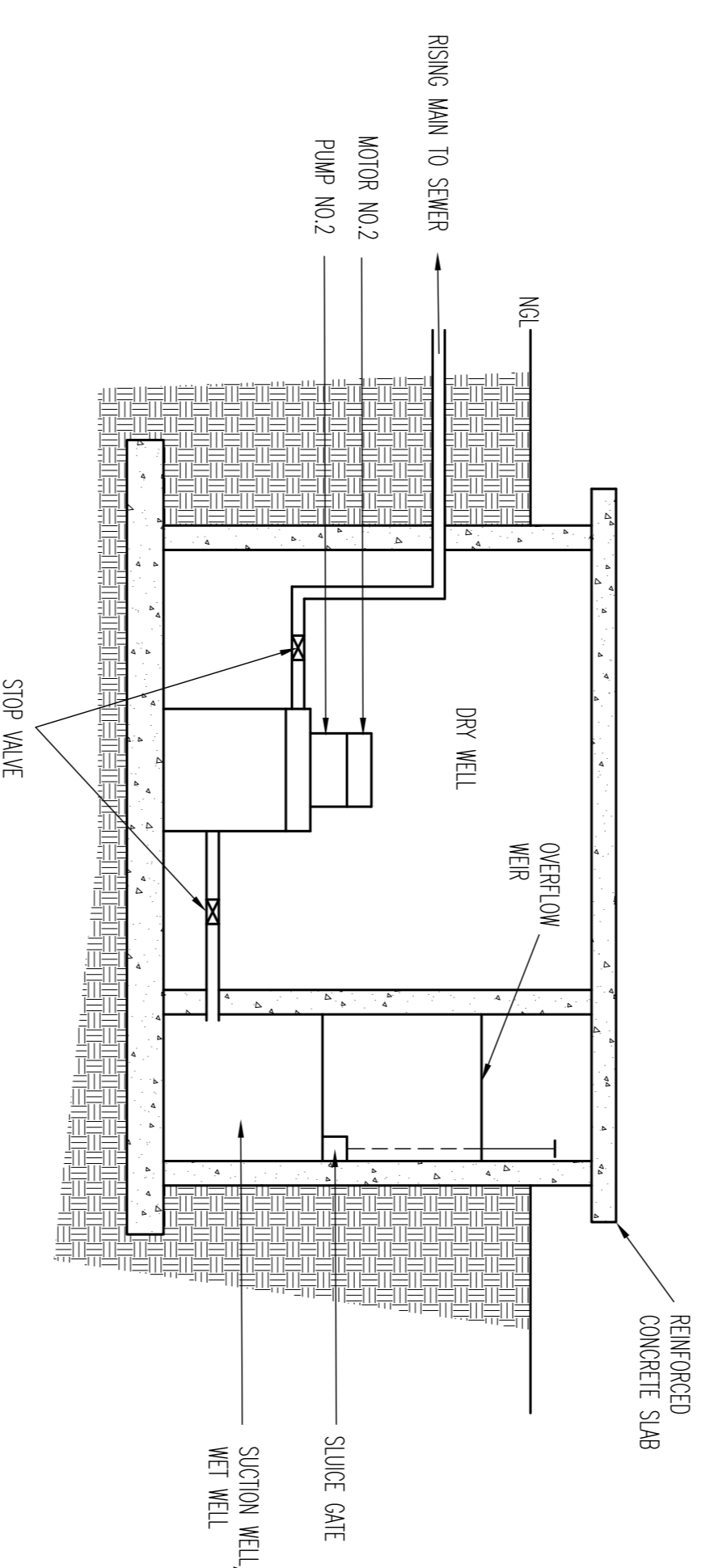
- 1) ALL REINFORCEMENT TO BE INSPECTED BY ENGINEER BEFORE CASTING CONCRETE
- 2) READ ALL DIMENSIONS IN CONJUNCTION WITH ARCHITECT'S
- 3) ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE OPENING PRE-CAST UNITS
- 4) COVER TO REINFORCEMENT MUST BE AS FOLLOWS:
SLABS 19mm
BEAMS 25mm
COLUMNS 30mm
FOUNDATIONS 50mm
- 5) CEMENT FOR MORTAR AND CONCRETE TO BE GEN II/A-S
- 6) FINE AGGREGATES USED IN MORTAR AND CONCRETE SHALL COMPLY WITH THE REQUIREMENTS OF SABS 1003
- 7) WATER USED FOR CONCRETE AND MORTAR SHALL COMPLY FREE OF ANY ORGANIC OR OTHER MATERIALS
- 8) BRICK TO BE USED IN CONSTRUCTION SHALL COMPLY WITH SABS 227. THE BRICKS USED IN THE BUILDING FROM THE FOUNDATION TO THE UNDERSIDE OF THE FIRST FLOOR SLAB SHALL HAVE A STRENGTH OF AT LEAST 25 MPa. THE BRICKS IN THE REST OF THE OF THE BUILDING SHALL HAVE A STRENGTH OF AT LEAST 15 MPa
- 9) THE MORTAR USED FOR THE CONSTRUCTION FROM THE FOUNDATION TO THE UNDERSIDE OF THE FIRST FLOOR SLAB SHALL BE CLASS 1 (14.5 MPa) ACCORDING TO SABS 0164.
- 10) MASONRY WALLS SHALL BE BONDED TOGETHER TO THE SATISFACTION OF THE ENGINEER. BRICKFORCE EVERY FIFTH COURSE WILL BE DEEMED SATISFACTORY. SPECIAL ATTENTION MUST BE PAID TO CORNERS WHERE A PROPER BOND IN ADDITION TO BRICKFORCE IS REQUIRED
- 11) NO OPENINGS, CHASES OR RECESSES WILL BE ALLOWED IN THE WALLS OTHER THAN THOSE SPECIFIED FOR WINDOWS AND DOORS BY THE ARCHITECT WITHOUT THE WRITTEN CONSENT OF THE ENGINEER. RECESSES MAY, SUBJECT TO A DECISION BY THE ENGINEER HAVE TO BE BRIDGED BY LINTELS. ALL RECESSES ARE TO BE BRICKLIED WITH CLASS 1 MORTAR TO THE SATISFACTION OF THE ENGINEER. NO CHASE OR RECESS WILL BE ALLOWED TO BE CUT IN A WALL WHICH IS LESS THAN 500mm BETWEEN OPENINGS.
- 12) THE CONSTRUCTION OF MASONRY WILL BE ACCORDING TO STANDARD BUILDING REGULATIONS OF SABS 0400
- 13) CONCRETE USED FOR FOOTINGS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 25 MPa AT 28 DAYS. ALL OTHER STRUCTURAL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 30 MPa AT 28 DAYS
- 14) ALL STRUCTURAL STEEL TO BE GRADE S355JR
- 15) ALL WORK TO BE IN COMPLIANCE WITH NATIONAL BUILDING REGULATIONS



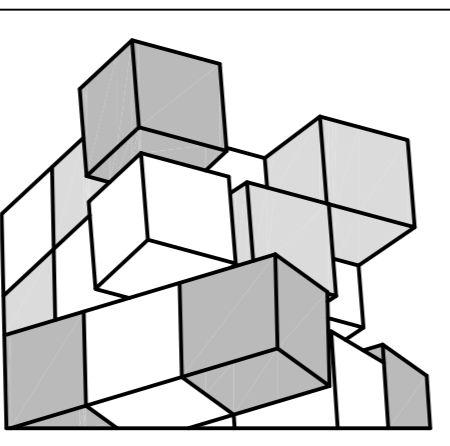
PLAN - TYPICAL DRY-WELL PUMP STATION AND EMERGENCY STORAGE
SCALE 1 : 50



SECTION A
SCALE 1 : 50



SECTION B
SCALE 1 : 50



PROJECT:
NEW LICENSING HUB, TEMBISA

GANT
PROJECT MANAGEMENT (PTY) LTD.
CONSULTING ENGINEERING
BUILT ENVIRONMENT PROFESSIONALS

JHB OFFICE :
P.O. BOX 81317
PARKHURST 2120
(011) 792 2359
CPT OFFICE :
P.O. BOX 48425
KOMKLEUE 7976
(021) 783 5720
E-mail :
petel@gant.co.za

TYPICAL DRY-WELL PUMP STATION AND EMERGENCY STORAGE

COMPUTER ID	DRAWN
J P L GOETE PR. ENG. REG. NO 940236	C O HLONGWANE
SCALE 1 : 50	DATE 03/07/2015

Traffic Impact Assessment



Appendix G10



TRAFFIC IMPACT STUDY

PROPOSED NEW EMM TEMBISA LICENSING HUB

30 June 2015



Report prepared by:



Corli Havenga Transportation Engineers

91 Tinderwood Crescent
Sand River Camp
WITFONTEIN X25
PO Box 133, SERENGETI, 1642

Tel: +27 (011) 552 7271
Fax: +27(011) 552 7272
Cell: 083 284 2860 (Corli)
Cell: 083 458 0066 (Cobus)

TRAFFIC IMPACT STUDY

PROPOSED NEW EMM TEMBISA LICENSING HUB

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ANNEXURE A

At the back of report

FIGURES 1 – 5

ANNEXURE B

PROPOSED TOWNSHIP LAYOUT: URBAN DYNAMICS

SITE PLAN: AXIS ARCHITECTS

EXTRACT FROM GAUTRANS STRATEGIC ROAD NETWORK PLANNING

ANNEXURE C

SECTION 7 REPORT (no 773B)



CC Reg No 91/30938/23

91 Tinderwood Cresc
Sand River Camp
WITFONTEIN X25
PO Box 133, SERENGETI, 1642
E-mail: chavenga@serengeti.co.za

Tel: +27(011) 552 7271
Fax: +27(011) 552 7272
Cell: 083 284 2860 (Corli)
Cell: 083 458 0066 (Cobus)

DECLARATION

It is herewith certified that this TRAFFIC IMPACT STUDY: PROPOSED NEW EMM
TEMBISA LICENSING HUB has been prepared according to requirements of the South African
Traffic Impact and Site Traffic Assessment Manual.

Signed: ... 

DATE: 30 June 2015

Name:	Corli Havenga
Qualification:	Pr Eng, B Eng Civil, M. Eng Transportation Engineering
ECSA Registration Number:	970277
Company:	Corli Havenga Transportation Engineers

TRAFFIC IMPACT STUDY

PROPOSED NEW EMM TEMBISA LICENSING HUB

1. BACKGROUND

This traffic impact study is done for the proposed new Ekurhuleni Licensing Hub on Portion 67 (a portion of Portion 15) of the farm Witfontein 15-IR. Portion 67 measures 7,0938ha.

A new licensing hub is planned for the Ekurhuleni Metropolitan Municipality similar in size to the licensing hub of the City of Tshwane in Centurion.

The proposed township layout by Urban Dynamics together the proposed preliminary Site Plan by The Creative Axis Architects is presented in Annexure B.

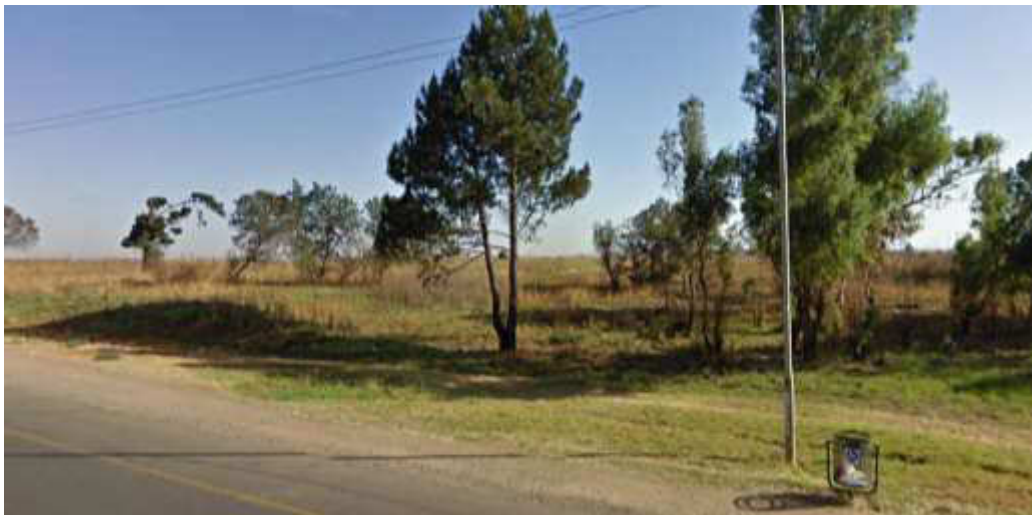
2. SITE LOCATION AND ACCESS

The site is located next to and on the northern side of Sam Molele Drive, east of Pretoria Road and just east of the railway line as depicted in Figure 1.

Access to the site will be off Sam Molele Drive. There is an existing access off Sam Molele Drive at the opposite side of the proposed development site (see photos below).



Sam Molele Dr direction east at gate to Esselen Park Sports Complex



The Site - Sam Molele Dr, facing north, opposite the gate to the Esselen Park Sports Complex



Sam Molele Dr direction west at gate to Esselen Park Sports Complex

There is also an access to Esselen Park off Sam Molele Drive approximately 750m west of this access (see photos below).



Sam Molele Dr direction east at access to Esselen Park



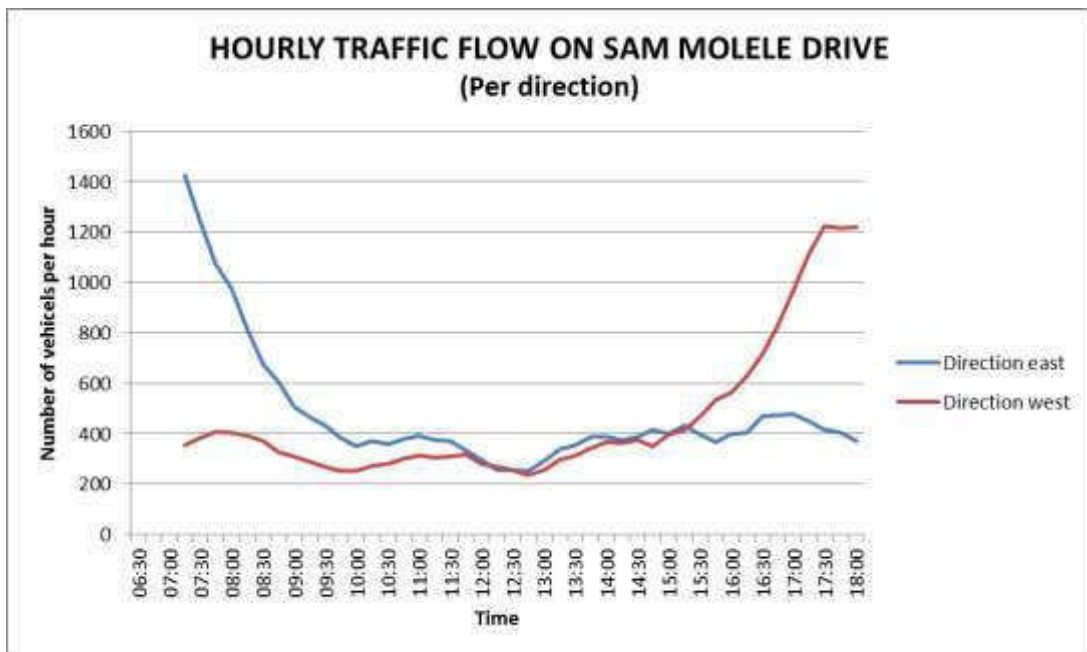
Access to Esselen Park off Sam Molele Dr

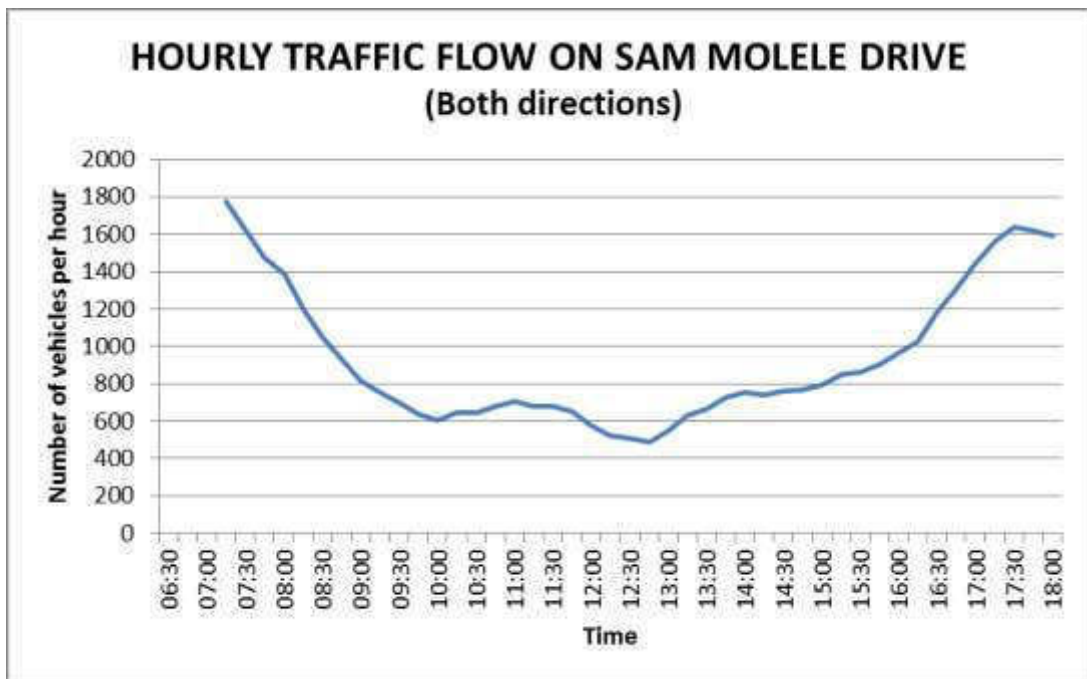


Sam Molele Dr direction west at access to Esselen Park

3. EXISTING TRAFFIC DEMAND

The existing traffic demand was obtained from counts conducted on Tuesday, 12 May 2015 from 06:15 until 18:00. The existing traffic demand on Sam Molele Drive on the section next to the proposed Licensing Hub is depicted in the graphs below.





The peak traffic hours are as follows:

Morning peak traffic hour: 06:15 – 07:15
 Afternoon peak traffic hour: 16:30 – 17:30

The existing peak hour traffic demand is depicted in Figure 2.

4. FUTURE ROAD NETWORK

4.1 Provincial roads

The existing road network and future road network in the area are depicted in the extract from the Gautrans Strategic Road Network Plan in Annexure B of this report. According to this plan the provincial road K60 runs on the alignment of Sam Molele Drive and K105 on Pretoria Road.

There is only a route determination available for the proposed K60 (Report no 773B,) and in terms of the Infrastructure Act, a Section 7 report is required. A copy of this report is presented in Annexure C.

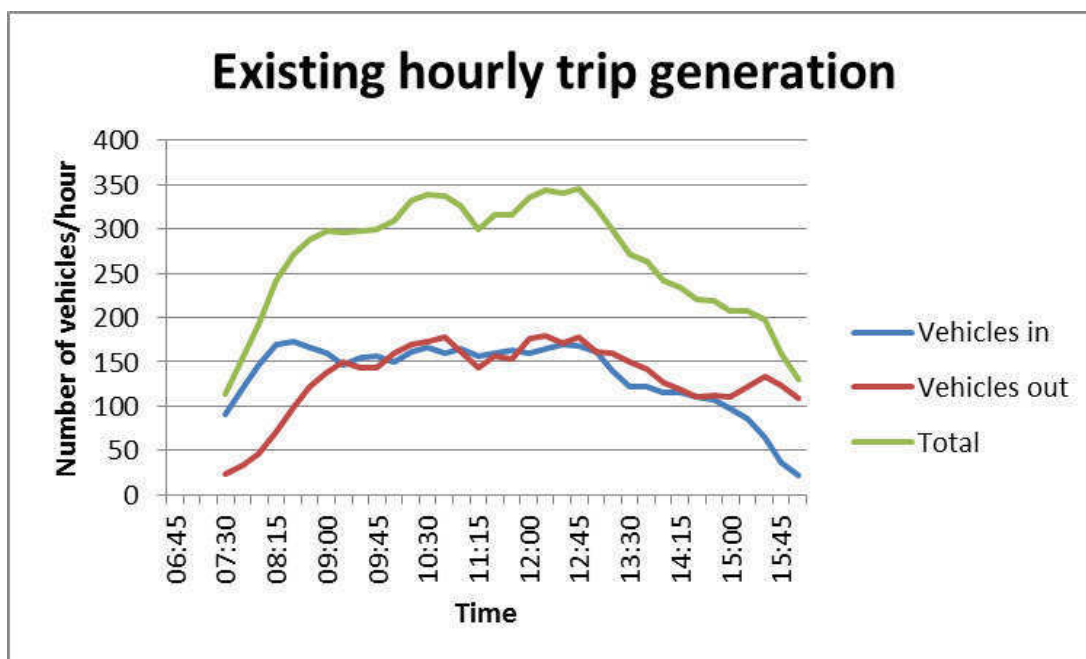
4.2 Local Road Network

There is still undeveloped land north of Sam Molele Drive. In terms of provincial access policy, an access off a provincial road should serve the area and not only an individual development. The proposed access off Sam Molele Drive should therefore be constructed in such a way as to provide access to the remaining land north of Sam Molele Drive.

5. TRIP GENERATION

There are no trip generation rates available for a licensing hub in the “South African Trip Data Manual”⁽¹⁾. The proposed facility will however be similar to the fully functional facility of the City of Tshwane in Centurion. In order to obtain a realistic expected peak hour trip generation for the proposed facility, we conducted a full day survey at the existing facility in Centurion. The survey was conducted on Tuesday, 26 May 2014 from 6:30 until 16:00. The office hours run only until 15:30.

The results of that survey are depicted in the graphs below.



As can be seen in the graph, the proposed development is not a peak traffic hour trip generator (the highest hourly trip generation occurred outside the normal peak hour on the adjacent road network).

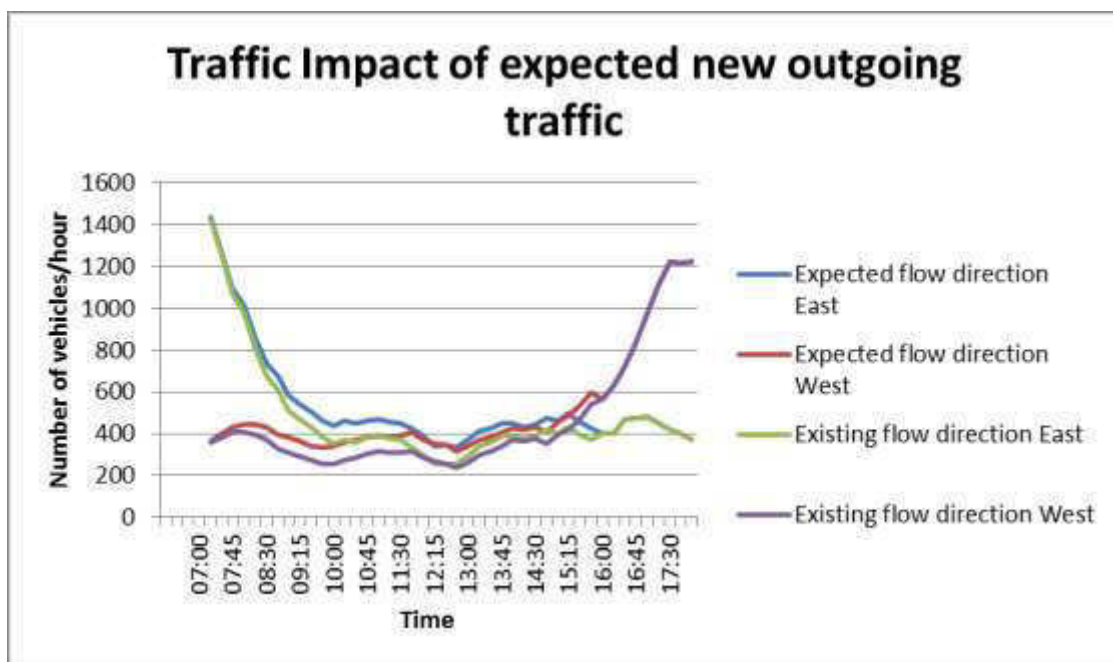
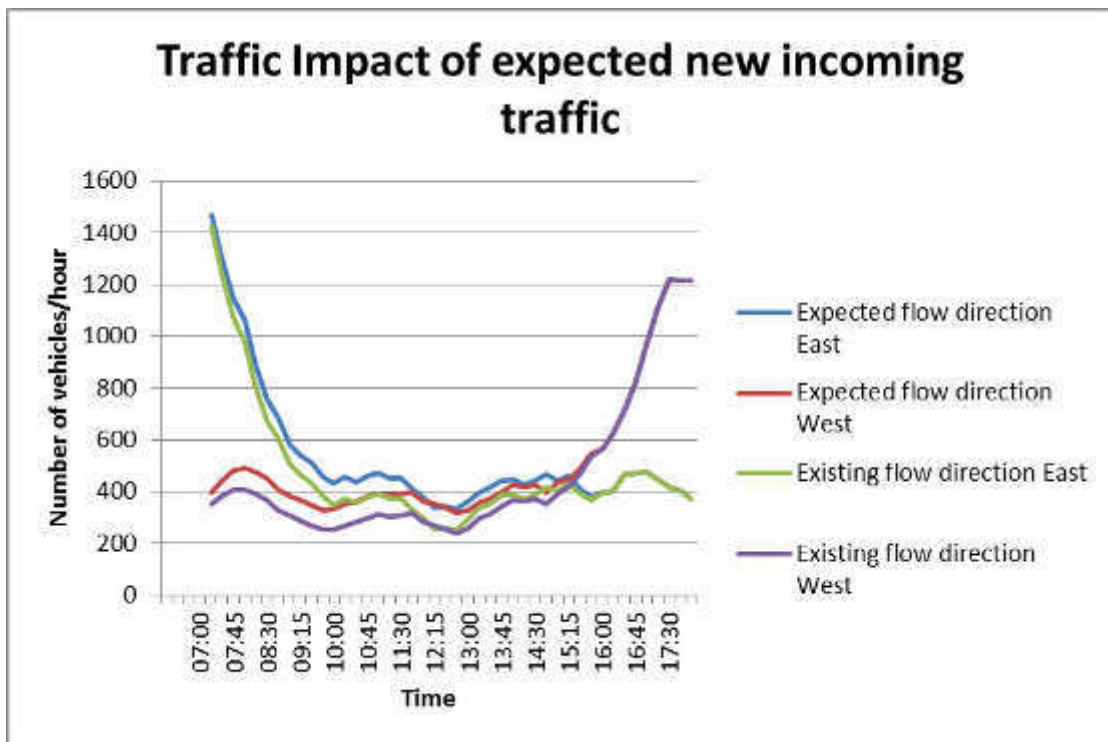
As stated, the peak traffic hours on Sam Molele drive are:

Morning peak traffic hour:	06:15 – 07:15
Afternoon peak traffic hour:	16:30 – 17:30

The highest trip generation rates recorded were:

9:30 – 10:30	338 vehicles with a split of 49:51 (166 vehicles in and 172 vehicles out)
11:45 – 12:45	345 vehicles with a split of 49:51 (168 vehicles in and 177 vehicles out)

In order to determine the traffic impact of the proposed development on Sam Molele Drive, the above recorded trip generation was added to the existing traffic demand. The results are depicted in the graphs below.



As can be seen from the graphs, the worst-case traffic scenario will be during the morning peak hour. The expected morning peak hour trip generation of the proposed licensing hub (based on the recorded trip generation) is presented in Table 1.

A.m. peak hour	Directional split (in/out)	Total number of trips	New trips in	New trips out
06:15 – 07:15	80:20	113	90	23

Table 1: Expected weekday morning peak hour trip generation

Based on the above, the proposed new licensing hub will not have a weekday afternoon peak hour trip generation.

6. TRIP ASSIGNMENT

The expected peak hour trip assignment from the proposed development is depicted in Figure 3.

7. LATENT RIGHTS AND BACKGROUND TRAFFIC GROWTH

There are no specific planned new developments in the area that can be included as latent rights. Sam Molele Drive is one of the major roads into Tembisa, with a big growth potential. A traffic growth rate of 4% per annum will be applied for future design scenarios.

8. CAPACITY ANALYSIS

The aaSIDRA 5.1 software package⁽²⁾ was used to simulate the operating conditions of the adjacent intersection from which access will be obtained.

The following design scenarios were adopted for the purposes of this investigation:

- Scenario 1: Existing (2015) a.m. peak hour traffic demand (Figure 2).
- Scenario 2: Existing (2015) a.m. peak hour traffic demand with the addition of the expected traffic generated by the licensing hub (Figure 4).
- Scenario 3: Expected (2020) a.m. peak hour traffic demand with an annual growth rate of 4% and the traffic generated by the proposed developments (Figure 5).

The following parameters were used to evaluate the capacity analysis:

The capacity analysis was done with a PHF of 0,95. Queue lengths are averaged queue lengths.

The operation of priority-controlled intersections is acceptable when the following conditions are met for each individual turning movement:

Period	Maximum Volume/Capacity	Minimum Level of service (TRB 2004)
Normal 15-minute peak	85%	D

Table 2: Performance measures priority-controlled intersections

For signalised intersections the following will apply:

Period	Maximum Volume/Capacity	
	Left-turn/through	Right-turn
Normal 15-minute peak	90%	95%

Table 3: Performance measures for signalised intersections

Where these conditions cannot be met, the conditions are acceptable when the following circumstances are met on each approach:

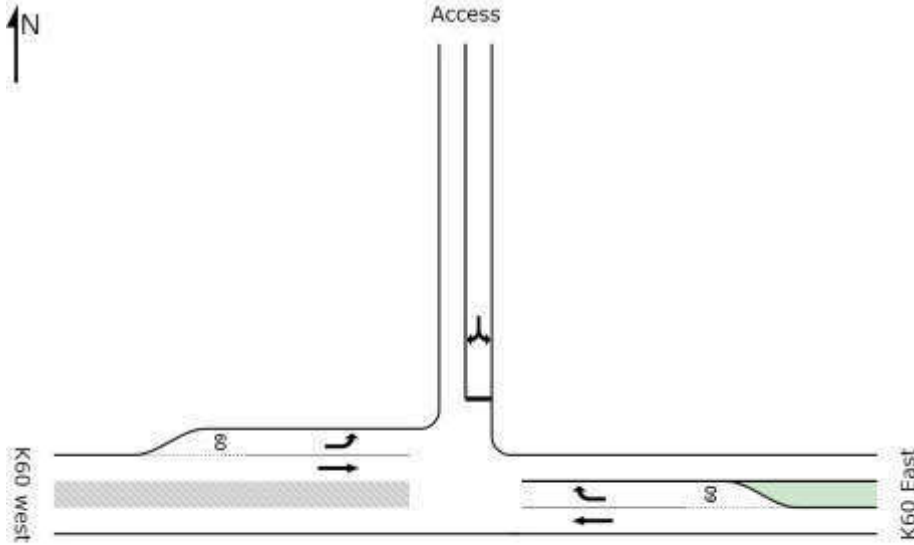
Period	Maximum Volume/Capacity		Minimum Level of service (TRB 2004)	
	LT & ST	RT	LT & ST	RT
Normal 15-minute peak	95%	100%	D	E

L – Left-turn, T – Through, R – Right-turn

Table 4: Performance measures for signalised intersections

8.1 Intersection: Access & Sam Molele Street (K60) – minimum cost layout

Scenario 2



Operating conditions:

Weekday A.M. Peak Hour

Approach	Turn	V/C	LOS	Delay	Queue length
South	L				
	T				
	R				
Approach					
East	L				
	T	0.192	A	0	0
	R	0.524	F	77.4	5.6
Approach		0.524	NA	8.7	5.6
North	L	0.472	F	100	3.8
	T				
	R	0.472	F	99.9	3.8
Approach		0.472	F	99.9	3.8
West	L	0.026	A	8.2	0
	T	0.768	A	0	0
	R				
Approach		0.768	NA	0.3	0
All Vehicles		0.768	NA	3.3	5.6

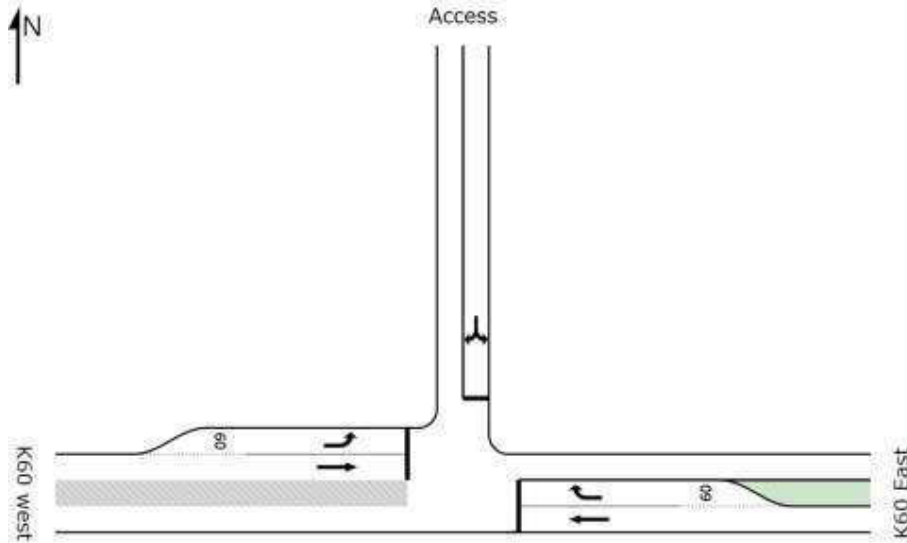
With stop control on the new access and the following improvements:

- 60m left-turn lane on western approach; and
- 60m right-turn lane on eastern approach

The approaches to the intersection as well as the individual movements on each approach operate at acceptable levels of service except the northern approach and the right-turn on the eastern approach. The unacceptable level of service “F” is due to long delays (average of more than one minute per vehicle). The high traffic volume from Tembisa eastwards results in very limited gaps for vehicles. Only a small number of right-turn vehicles are affected in comparison to the rest of the traffic volume.

8.2 Intersection: Access & Sam Molele Street (K60) – minimum cost layout with traffic lights

Scenario 2



Operating conditions:

Weekday A.M. Peak Hour

Approach	Turn	V/C	LOS	Delay	Queue length
South	L				
	T				
	R				
Approach					
East	L				
	T	0.25	A	3.2	0
	R	0.538	E	59.1	5.6
Approach		0.538	A	9.5	19.9
North	L	0.13	D	49.6	3.8
	T				
	R	0.13	D	49.7	3.8
Approach		0.13	D	49.6	4.3
West	L	1	B	10.8	0
	T	1	E	61.1	0
	R				
Approach		1	E	59.5	468.4
All Vehicles		1	D	48.8	468.4

With traffic signals and the following improvements:

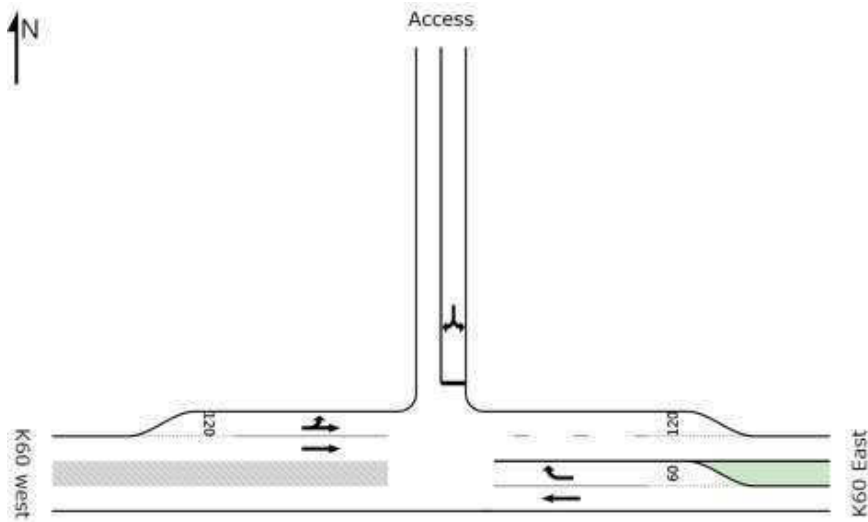
- 60m left-turn lane on western approach; and
- 60m right-turn lane on eastern approach

The intersection operates at acceptable levels of service except the right-turn on the eastern approach and the through movement on the western approach. The highest traffic demand is the worst affected with an average queue of 468m.

The implementation of traffic lights will severely affect the traffic flow on K60. It will not be warranted **and cannot** be supported.

8.3 Intersection: Access & Sam Molele Street (K60) - with additional capacity for highest traffic demand

Scenario 2



Operating conditions:

Weekday A.M. Peak Hour

Approach	Turn	V/C	LOS	Delay	Queue length
South	L				
	T				
	R				
Approach					
East	L				
	T	0.192	A	0	0
	R	0.524	F	77.3	5.6
Approach		0.524	NA	8.7	5.6
North	L	0.472	F	100	3.8
	T				
	R	0.472	F	99.9	3.8
Approach		0.472	F	99.9	3.8
West	L	0.305	A	8.2	0
	T	0.489	A	0	0
	R				
Approach		0.489	NA	0.3	0
All Vehicles		0.524	NA	3.3	5.6

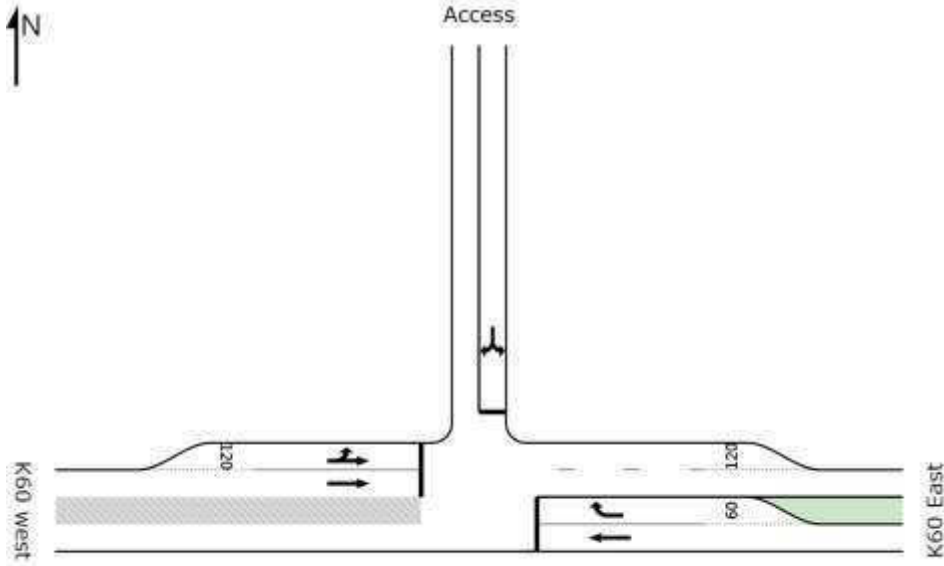
With stop control on the new access and the following improvements:

- 120m left-turn and through lane on western approach;
- 120m through lane downstream east of intersection; and
- 60m right-turn lane on eastern approach

The approaches to the intersection as well as the individual movements on each approach operate at acceptable levels of service except the northern approach and the right-turn on the eastern approach. The unacceptable level of service "F" is due to long delays (average of more than one minute per vehicle). The high traffic volume from Tembisa eastwards results in very limited gaps for vehicles. Only a small number of right-turn vehicles are affected in comparison to the rest of the traffic volume.

8.4 Intersection: Access & Sam Molele Street (K60) - with additional capacity for highest traffic demand and traffic lights

Scenario 2



Operating conditions:

Weekday A.M. Peak Hour

Approach	Turn	V/C	LOS	Delay	Queue length
South	L				
	T				
	R				
Approach					
East	L				
	T	0.25	A	3.2	19.9
	R	0.288	C	23.6	5.6
Approach		0.288	A	5.5	19.9
North	L	0.13	D	49.6	4.3
	T				
	R	0.13	D	49.7	4.3
Approach		0.13	D	49.6	4.3
West	L	0.436	B	11.7	29
	T	0.699	A	5	97.60
	R				
Approach		0.699	A	5.2	97.6
All Vehicles		0.699	A	5.8	97.6

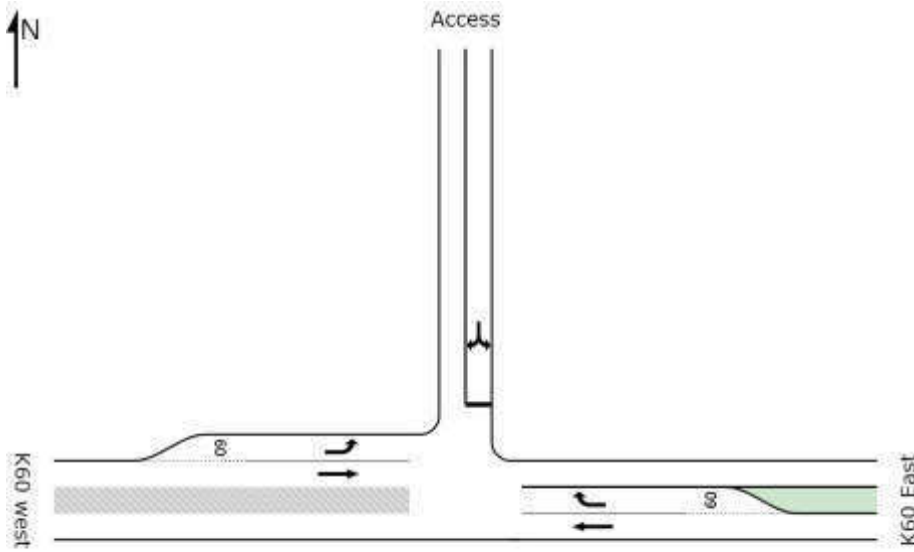
With traffic signals and the following improvements:

- 120m left-turn and through lane on western approach;
- 120m through lane downstream east of intersection; and
- 60m right-turn lane on eastern approach

The intersection operates at acceptable levels of service. The implementation of traffic lights will however still not be warranted. With this layout, the implementation of vehicle activated traffic lights can be considered.

8.5 Intersection: Access & Sam Molele Street (K60) – minimum cost layout

Scenario 3



Operating conditions:

Weekday A.M. Peak Hour

Approach	Turn	V/C	LOS	Delay	Queue length
South	L				
	T				
	R				
Approach					
East	L				
	T	0.233	A	0	0
	R	0.817	F	284.1	8.4
Approach		0.817	NA	15.5	8.4
North	L	1.0 ⁴	F	430.7	12.6
	T				
	R	1.0 ⁴	F	430.6	12.6
Approach		1	F	430.6	12.6
West	L	0.037	A	8.2	0
	T	0.93	A	0	0
	R				
Approach		0.93	NA	0.3	0
All Vehicles		1	NA	7.7	12.6

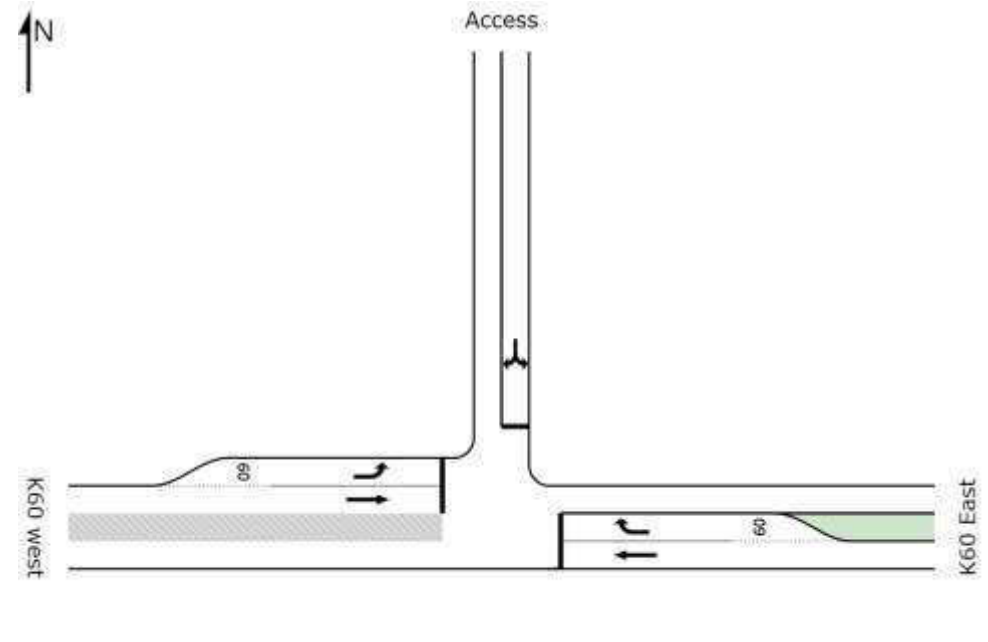
With stop control on the new access and the following improvements:

- 60m left-turn lane on western approach; and
- 60m right-turn lane on eastern approach

The northern approach and the right-turn on the eastern approach operate at an unacceptable level of service "F", due to long delays (average of more than 7 minutes per vehicle on northern approach and 4 minutes for right-turning vehicles on eastern approach). The high traffic volume from Tembisa eastwards results in very limited gaps for vehicles.

8.6 Intersection: Access & Sam Molele Street (K60) – minimum cost layout with traffic lights

Scenario 3



Operating conditions:

Weekday A.M. Peak Hour

Approach	Turn	V/C	LOS	Delay	Queue length
South	L				
	T				
	R				
Approach					
East	L				
	T	0.29	A	2.2	20.7
	R	0.538	E	59.1	9.7
Approach		0.538	A	7.6	20.7
North	L	0.168	D	52.3	4.5
	T				
	R	0.168	D	52.4	4.5
Approach		0.168	D	52.3	4.5
West	L	0.053	A	9.9	1.7
	T	1.151	F	176.6	908.8
	R				
Approach		1.151	F	172.4	908.8
All Vehicles		1.151	F	136.6	908.8

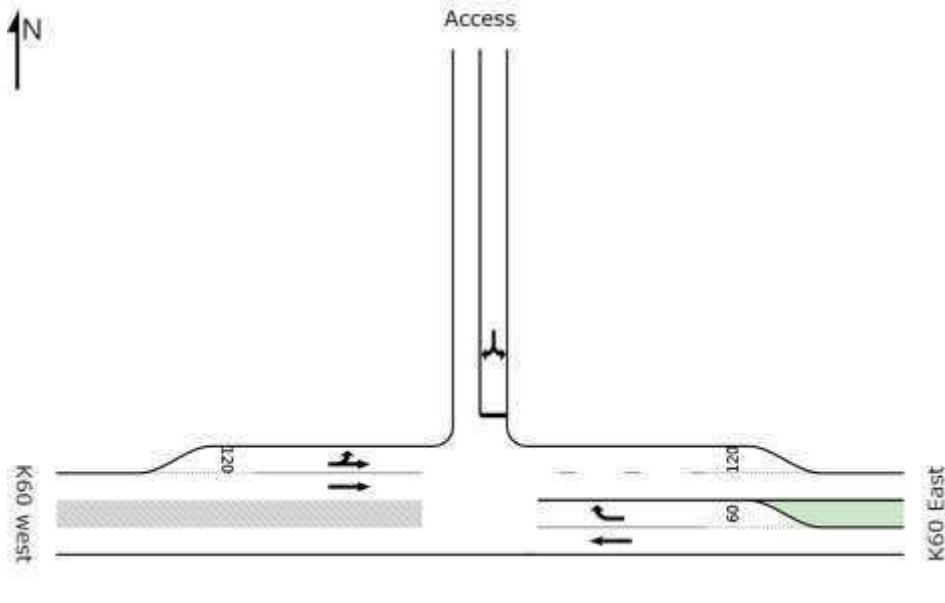
With traffic signals and the following improvements:

- 60m left-turn lane on western approach; and
- 60m right-turn lane on eastern approach

The intersection operates at an unacceptable level of service. The highest traffic demand is the worst affected with an average queue of 909m.

8.7 Intersection: Access & Sam Molele Street (K60) - with additional capacity for highest traffic demand

Scenario 3



Operating conditions:

Weekday A.M. Peak Hour

Approach	Turn	V/C	LOS	Delay	Queue length
South	L				
	T				
	R				
Approach					
East	L				
	T	0.233	A	0	0
	R	0.817	F	283.9	8.4
Approach		0.817	NA	15.5	8.4
North	L	1 ⁴	F	430.7	12.6
	T				
	R	1 ⁴	F	430.6	12.6
Approach		1	F	430.6	12.6
West	L	0.037	A	8.2	0
	T	0.934	A	0	0
	R				
Approach		0.934	NA	0.3	0
All Vehicles		1	NA	7.7	12.6

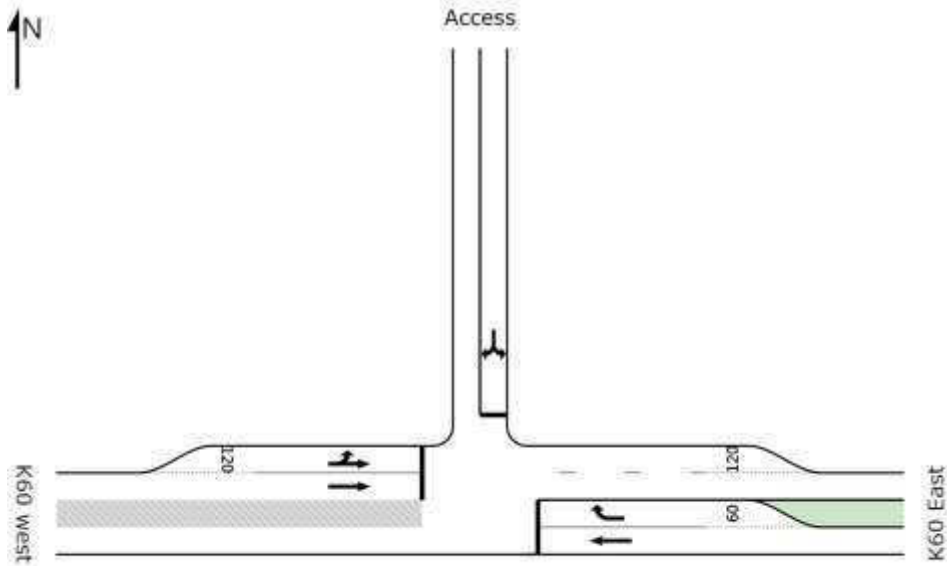
With stop control on the new access and the following improvements:

- 120m left-turn and through lane on western approach;
- 120m through lane downstream east of intersection; and
- 60m right-turn lane on eastern approach

The northern approach and the right-turn on the eastern approach operate at an unacceptable level of service "F", due to long delays (average of more than 7 minutes per vehicle on northern approach and more than 4 minutes for vehicles turning right on eastern approach). The high traffic volume from Tembisa eastwards results in very limited gaps for vehicles.

8.8 Intersection: Access & Sam Molele Street (K60) - with additional capacity for highest traffic demand and traffic lights

Scenario 3



Operating conditions:

Weekday A.M. Peak Hour

Approach	Turn	V/C	LOS	Delay	Queue length
South	L				
	T				
	R				
Approach					
East	L				
	T	0.288	A	2.2	20.7
	R	0.388	C	26.3	6.3
Approach		0.388	A	4.5	20.7
North	L	0.168	D	52.3	4.5
	T				
	R	0.168	D	52.4	4.5
Approach		0.168	D	52.3	4.5
West	L	0.494	B	10.7	31.4
	T	0.793	A	4.1	123.2
	R				
Approach		0.793	A	4.2	123.2
All Vehicles		0.793	A	4.8	123.2

With traffic signals and the following improvements:

- 120m left-turn and through lane on western approach; 120m through lane downstream east of intersection; and
- 60m right-turn lane on eastern approach

The intersection operates at acceptable levels of service.

9. ACCESS TO EMM LICENSING HUB

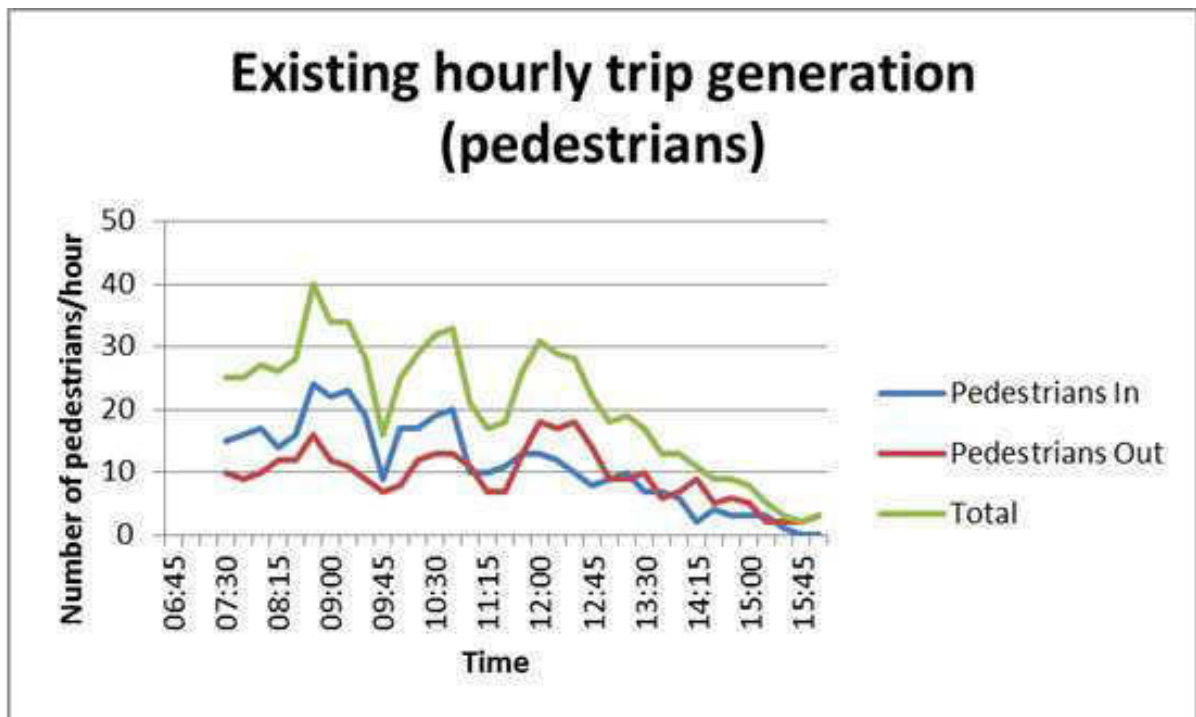
The access to the development off Sam Molele Drive will need to comply with the minimum requirements set by Gautrans. The detail design will need to be done in consultation with Gautrans and wayleave will be required from Gautrans. The following will (amongst others) be required:

- Minimum of 100m measured from the proposed road reserve of the future K60 (the existing Sam Molele Drive will become the southern lane of the future dual carriage-way) to the centre line of proposed access off the new access road.
- The proposed new access off the future K60 should serve the area and not only the proposed development.
- The access to the proposed new development off Sam Molele Drive should be located directly opposite the existing access to the Esselen Park Sport Complex.

10. PUBLIC TRANSPORT

Sam Molele Drive is a major public transport route.

Based on the pedestrian counts at the Centurion facility, the expected public transport demand is depicted in the graph below.



The highest hourly pedestrian demand recorded was between 07:45 and 08:45:

- 40 pedestrians (24 in and 16 out)

This represents 3 taxis. This demand does not warrant the provision of public transport facilities at this stage.

11. ROAD IMPROVEMENTS

11.1 Intersection Sam Molele and Access

The following is proposed, but the final design will be determined in consultation with Gautrans at wayleave application stage and may be significantly different than the minimum requirement proposed below:

- Stop control on access road;
- 60m right-turn lane on eastern approach; and
- 60m left-turn lane on western approach.

A design could however include the following:

- Stop control on access road;
- 60m right-turn lane on eastern approach;
- 60m left-turn slip lane on western approach; and
- Bus/taxi lay-byes on both sides of the new intersection along K60.

Vehicles turning right from Sam Molele Drive will experience some delays during the morning peak hour, as will vehicles on the access road turning left and right onto Sam Molele Drive. However, only a few vehicles will be affected.

At an annual traffic growth rate of 4% the following is proposed in 2020:

- Vehicle actuated traffic lights;
- 120m left-turn and through lane on western approach;
- 120m through lane downstream east of intersection; and
- 60m right-turn lane on eastern approach.

12. CONCLUSION AND RECOMMENDATION

This traffic impact study is done for the proposed new Ekurhuleni Licensing Hub on Portion 67 (a portion of Portion 15) of the farm Witfontein 15-IR. Portion 67 measures 7.0938ha.

The site is located next to and on the northern side of Sam Molele Drive east of Pretoria Road and just east of the railway line. Access to the site will be off Sam Molele Drive. Sam Molele Drive is part of the provincial road network, becoming K60 in future. Access approval will be required from Gautrans. There is no Preliminary Design available for this section. In terms of the Gauteng Transport Infrastructure Act 2001, a Section 7 report is required (see copy attached).

The access to the development off Sam Molele Drive will need to comply with the minimum requirements set by Gautrans. The detail design will need to be done in consultation with Gautrans and wayleave will be required from Gautrans. The following will (amongst others) be required:

- Minimum of 100m measured from the proposed road reserve of the future K60 (the existing Sam Molele Drive will become the southern lane of the future dual carriage-way) to the centre line of proposed access off the new access road.
- The proposed new access off the future K60 should serve the area and not only the proposed development.
- The access to the proposed new development off Sam Molele Drive should be located directly opposite the existing access to the Esselen Park Sport Complex.

The expected traffic demand from the proposed facility was obtained from a survey done at a similar facility in Centurion. .

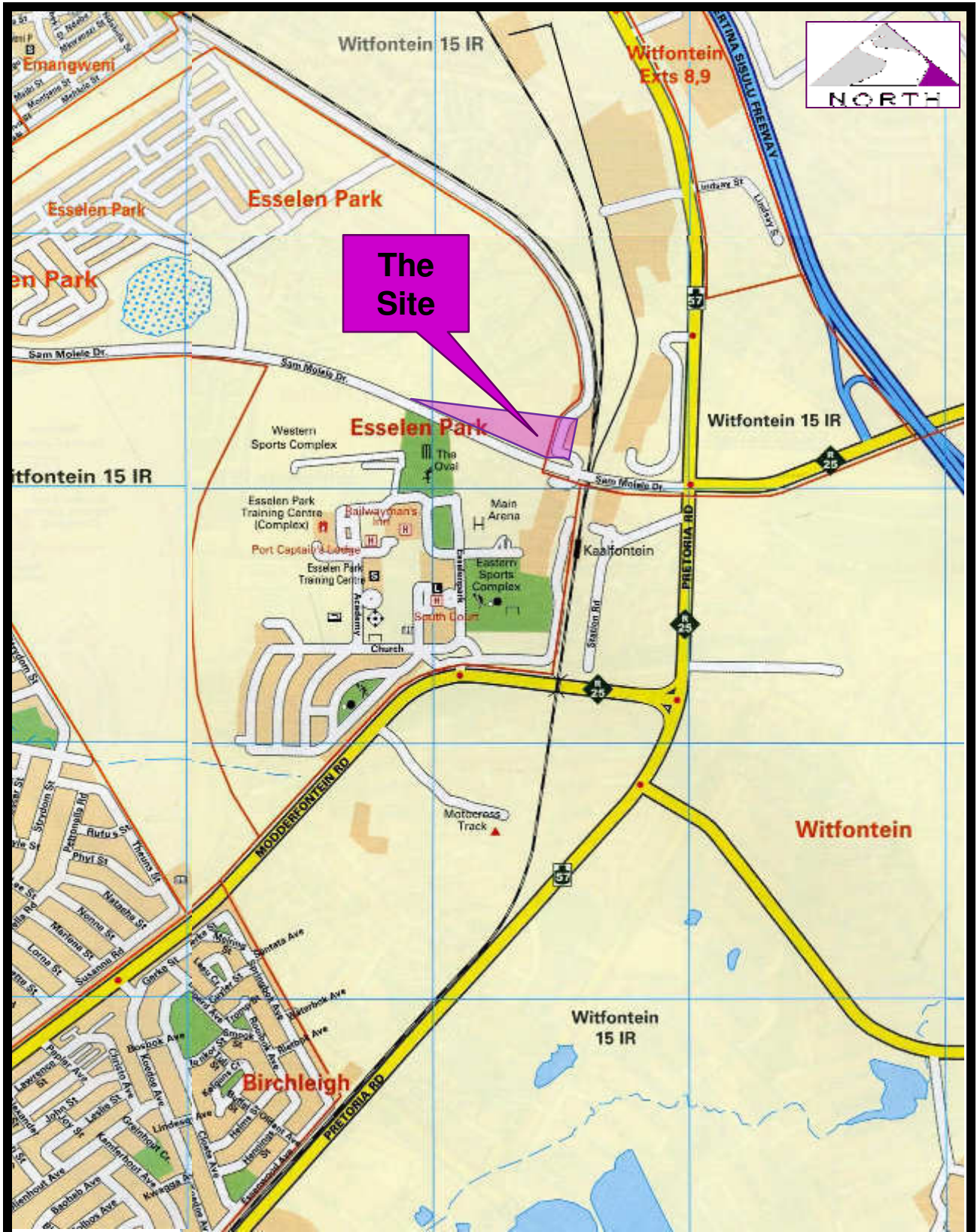
The proposed development is supported from a traffic flow point of view. It is further recommended that:

- 12.1 Access be off Sam Molele Drive directly opposite the access to the Esselen Park Sports Complex;
- 12.2 Provision be made for the following in the layout in terms of the Section 7 report:
 - Future road reserve of K60;
 - 25m access road from the K60 opposite the Esselen Park Sports Complex's access; and
 - 15mx45m splays at the intersection on K60.
- 12.3 In terms of the Gauteng Transport Infrastructure Act the road reserve of K60 is excluded from the application;
- 12.4 Provision is made to reinstate access to Transnet via the new access on K60 and the access to the development; and
- 12.5 The applicant to implement the new access on Sam Molele Drive with the following minimum upgrades (subject to approval from Gautrans):
 - Stop control on access road;
 - 60m right-turn lane on eastern approach; and
 - 60m left-turn lane on western approach.

13. REFERENCES

- (1) COTO, South African Trip Data Manual Version 1, September 2012.
- (2) ARRB Transport Research Ltd, aaSIDRA 5.1, Akcelik & Associates Pty Ltd, Greythorn, Victoria, Australia.
- (3) COTO, South African Traffic Impact Standards Site traffic Assessment Standards and Requirements Manual, TMH 16 Volume, 2 August 2012.

ANNEXURE A

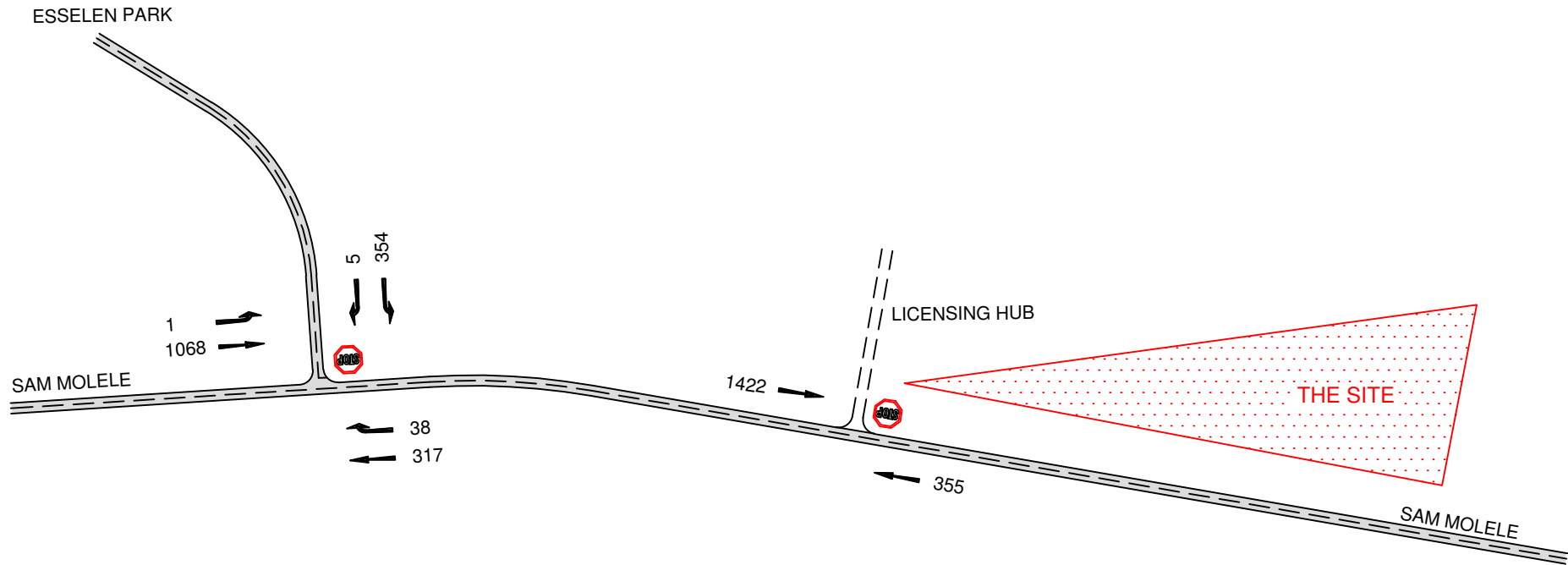


**TRAFFIC IMPACT STUDY
PORTION 67 OF FARM WITFONTEIN NO. 15 IR**

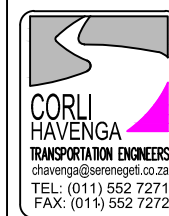
FIGURE 1: SITE LOCATION PLAN

SCALE : N/A

PP21125



NOTES:
7
FIGURES DEPICT ALL VEHICLES
7 - WEEKDAY A.M. PEAK HOUR TRAFFIC FLOW



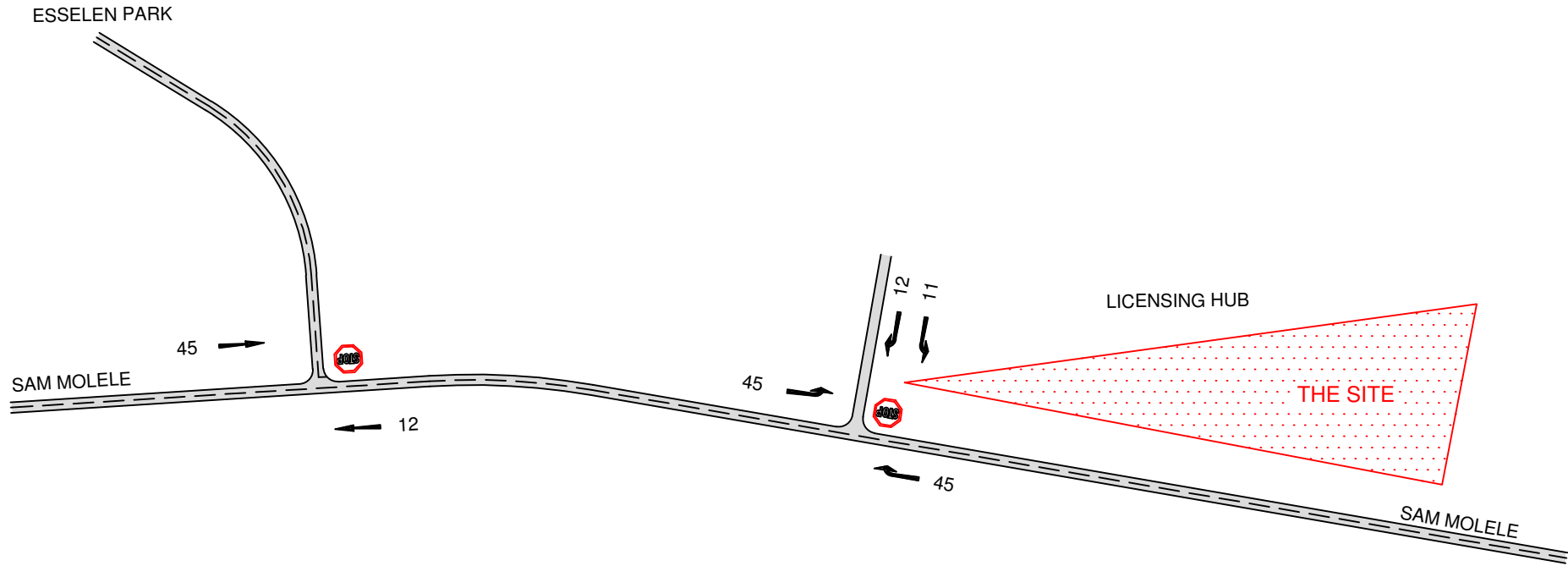
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GANT PROJECT MANAGEMENT (PTY) LTD.

TITLE:
TRAFFIC IMPACT STUDY
EMM LICENSING HUB

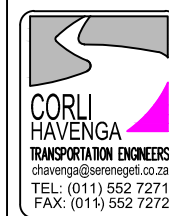
EXISTING PEAK HOUR
TRAFFIC DEMAND
SCENARIO 1

SCALE: NA PP21125

FIGURE: 2



NOTES:
7
FIGURES DEPICT ALL VEHICLES
7 - WEEKDAY A.M. PEAK HOUR TRAFFIC FLOW

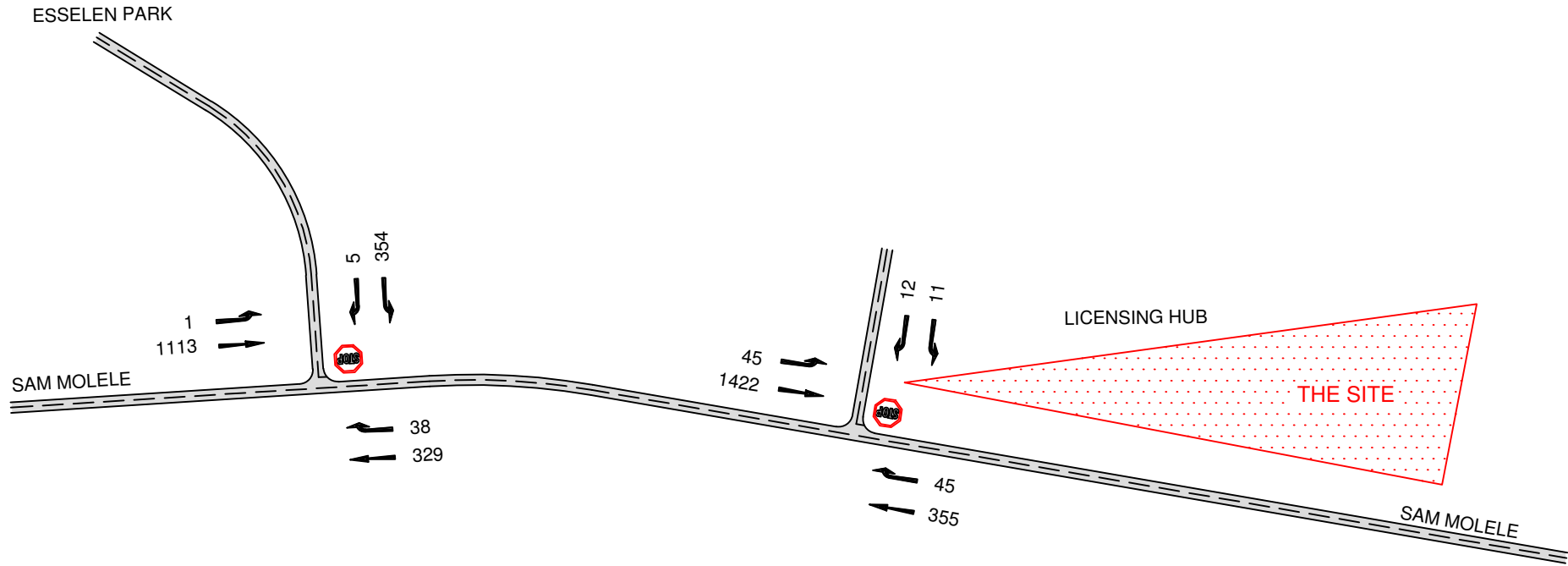


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GANT PROJECT MANAGEMENT (PTY) LTD.

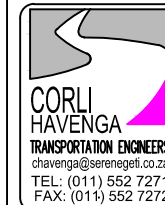
TITLE:
TRAFFIC IMPACT STUDY
EMM LICENSING HUB

EXPECTED PEAK HOUR
TRIP ASSIGNMENT

SCALE: NA	PP21125
FIGURE: 3	



NOTES:
7
FIGURES DEPICT ALL VEHICLES
7 - WEEKDAY A.M. PEAK HOUR TRAFFIC FLOW



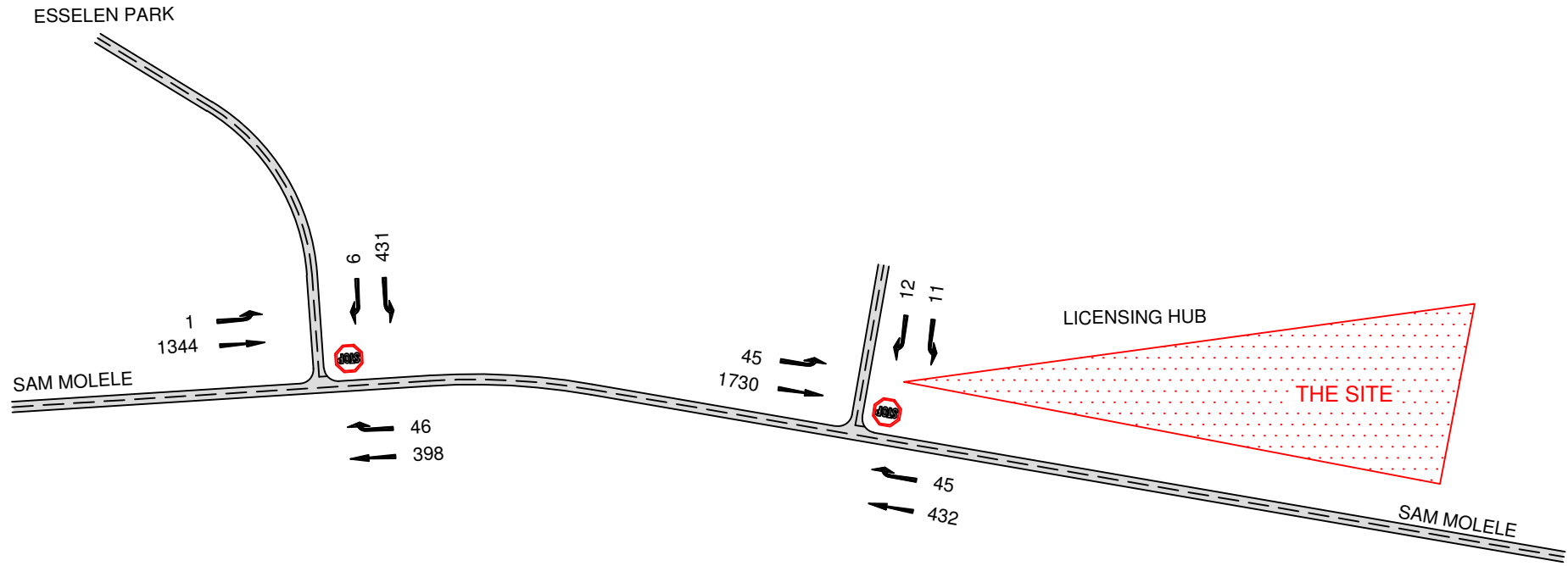
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TITLE:
TRAFFIC IMPACT STUDY
EMM LICENSING HUB

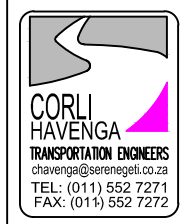
EXPECTED PEAK HOUR
TRAFFIC DEMAND
SCENARIO 2

SCALE: NA PP21125

FIGURE: 4



NOTES:
7
FIGURES DEPICT ALL VEHICLES
7 - WEEKDAY A.M. PEAK HOUR TRAFFIC FLOW



CLIENT:
GANT PROJECT MANAGEMENT (PTY) LTD.

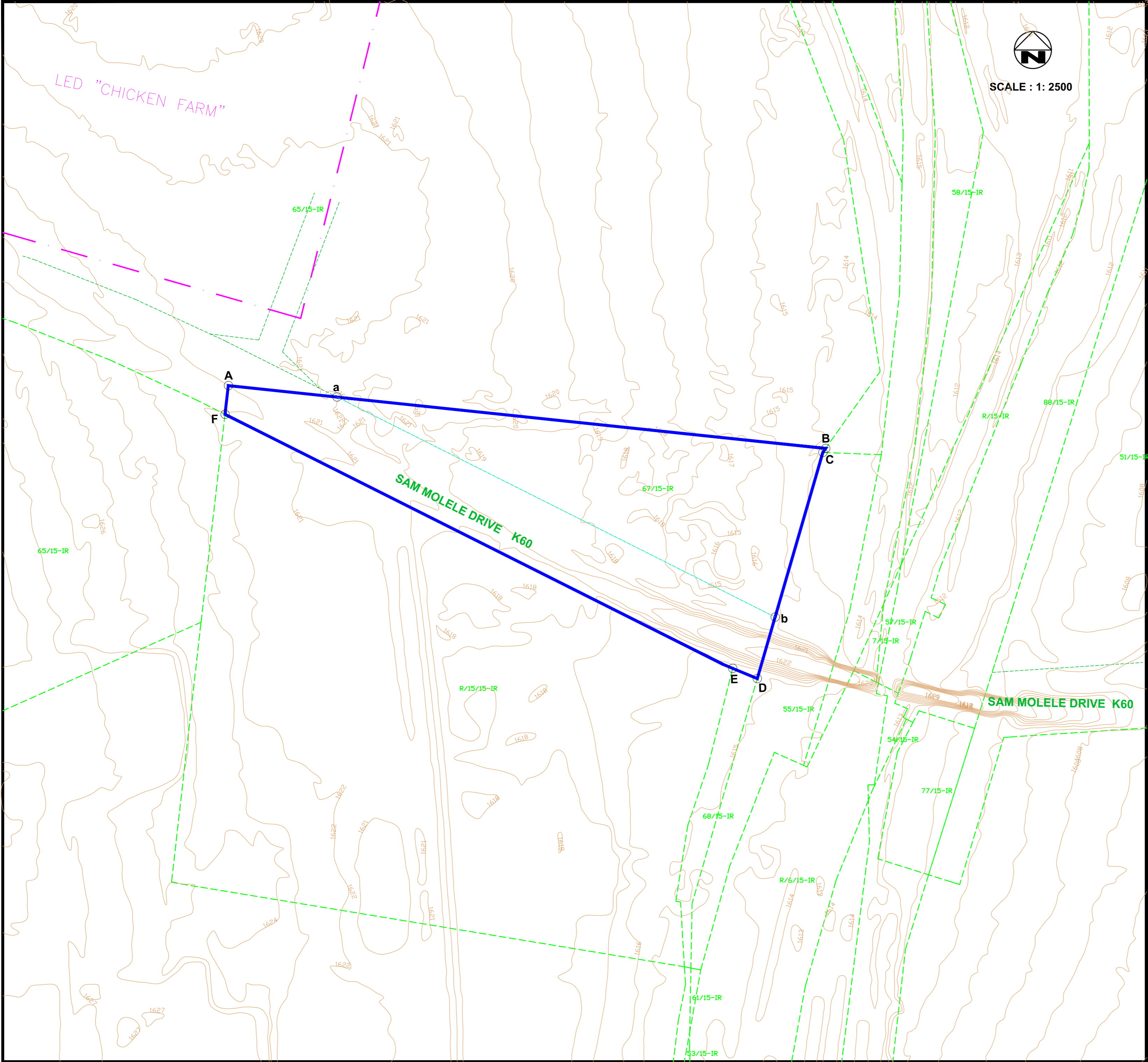
TITLE:
TRAFFIC IMPACT STUDY
EMM LICENSING HUB

EXPECTED PEAK HOUR
TRAFFIC DEMAND
SCENARIO 3

SCALE: NA | PP21125

FIGURE: 5

ANNEXURE B



PROPOSED DIVISION OF PORTION 67 OF THE FARM WITFONTEIN NO. 15 IR

- THE SITE
- PROPOSED DIVISION BOUNDARY

THE FIGURE ABCDEFA REPRESENTS PORTION 67 OF THE FARM WITFONTEIN NO. 15 IR MEASURING APPROXIMATELY 7,0938ha IN EXTENT WHICH IS PROPOSED TO BE DIVIDED INTO 2 PORTIONS AS DETAILED BELOW:

PROPOSED PORTION	FIGURE	SIZE (ha)	PROPOSED USE/ZONING
RE / 67	AabDEFA	3,3136ha	K60 PROVINCIAL RD
1 / 67	aBCba	3,7802ha	MUNICIPAL LICENCING HUB

PLAN No. xxx xxx G	
REVISION	DATE
1	06.05.2015

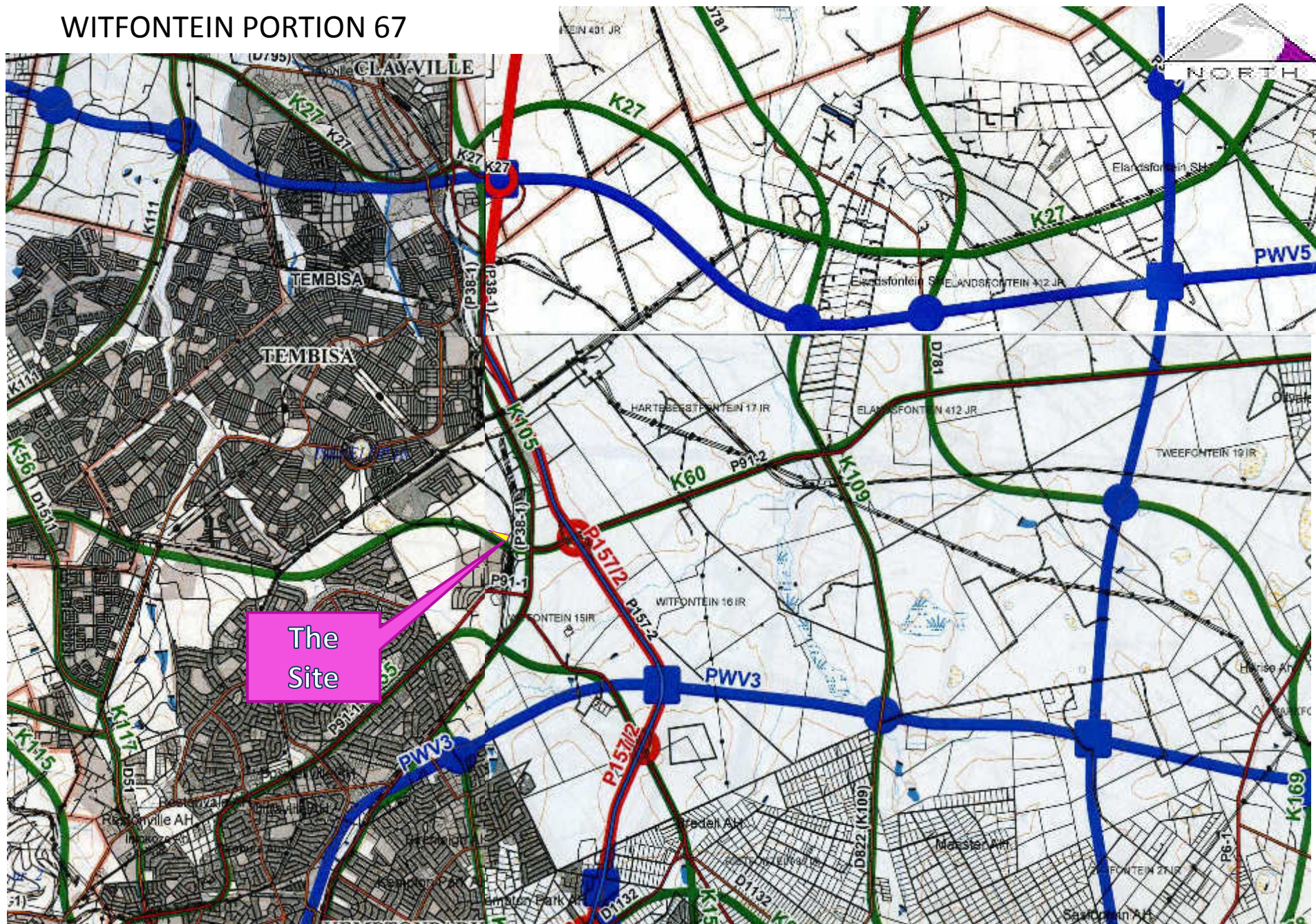
DIMENSION AND SIZES
All dimensions shown on the plan are approximate, scaled in meters and subject to final survey.

URBAN DYNAMICS
 37 EMPIRE ROAD
 FARMTOIN
 P.O. BOX 291803
 MELVILLE
 2108
 TEL: (+27 11) 482-4131
 FAX: (+27 11) 482-9959
 E-MAIL: danie@urbandynamics.co.za
 WEB MAIL: www.urbandynamics.co.za



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WITFONTEIN PORTION 67



Extract from Gautrans Strategic Road Network Planning

ANNEXURE C

**DEPARTMENT OF PUBLIC TRANSPORT
ROADS AND WORKS**

Private Bag X83
Marshalltown
2107

Date: 24 June 2015

**Attention: Mr. M. Mogane
Mr. K. Govender**



CC Reg No 91/30938/23

91 Tinderwood Cresc
Sand River Camp
WITFONTEIN X25
PO Box 133, SERENGETI, 1642
E-mail: chavenga@serengeti.co.za

Tel: +27(011) 552 7271
Fax: +27(011) 552 7272
Cell: 083 284 2860 (Corli)
Cell: 083 458 0066 (Cobus)

**SECTION 7 REPORT:
EKURHULENI LICENSING HUB ON PORTION 67 (A PORTION OF PORTION 15) OF THE FARM
WITFONTEIN 15-IR**

A new licensing hub is planned for the Ekurhuleni Metropolitan Municipality similar in size to the licensing hub in Centurion of the City of Tshwane. The development will be located on Portion 67 (a portion of Portion 15) of the farm Witfontein 15-IR. The site is located next to and on the northern side of Sam Molele Drive (P91-2) east of Pretoria Road (P38-1) and just east of the railway line as depicted in Figure 1. The site location is depicted in Figure 1 and also on the extract from the Gautrans Strategic Road Network Plan.

Sam Molele Drive is also the future K60 for which only a route determination is available, Report No 773B. In terms of the Gauteng Transport Infrastructure Act the K-route is a listed route with an accepted route determination. In terms of the ACT the points are addressed as follows:

7(a) (i) This section of K60 has an accepted route which follows more or less the alignment of Sam Molele Drive along the proposed development. From an access point of view there is an existing access to Esselen Park Sports Complex which, as far as we could determine, is an approved access point. In terms of access spacing and the rail crossing the access spacing is as follows:

P38-1(K105) to the access:	±800m
Access to existing access road to Esselen Park:	±730m

In terms of access spacing requirements the Esselen Park Sports Complex's access comply with the access spacing requirements of Gautrans and an access opposite this access is therefore proposed for this development.

The existing access to Esselen Park is depicted in the photos below.



Sam Molele Dr direction east at gate to Esselen Park Sports Complex



The Site - Sam Molele Dr direction north opposite gate to Esselen Park Sports Complex



Sam Molele Dr direction west at gate to Esselen Park Sports Complex

There are no sight distance issues at this point. From a road planning point of view we will use the existing alignment of Sam Molele Drive as one carriageway of the future K60 and calculate the road reserve around this. The following was used for the purpose of determining the road reserve for the future K60:

- 62m road reserve
- The existing road centre line, 12.7m from the future centre line of K60
- Road reserve widening 18,3m towards Esselen Park Sports Complex
- 43,7m towards the proposed development's side

In terms of Gautrans design standards the access must serve the area and not only the proposed development. There are also a small access road to Transnet between the proposed access and the railway line. The aerial photo and photo below indicate the access road.



Transnet access road



Transnet road next to Sam Molele Drive

This Transnet road falls within the future K60 road reserve and in terms of access spacing cannot be accommodated in the current position. Provision is made to reinstate this access in future.

The proposed alignment of K60 and the proposed access is depicted in Figure 2. In terms of the ACT the road reserve of K60 is excluded from the application.

A Traffic Impact Study was conducted for this development and subject to approval from Gautrans. The final geometric layout to be determined at wayleave application stage. The cost of implementing the new access on Sam Molele Drive will be for the applicant's account.

- 7(a) (ii) The route is not affected.
- 7(a) (iii) No other routes are affected.
- 7(b) No amendment of the route is required.
- 7(c) Not applicable at this stage.
- 7(d) Not applicable.

IN SUMMARY:

The proposed development will be affected by the future K60 planning. In terms of the planning the existing Sam Molele Drive alignment was used as one of the future carriageways of K60. The future road reserve was determined with a road reserve widening of 43,7m towards the development's side and 18,3m towards the opposite side for a future 62m road reserve.

Access to be located directly opposite the existing access to the Esselen Park Sports Complex on the southern side of Sam Molele Drive.

Provision to be made to reinstate access in future to the Transnet buildings along the railway line.

In terms of the ACT the road reserve of K60 is excluded from the application and the cost of implementing the new access on Sam Molele Drive will be for the applicant's account.

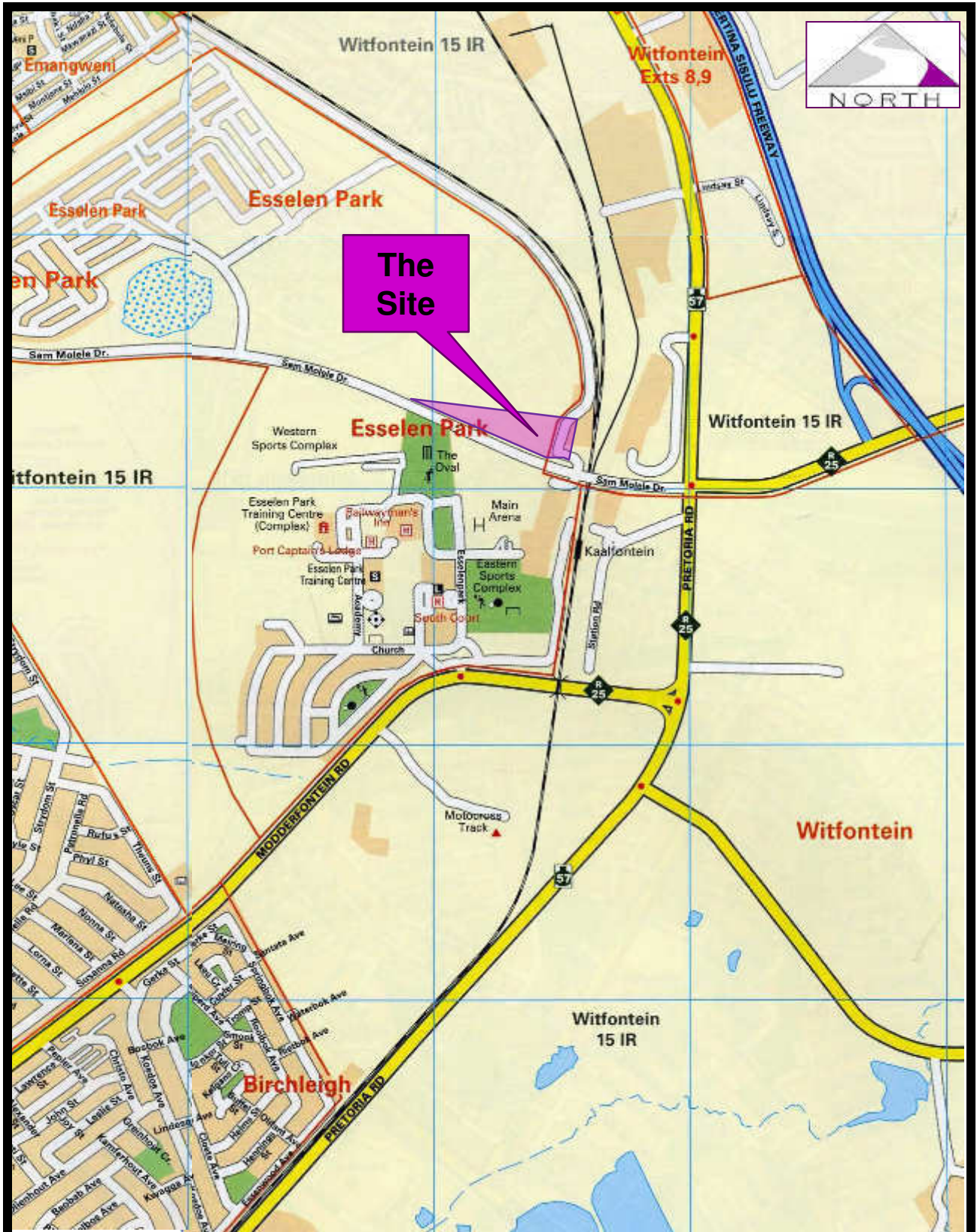
The application can be supported in terms of Section 7 of the Act with the proposed access and K60 alignment as depicted in Figure 2.

We trust that this will meet your requirements.

Regards



Cobus Havenga Pr Eng



The Site



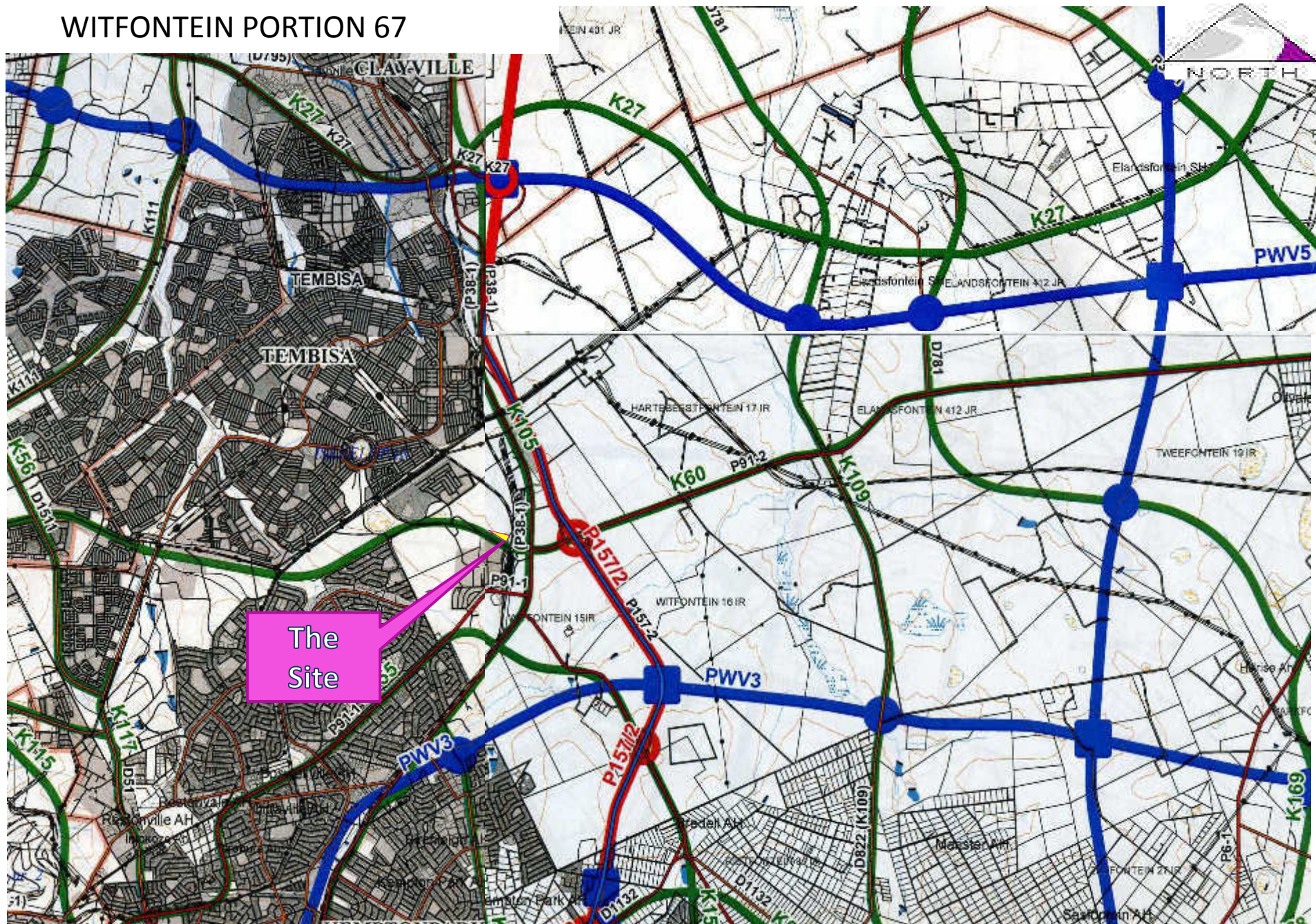
**SECTION 7 REPORT
PORTION 67 OF FARM WITFONTEIN NO. 15 IR**

FIGURE 1: SITE LOCATION PLAN

SCALE : N/A

PP21125

WITFONTEIN PORTION 67



Extract from Gautrans Strategic Road Network Planning



Environmental Management Programme (EMP)



Environmental Management Plan

Tembisa Licencing Hub

**Portion 67 of the farm Witfontein
15 IR**



BOKAMOSO

LANDSCAPE ARCHITECTS &
ENVIRONMENTAL CONSULTANTS CC

P.O. BOX 11375

MAROELANA

0161

TEL: (012) 346 3810

Fax: 086 570 5659

Email: Lizelleg@mweb.co.za

September 2015

Gaut Reference: 002/15-16/E0081

1 Project Outline

1.1 Background

Bokamoso Landscape Architects and Environmental Consultants CC were appointed by the **Ekurhuleni Metropolitan Municipality** to compile a Basic Assessment Report and Environmental Management Plan for the proposed development of **Tembisa Licencing Hub** and its associated activities.

1.2 Project description

The proposed development **Tembisa Licencing Hub** is situated on Portion 67 of the Farm Witkoppies 15 IR, Kempton Park in Ekurhuleni Metropolitan Municipality.

The proposed Tembisa Licencing Hub development entails a “Social Services”, development with associated services and infrastructure. The licencing hub development will include the following:

- Motor vehicle registration and licencing;
- Driver's license testing centre;
- Motor vehicle testing centre; and
- Grounds Area.

The study area is approximately 3.42 hectares in extent. The study area falls within the area of jurisdiction of the **Ekurhuleni Metropolitan Municipality** in the **Gauteng Province**.

(Refer to Figure 1 for the Locality Map and Figure 2 for the Aerial Map).

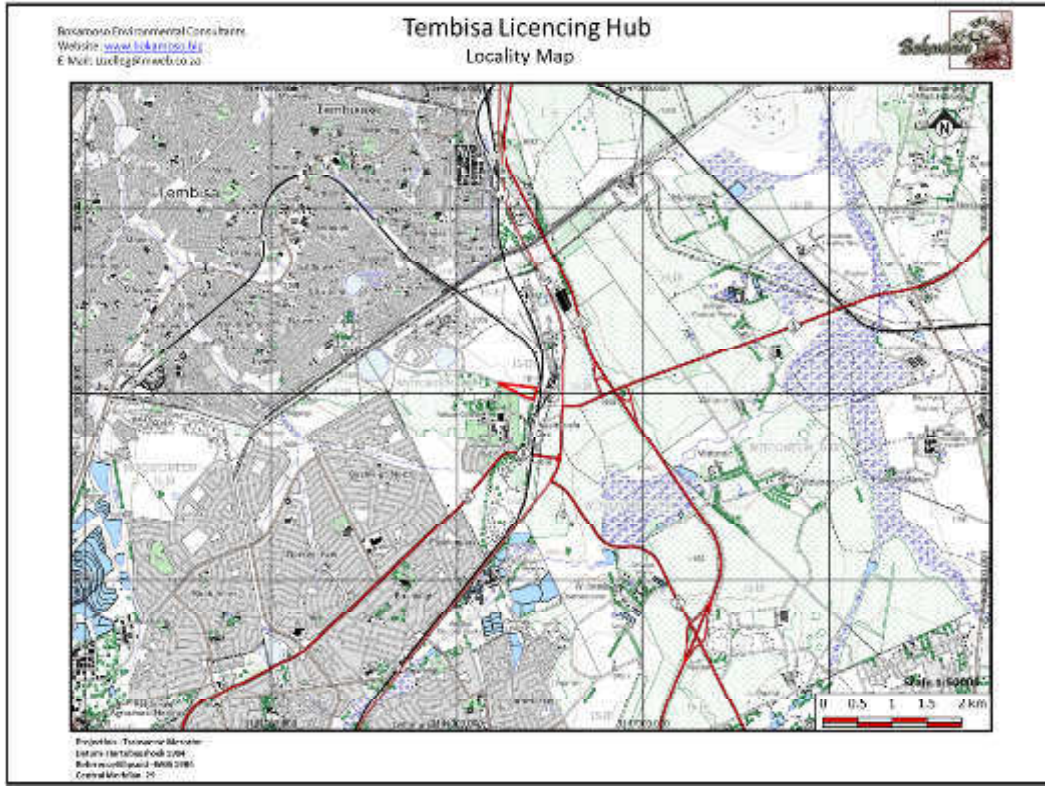


Figure 1 – Locality Map



Figure 2 – Aerial Map

Timeframe for construction:

Will be provided when or if the application for the proposed development is approved. Therefore the timeframe for construction is unknown.

The developer will be responsible for the on-site activities. The EMP will be a binding document for purposes of compliance.

1.3 Receiving Environment

Vegetation:

- No Red Data species were detected.
- One specimen of *Bonatea antennifera* [protected under Schedule 11 of the Transvaal Nature Conservation Act (No.12 of 1983)] had been found in the transformed secondary grassland.

Fauna:

- The near threatened South African Hedgehog *Atelerix frontalis* may occur on the site as indicated by historical records; however it's not expected to occur on the due to the disturbed nature of the site.

Hydrology:

- No wetlands were identified on the site.

Cultural /Historical:

- There is no important visible cultural heritage resources present on the proposed development area.

Visual:

- The development will be visible from Sam Molele Drive located north of the site.

Geology:

- The site is underlain by chert-rich dolomite of the Monte christo Formation of Malmani Subgroup of the Chuniespoort Group, Transvaal Supergroup.
- The soil cover often comprises highly erodible soils that may form sinkholes or dolines due to the downward percolation of water.
- Due to dolomite occurrence on the site, it is advised to construct foundations according to reinforced concrete raft design.

2 EMP Objectives and context

Objectives

The objectives of this plan are to:

- Identify the possible environmental impacts of the proposed activity;
- Develop measures to minimise, mitigate and manage these impacts;
- Meet the requirements of the Record of Decision of GDARD and requirements of other Authorities; and
- Monitor the project.

EMP context

This EMP fits into the overall planning process of the project by carrying out the conditions of consent set out by the Gauteng Department of Agriculture and Rural Development. In addition, all mitigation measures recommended in the Basic Assessment Report are included in the EMP.

This EMP addresses the following three phases of the development:

- Pre-construction planning phase;
- Construction phase; and
- Operational phase.

3 Monitoring

In order for the EMP to be successfully implemented all the role players involved must have a clear understanding of their roles and responsibilities in the project.

These role players may include the Authorities (A), other Authorities (OA), Developer/ Proponent (D), Environmental Control Officer (ECO), Project Manager (PM), Contractors (C), Environmental Assessment Practitioner (EAP) and Environmental Site Officer (ESO). Landowners, Interested and Affected Parties (I&APs) and the relevant environmental and project specialists are also important role players.

3.1 Roles and responsibilities

Developer (D)

The developer is ultimately accountable for ensuring compliance with the EMP and conditions contained in the Environmental Authorization. The developer must appoint an independent Environmental Control Officer (ECO), for the duration of the pre-construction and construction phases, to ensure compliance with the requirements of this EMP. The developer must ensure that the ECO is integrated as part of the project team.

Project Manager (PM)

The Project Manager is responsible for the coordination of various activities and ensures compliance with this EMP through delegation of the EMP to the contractors and monitoring of performance as per the Environmental Control Officer's monthly reports.

Environmental Control Officer (ECO)

An independent Environmental Control Officer (ECO) shall be appointed, for the duration of the pre-construction and construction phases of the development, by the developer to ensure compliance with the requirements of this EMP.

- The Environmental Control Officer shall ensure that the contractor is aware of all the specifications pertaining to the project.
- Any damage to the environment must be repaired as soon as possible after consultation between the Environmental Control Officer, Consulting Engineer and Contractor.
- The Environmental Control Officer shall ensure that the developer staff and/or contractor are adhering to all stipulations of the EMP.
- The Environmental Control Officer shall be responsible for monitoring the EMP throughout the project by means of site visits and meetings. This should be documented as part of the site meeting minutes.
- The Environmental Control Officer shall be responsible for the environmental training program.
- The Environmental Control Officer shall ensure that all clean up and rehabilitation or any remedial action required, are completed prior to transfer of properties.
- A post construction environmental audit is to be conducted to ensure that all conditions in the EMP have been adhered to.

Contractor (C):

The contractors shall be responsible for ensuring that all activities on site are undertaken in accordance with the environmental provisions detailed in this document and that sub-contractor and labourers are duly informed of their roles and responsibilities in this regard.

The contractor will be required, where specified to provide Method Statements setting out in detail how the management actions contained in the EMP will be implemented.

The contractors will be responsible for the cost of rehabilitation of any environmental damage that may result from non-compliance with the environmental regulations.

Environmental Site Officer (ESO):

The ESO is appointed by the developer and then finally the manager/owner as his/her environmental representative to monitor, review and verify compliance with the EMP by the contractor. The ESO is not an independent appointment but must be a member of the contractor's management team. The ESO must ensure that he/she is involved at all phases of the construction (from site clearance to rehabilitation).

Authority (A):

The authorities are the relevant environmental department that has issued the Environmental Authorization. The authorities are responsible for ensuring that the monitoring of the EMP and other authorization documentation is carried out by means of reviewing audit reports submitted by the ECO and conducting regular site visits.

Other Authorities (OA):

Other authorities are those that may be involved in the approval process of the EMP.

Environmental Assessment Practitioner (EAP):

According to Section 1 of NEMA the definition of an Environmental Assessment Practitioner is "the individual responsible for the planning, management and coordination of Environmental Impact Assessments, Strategic Environmental

Assessments, Environmental Management Plans or any other appropriate environmental instruments through regulations”.

3.2 Lines of Communication

The Environmental Control Officer in writing should immediately report any breach of the EMP to the Project Manager. The Project Manager should then be responsible for rectifying the problem on-site after discussion with the contractor. Should this require additional cost, then the developer should be notified immediately before any additional steps are taken.

3.3 Reporting Procedures to the Developer

Any pollution incidents must be reported to the Environmental Control Officer immediately (within 12 hours). The Environmental Control Officer shall report to the Developer on a regular basis (site meetings).

3.4 Site Instruction Entries

The site instruction book entries will be used for the recording of general site instructions as they relate to the works on site. There should be issuing of stop work order for the purposes of immediately halting any activities of the contractor that may pose an environmental risk.

3.5 ESA/ESO (Environmental Site Officer) Diary Entries

Each of these books must be available in duplicate, with copies for the Engineer and Environmental Site Officer. These books should be available to the authorities for inspection or on request. All spills are to be recorded in the ESA/Environmental Site Officer's diary.

3.6 Methods Statements

Methods statements from the contractor will be required for specific sensitive actions on request of the authorities or ESA/ESO (Environmental Site Officer). All method statements will form part of the EMP documentation and are subject to all terms and conditions contained within the EMP document. For each instance wherein it is requested that the contractor submit a method statement to the satisfaction of ESA/ESO, the format should clearly indicate the following:

- What – a brief description of the work to be undertaken
- How – a detailed description of the process of work, methods and materials
- Where – a description / sketch map of the locality of work; and
- When – the sequencing of actions with due commencement dates and completion date estimate.

The contractor must submit the method statement before any particular construction activity is due to start. Work may not commence until the method statement has been approved by the ESA/ESO.

3.7 Record Keeping

All records related to the implementation of this Management Plan (e.g. site instruction book, ESA/ESO diary, methods statements etc.) must be kept together in an office where it is safe and can be retrieved easily. These records should be kept for two years and must be available at any time for scrutiny by any relevant authorities.

3.8 Acts

3.8.1. The National Water Act, 1998 (Act No: 36 of 1998)

The purpose of this Act is to ensure that the Nation's water resources are protected, used, developed, conserved, managed and controlled in ways that take into account, amongst other factors, the following:

- ❑ Meeting the basic human needs of present and future generations;
- ❑ Promoting equitable access to water;
- ❑ Promoting the efficient, sustainable and beneficial use of water in the public interest;
- ❑ Reducing and preventing pollution and degradation of water resources;
- ❑ Facilitating social and economic development; and
- ❑ Providing for the growing demand for water use.

In terms of the section 21 of the National Water Act, the developer must obtain water use licences if the following activities are taking place:

- a) Taking water from a water resource;
- b) Storing water;
- c) Impeding or diverting the flow of water in a water course;
- d) Engaging in a stream flow reduction activity contemplated in section 36;
- e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
- f) Discharging waste or water containing waste into a water resource through a pipeline, canal, sewer, sea outfall or other conduit;
- g) Disposing of waste in a manner which may detrimentally impact on a water resource;
- h) Disposing in any manner which contains waste from or which has been heated in any industrial or power generation process;
- i) Altering the bed, banks, course or disposing of water found underground if it is necessary for the safety of people;

- j) Removing, discharging, or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and
 - k) Using water for recreational purposes.
- The National Water Act also requires that (where applicable) the 1:50 and 1:100 year flood line be indicated on all the development drawings (even the drawings for the external services) that are submitted for approval.

Impact on proposed Development:

Not Significant – The proposed development is not subject to flood lines or wetlands. Therefore in terms of Section 21 of the National Water Act, it is not expected that the developer will need a water use license for the proposed development.

3.8.2. Atmospheric Pollution Prevention Act (Act 45 of 1965)

The NEMA: AQA serves to repeal the Atmospheric Pollution Prevention Act (45 of 1965) and various other laws dealing with air pollution and it provides a more comprehensive framework within which the critical question of air quality can be addressed. The purpose of the Act is to set norms and standards that relate to:

- Institutional frameworks, roles and responsibilities
- Air quality management planning
- Air quality monitoring and information management
- Air quality management measures
- General compliance and enforcement.

Amongst other things, it is intended that the setting of norms and standards will achieve the following:

- The protection, restoration and enhancement of air quality in South Africa.
- Increased public participation in the protection of air quality and improved public access to relevant and meaningful information about air quality.
- The reduction of risks to human health and the prevention of the degradation of air quality.

The Act describes various regulatory tools that should be developed to ensure the implementation and enforcement of air quality management plans. These include:

- Priority Areas, which are air pollution 'hot spots'.
 - Listed Activities, which are 'problem' processes that require an Atmospheric Emission Licence.
 - Controlled Emitters, which includes the setting of emission standards for 'classes' of emitters, such as motor vehicles, incinerators, etc.
 - Control of Noise.
 - Control of Odours.
- On 22 November 2013 the list of activities which result in atmospheric emissions that have or may have a detrimental effect on the environment, was amended.

Impact on proposed Development:

Significant – During the construction phase, dust and the generation of noise can become a significant factor, especially to the surrounding landowners. However if the development is well planned and the mitigating measures are successfully implemented the proposed licencing hub's contribution to air pollution and the generation of air pollution can become less significant. None of the listed activities, according to this Act, have been triggered.

3.8.3 National Environmental Management Act (Act 107 of 1998)

The NEMA is primarily an enabling Act in that it provides for the development of environmental implementation plans and environmental management plans. The principles listed in the act serve as a general framework within which environmental management and implementation plans must be formulated.

The Minister of Environmental Affairs and Tourism passed (in April 2006) Environmental Impact Assessment Regulations¹ (the Regulations) in terms of Chapter 5 of the National Environmental management Act, 1998² (NEMA). These Regulations have been amended and the latest Regulations have been published in 2014. The NEMA EIA Regulations were amended on 4 December 2014 and came into effect on 8 December 2014. Notice **No. R 983, R 984 and R 985** of the Amended Regulations list the activities that indicate the process to be followed. The activities listed in Notice No. R 983 requires that a Basic Assessment process be followed and the Activities listed in terms of Notice No. R 984 requires that the Scoping and EIA process be followed. Notice No. 985 has been introduced to make provision for Activities in certain geographical and sensitive areas.

Subsequently, Listing (R. 983) requires that a Basic Assessment Process be followed. It should however be noted that the Draft Guideline Document of DEA [Department of Environmental Affairs, previously known as the Department of Environmental Affairs and Tourism] states that if an activity being applied for is made up of more than one listed activity, and the Scoping and EIA process is required for one or more of these activities, the Scoping and EIA process must be followed for the whole application.

Impact on proposed Development:

Significant – Section 28 (1) of NEMA stated that every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from

occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. The application for the proposed licencing hub consists of activities listed under Notice R. 983 (Listing No. 1) and thus considered significant.

The EMP is compiled in terms of Section 28 of NEMA.

3.8.4. The National Environmental Management: Waste Act (Act 59 of 2008)

This Act aims to consolidate waste management in South Africa, and contains a number of commendable provisions, including:

- The establishment of a national waste management strategy, and national and provincial norms and standards, for amongst other, the classification of waste, waste service delivery, and tariffs for such waste services;
- Addressing reduction, reuse, recycling and recovery of waste;
- The requirements for industry and local government to prepare integrated waste management plans;
- The establishment of control over contaminated land;
- Identifying waste management activities that requires a license, which currently include facilities for the storage, transfer, recycling, recovery, treatment and disposal of waste on land;
- Co-operative governance in issuing licenses for waste management facilities, by means of which a licencing authority can issue an integrated or consolidated license jointly with other organs of state that has legislative control over the activity; and
- The establishment of a national waste information system.

On 29 November 2013 the Minister of Environmental Affairs and Tourism amended the list of waste management activities that might have a detrimental effect on the environment.

Impact on proposed Development:

Not Significant– No waste management license will be required during the construction or operational phases of the proposed licencing hub. Due to the fact that a small amount of solid construction waste will be stored and handled on the site, before it is hauled away and dumped at the nearest registered landfill site.

3.8.5 . The Municipal Systems Act (Act 32 of 2000)

This Act was introduced to provide for the core principles, mechanisms and processes that are necessary to enable municipalities to move progressively towards the social and economic upliftment of local communities, and ensure universal access to essential services that are affordable to all.

The proposed development will support the local authority in complying with the principles of the Municipal Systems Act, by assisting in providing the community with essential services, such as water and sewage infrastructure.

Impact on proposed Development:

Significant –The proposed development will promote the Municipal System with in the area of Ekurhuleni, as the proposed development will upgrade, and improve the essential services such as water and sewage reticulation networks and it will provide a service to the public.

3.8.6 National Veld and Forrest Fire Act, 1998 (Act No. 101, 1998)

The purpose of this Act is to prevent and combat veld, forest and mountain fires throughout the Republic. Furthermore the Act provides for a variety of institutions, methods and practices for achieving the prevention of fires.

Impact on proposed Development:

Significant – Fires of construction workers may only be lit in the designated site camp as indicated in assistance with the ECO. It is important that a site development camp be located on a part of the application site that is already disturbed.

3.8.7 National Heritage Resources Act, 1999 (Act No. 25 of 1999)

The National Heritage Resources Act legislates the necessity and heritage impact assessment in areas earmarked for development, which exceed 0.5ha. The Act makes provision for the potential destruction to existing sites, pending the archaeologist's recommendations through permitting procedures. Permits are administered by the South African Heritage Resources Agency (SAHRA).

Impact on proposed Development:

Not significant- A heritage specialist were appointed to conduct a study and investigate the site, this specialist is attached to the Basic Assessment Report. Nothing of cultural or historical importance was identified on the site. If any historical features are discovered due to construction activities and clearing of the application site, the correct "procedures for an Environmental incident" must be followed.

3.8.8. Conservation of Agricultural Resources Act (Act No. 43 of 1983)

This Act provides for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.

Impact on proposed Development:

Not Significant– According to the Gauteng Agricultural Potential Atlas (GAPA 3), the proposed development is located on land with high agricultural potential. The study does not fall in any of the Seven Agriculture Hubs identified for the Gauteng province. However, the proposed study area is of such small size that it is not considered viable for agricultural activities.

3.8.9. National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004)

The Biodiversity Act, provides for the management and protection of the country's biodiversity within the framework established by NEMA. It provides for the protection of species and ecosystems in need of protection, sustainable use of indigenous biological resources, equity and bioprospecting, and the establishment of a regulatory body on biodiversity- South African National Biodiversity Institute.

Objectives of the Act:

- (a) With the framework of the National Environmental Management Act, to provide for:
 - (i) The management and conservation of biological diversity within the Republic and of the components of such biological diversity;
 - (ii) The use of indigenous biological resources in a sustainable manner; and
 - (iii) The fair and equitable sharing among stakeholders of benefits arising from bio-prospecting involving indigenous biological resources;
- (b) To give effect to ratified international agreements relating to biodiversity which are binding on the republic;
- (c) To provide for co-operative governance in biodiversity management and conservation; and

(d) To provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act.

Under this Act notices are published in terms of alien and invasive species or threatened ecosystems in order to promote the biodiversity of natural resources and protect species endemic to South Africa.

Impact on proposed Development:

Not Significant – The proposed development is situated within the Carletonville Dolomite Grassland vegetation type according to Mucina and Rutherford (2006). No red data plant species or any threatened plant species have been recorded on the study area. A single specimen of the geophyte *Bonatea antennifera* (Orchidaceae) was recorded from the transformed secondary grassland. This species is not threatened or near-threatened (sensu Raimondo et al., 2009), but it is protected under Schedule 11 of the Transvaal Nature Conservation Act (No.12 of 1983). The vegetation communities were considered to be of low to negligible sensitivity. According to the GDARD C-Plan the proposed development is not situated in any Ecological Support Areas or Important Areas.

3.8.11. National Spatial Biodiversity assessment

The National Spatial Biodiversity Assessment (NSBA) classifies areas as worthy of protection based on its biophysical characteristics, which are ranked according to priority levels.

Impact on proposed Development:

Not Significant – No irreplaceable sites exist on the land development area.

3.8.12 Protected Species – Provincial Ordinances

Provincial ordinances were developed to protect particular plant species within specific provinces. The protection of these species is enforced through permitting requirements associated with provincial lists of protected species. Permits are administered by the Provincial Departments of Environmental Affairs.

Impact on proposed Development:

Not Significant- The proposed development is situated within the Carletonville Dolomite Grassland vegetation type according to Mucina and Rutherford (2006). No red data plant species or any threatened plant species have been recorded on the study area. A single specimen of the geophyte *Bonatea antennifera* (Orchidaceae) was recorded from the transformed secondary grassland. This species is not threatened or near-threatened (sensu Raimondo et al., 2009), but it is protected under Schedule 11 of the Transvaal Nature Conservation Act (No.12 of 1983). The vegetation communities were considered to be of low to negligible sensitivity. According to the GDARD C-Plan the proposed development is not situated in any Ecological Support Areas or Important Areas.

3.8.13. National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)

The purpose of this Act is to provide for the protection, conservation and management of ecologically viable areas representative of South Africa's biological biodiversity and its natural landscapes.

Impact on proposed Development:

Not Significant- The proposed development is not subject to any protected areas

3.8.14 National Road Traffic Act, 1996 (Act No. 93 of 1996)

This Act provides for all road traffic matters which shall apply uniformly throughout the Republic and for matters connected therewith.

Impact on proposed Development:

Not significant – Not Applicable.

3.8.15 GDARD Draft Ridges Policy

The biodiversity and socio-cultural value of ridges and their essential role in ecosystem processes will be established in order to show why it is absolutely imperative that the Department adopts a no-go development policy for the ridges of Gauteng. It is important to remember that the quartzite ridges of Gauteng, together with the Drakensberg Escarpment, should be regarded as one of the most important natural assets in the entire region of the northern provinces of South Africa. They are characterized by a unique plant species composition that is found nowhere else in South Africa or the world (Bredenkamp & Brown, 1998). Ridges are important for biodiversity hotspots, red data/threatened species, invertebrates, wildlife corridors, ecosystem processes and socio-cultural value (aesthetic value). A ridge is defined as any topographic feature in the landscape that is characterized by slopes of 5° or more, as determined by means of a GIS digital elevation model.

Implications for the development:

According to the data there are no ridges (or transformed ridges) on the study area and the slope of this study area is between 0 and 5%.

3.8.16 GDARD Agricultural Hub Policy

GDARD identified 7 Agricultural Hubs in Gauteng province. These hubs are earmarked for agricultural activities and there are policies and guidelines that should be taken into consideration when one plans to develop in these hubs areas. Urban development is usually not supported in these hubs.

Implications for the development:

Not significant - The study area is not situated within any of the 7 agricultural hubs identified for Gauteng.

3.8.17 Red List Plant Species Guidelines

The purpose of these guidelines is to promote the conservation of Red List Plant Species in Gauteng, which are species of flora that face risk of extinction in the wild. By protecting Red List Plant Species, conservation of diverse landscapes is promoted which forms part of the overall environmental preservation of diverse ecosystems, habitats, communities, populations, species and genes in Gauteng. These Guidelines are intended to provide a decision-making support tool to any person or organization that is responsible for managing, or whose actions affect, areas in Gauteng where populations of Red List Plant Species grow, whether such person or organization be an organ of state or private entity or individual; thereby enabling the conservation of the Red List Plant Species that occur in Gauteng.

Implication for the development:

The proposed area to be developed does not have a possibility of any Orange-Listed plant species' habitat according to the map and C-plan data. The specialist did not identify any threatened or near-threatened plant species on the site; they did however identify one specimen of a protected plant species under Schedule 11 of the Transvaal Nature Conservation Act (No.12 of 1983).

3.8.18 Gauteng Noise Control Regulations

The regulation controls noise pollution. According to the acceptable noise levels in a residential area situated within an urban area is 55dBA and the maximum acceptable noise levels in a rural area is 45dBA.

Implication for the development:

Within the construction phase of the proposed development, the impact of noise could be problematic, but such impacts are generally short term. One should note that practical mitigation measures for noise pollution are low, but certain measures can be implemented to mitigate the severity. During the operational phase, there will be no noise impacts.

3.8.19 The Gauteng Transport Infrastructure Act

The Act was created to consolidate the laws relating to roads and other types of transport infrastructure in Gauteng; and to provide for the planning, design, development, construction, financing, management, control, maintenance, protection and rehabilitation of provincial roads, railway lines and other transport infrastructure in Gauteng; and to provide for matter connected therewith.

Implication for the development:

All developments in Gauteng must take the Gauteng Road network as published into consideration and no development may be planned across any provincial or K-route.

3.8.20 Gauteng Spatial Development Framework

The Gauteng Spatial Development Framework aims to:

- Provide a clear future provincial spatial structure that is robust to

accommodate growth and sustainability;

- Specify a clear set of spatial objectives for municipalities to achieve in order to ensure realization of the future provincial spatial structures;
- Propose a set of plans that municipalities prepare in their pursuit of these objectives;
- Provide a common language and set of shared planning constructs for municipalities to use in their planning process and plans; and
- Enable and direct growth.

Implication for the development:

It is evident that the proposed development complies with most of the above-mentioned development directives.

3.8.21 The Integrated Development Plan (IDP) for Ekurhuleni Metropolitan Municipality

According to the Ekurhuleni Metropolitan Municipality IDP 2013/14, its mission statement is to provides sustainable and people centered development services that are affordable, appropriate and of high quality. Furthermore, to focus on social, environmental and economic regeneration of our city and communities, as guided by the principles of Batho Pele and through the commitment of a motivated and dedicated team.

Implication for the development:

The proposed development will encourage economic growth and extent the existing municipal services network and could therefore be regarded as directly in line with the directives of the IDP.

4 Project activities

4.1 Pre-Construction Phase

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
General	Project contract	To make the EMP enforceable under the general conditions of the contract.	The EMP document must be included as part of the tender documentation	The EMP is included as part of the tender documentation	Developer	-
Design and planning	Stability of structures and restriction of land use due to geology	To ensure stability of structures	The layout and land uses must correspond to the stability zonation and development types recommended by the geotechnical engineer.	The land uses and layout corresponds to the recommended stability zonation and development types.	Individual Developer Engineer	-
			More detailed foundation investigation shall be done for each of the structures.	More detailed foundation investigations done.	Engineer Individual Developer	-
	Stability of excavations due to geology	To ensure stability of excavations	Sides of excavations should be either shored or else battered back.	Excavations remain stable.	Engineer Individual Developer	
	Storm water system	To ensure the effective functioning of the system.	-The site should be landscaped to aid in the flow control of storm water and prevent ponding.			
		Erosion of drainage lines	1) Appropriate flow diversion and erosion control structures i.e. earth embankments must be put in place in areas where soil may be exposed to high levels of erosion due to steep slopes etc. 2) Any damage, displacement or loss of soil resulting from unforeseen events is to be recorded and remediated immediately. Should this occur due to			

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<p>negligence on the contractor's behalf, the contractor shall carry remediation costs.</p> <p>3) Storm water at the site camp must be managed so as to reduce/ minimise the silt loads in the stream channel.</p> <p>4) Construction on steep slopes and in soft or erodible material will require erosion control measures and appropriate grassing/ hydroseeding measures.</p> <p>5) All construction areas should be suitably top-soiled and vegetated as soon as is possible after construction; and disturbed areas to be rehabilitated must be ripped and the area must be backfilled with topsoil.</p>			
	Light pollution	To minimise light pollution	The generation of light by night events, security lighting and other lighting shall be effectively designed so as not to spill unnecessary outward into the oncoming traffic, or into the yards of the neighbouring properties or open spaces.	Lighting effectively designed	Architect/ Landscape Architect	-
	Visual impact	To minimise the visual impact of the proposed development.	<p>Architectural guidelines to minimize the visual impact:</p> <p>1) Roof colour will blend in tastefully with the surrounding environment. Building design must be aesthetically pleasing.</p> <p>2) Suitable plant materials should be used at strategic points to screen off impacts caused by roofs, cars in large parking areas and in particular Sam Molele Drive bordering the study area to the north.</p> <p>3) Mature existing trees should be retained as far as possible. The trees will soften the impact of the proposed development.</p> <p>4) Rubble and litter must be removed on a weekly basis and be disposed of at a suitably registered landfill site.</p>	Architectural guidelines minimise visual impact	Architect	-

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			These measures are relevant to the project and must be seen as appropriate.			
Climate	Extreme change in micro climate temperatures	To prevent the extreme change in micro climate temperatures	Where open parking bays are involved, one tree for every two parking bays shall be indicated on Landscape Development Plan which shall be approved by the Design Review Committee / Local Authority.	Landscape Development Plan complies	Landscape Architect	-
Fauna and flora	Floral biodiversity and ecological health	To ensure that the species introduced to the area, are compatible with the current and future quality of the ecological processes.	1) The Landscape Development Plan for the proposed development shall be submitted to the local authority for approval. 2) It is important that all the plant positions, quantities and coverage per m ² be indicated on a plan. 3) The proposed planting materials for the areas to be landscaped shall be non-invasive, and preferably indigenous and /or endemic. Indigenous tree species will aid in habitat creation that will attract indigenous faunal species into the area. 4) Where possible, trees naturally growing on the site should be retained as part of the landscaping. 5) Trees used for screening must be mature trees with a stem diameter of at least 80mm and a minimum height of 3m. 6) Any Orange listed species that are affected by the proposed development are to be relocated to suitable habitat on a part of the site that is unaffected by the development.	The landscape development plan submitted to the local authority for approval.	Landscape Architect	-
Preparing Site Access	Environmental integrity	To avoid erosion and disturbance to indigenous vegetation	1) Designated routes shall be determined for the construction vehicles and designated areas for storage of equipment. 2) Clearly mark the site access point and	Access to site is erosion free. Minimum disturbance to	Contractor	Continuous

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			routes on site to be used by construction vehicles and pedestrians. 3) Provide an access map to all contractors whom in turn must provide copies to the construction workers. Instruct all drivers to use the access point and determined route.	surrounding vegetation. Vehicles make use of established access routes.		
		Entrance of Vehicles	Entrance by vehicles, especially off-road cars and bakkies, off-road bicycles and quad bikes and construction staff should be prohibited, both during the construction phase and during the lifespan of the project.			
	Waste storage	To control the temporary storage of waste.	Temporary waste storage points on site shall be determined. These storage points shall be accessible by waste removal trucks and these points should not be located in sensitive areas/areas highly visible from the properties of the surrounding land-owners/tenants/in areas where the wind direction will carry bad odours across the properties of adjacent tenants or landowners.		Contractor ESO	-
		Ensure waste storage area does not generate pollution	Build a bund around the waste storage area to stop overflow into storm water.		Contractor	-

4.2 Construction Phase

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
Contractors Camp	Vegetation and topsoil	To minimize damage to and loss of vegetation and retain quality of topsoil	1) Site to be established under supervision of ECO. 2) Clearing and relocation of plants to be undertaken in accordance with site specific requirements.	Minimal vegetation removed/ damaged during site activities.	Contractor	As and when required
	Surface and ground water pollution	To minimize pollution of surface and Groundwater resources.	1) Sufficient and temporary facilities including ablation facilities must be provided for construction workers operating on the site. 2) A minimum of one chemical toilet shall be provided per 10 persons. The contractor shall keep the toilets in a clean, neat and hygienic condition. Toilets provided by the contractor must be easily accessible and a maximum of 50m from the works area to ensure they are utilized. The contractor (who must use reputable toilet-servicing company) shall be responsible for the cleaning, maintenance and servicing of the toilets. The contractor (using reputable toilet-servicing company) shall ensure that all toilets are cleaned and emptied before the builders' or other public holidays. 3) No person is allowed to use any other area than chemical toilets. 4) No French drain systems may be installed. 5) No chemical or waste water must be allowed to contaminate the run-off on site. 6) Avoid the clearing of the site camp (of specific phase) or paved surfaces with soap.	Effluents managed Effectively. No pollution of water resources from site. Workforce use toilets provided.	Contractor ESO	As and when required
		To minimize pollution of surface	1) Drip trays and/ or lined earth bunds must be provided under vehicles and equipment,	No pollution of the environment	Contractor ESO	Daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		and Groundwater resources due to spilling of materials.	to contain spills of hazardous materials such as fuel, oil and cement. 2) Repair and storage of vehicles only within the demarcated site area. 3) Spill kits must be available on site. 4) Oils and chemicals must be confined to specific secured areas within the site camp. These areas must be bunded with adequate containment (at least 1.5 times the volume of the fuel) for potential spills or leaks. 5) All spilled hazardous substances must be contained in impermeable containers for removal to a licensed hazardous waste site. 6) No leaking vehicle shall be allowed on site. The mechanic/ the mechanic of the appointed contractor must supply the environmental officer with a letter of confirmation that the vehicles and equipment are leak proof. 7) No bins containing organic solvents such as paints and thinners shall be cleaned on site, unless containers for liquid waste disposal are placed for this purpose on site.			
		To minimize pollution of surface and groundwater resources by cement	The mixing of concrete shall only be done at specifically selected sites, as close as possible to the entrance, on mortar boards or similar structures to prevent run-off into drainage lines, streams and natural vegetation.	No evidence of contaminated soil on the construction site.	Contractor ESO	Daily
		To minimize pollution of surface and Groundwater resources due to effluent.	No effluent (including effluent from any storage areas) may be discharged into any water surface or ground water resource.	No evidence of contaminated water resources.	Contractor ESO	Daily
	Pollution of the environment	To prevent unhygienic usage on the site and	1) Weather proof waste bins must be provided and emptied regularly. 2) The contractor shall provide labourers to	No waste bins overflowing	Contractor ESO	Daily Weekly

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		pollution of the natural assets.	<p>clean up the contractor's camp and construction site on a daily basis.</p> <p>3) Temporary waste storage points on the site should be determined. THESE AREAS SHALL BE PREDETERMINED AND LOCATED IN AREAS THAT ARE ALREADY DISTURBED. These storage points should be accessible by waste removal trucks and these points should be located in already disturbed areas /areas not highly visible from the properties of the surrounding land-owners/ in areas where the wind direction will not carry bad odours across the properties of adjacent landowners. This site should comply with the following:</p> <ul style="list-style-type: none"> • Skips for the containment and disposal of waste that could cause soil and water pollution, i.e. paint, lubricants, etc.; • Small lightweight waste items should be contained in skips with lids to prevent wind littering; • Bunded areas for containment and holding of dry building waste. <p>4) No solid waste may be disposed of on the site.</p> <p>5) No waste materials shall at any stage be disposed of in the open veld of adjacent properties.</p> <p>6) The storage of solid waste on the site, until such time as it may be disposed of, must be in a manner acceptable to the local authority and DWS.</p> <p>7) Cover any wastes that are likely to wash away or contaminate storm water.</p>	No litter or building waste lying in or around the site		
		Recycle material where possible and	1) Waste shall be separated into recyclable and non-recyclable waste, and shall	Sufficient containers	Contractor ESO	Daily Weekly

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		correctly dispose of unusable wastes	be separated as follows: <ul style="list-style-type: none"> • General waste; including (but not limited to) construction rubble, • Reusable construction material. 2) Recyclable waste shall preferably be deposited in separate bins. 3) All solid waste including excess spoil (soil, rock, rubble etc.) must be removed to a permitted waste disposal site on a weekly basis. 4) No bins containing organic solvents such as paints and thinners shall be cleaned on site, unless containers for liquid waste disposal are placed for this purpose on site. 5) Keep records of waste reuse, recycling and disposal for future reference. Provide information to the ECO.	available on site No visible signs of pollution		
	Waste	To keep the site clean and tidy. To ensure waste enters the appropriate waste stream in order to optimize recycling opportunities.	1) Rubble must be removed from the construction site frequently and be disposed of at an approved dumping site. 2) Sufficient and covered containers must be available on the construction site. 3) Such containers are to be emptied frequently. 4) All liquid effluent is to be disposed of in a manner approved of by the Local Authority. 5) Material to be used as backfill during a later stage of the building construction must be covered with a layer of soil to prevent litter from being blown over the site and to prevent unhygienic conditions. 6) Chemical containers and packaging brought onto the site must be removed for disposal at a suitable site. 7) The burning of waste is prohibited. 8) Where possible, waste must be separated into clearly marked containers and		Contractor	Monitor daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			subsequent recycling thereof must be a priority.			
	Increased fire risk to site and surrounding areas	To decrease fire risk.	1) Fires shall only be permitted in specifically designated areas and under controlled circumstances. 2) Food vendors shall be allowed within specified areas. 3) Fire extinguishers to be provided in all vehicles and fire beaters must be available on site. 4) Emergency numbers/ contact details must be available on site, where applicable.	No open fires on site that have been left unattended	Contractor	Monitor daily
Construction site	Geology and soils	To protect underground services from alkaline or corrosive attack.	Underground services should be treated appropriately prior to installation	Underground services are not being corroded	Contractor	Monitor regularly/ as required
		To prevent damage of the existing soils and geology.	1) The top layer of all areas to be excavated for the purposes of construction shall be stripped and stockpiled in areas where this material will not be damaged, removed or compacted. 2) All surfaces that are susceptible to erosion, shall be protected either by cladding with biodegradable material or with the top layer of soil being seeded with grass seed/planted with a suitable groundcover.	Excavated materials correctly stockpiled No signs of erosion	Contractor	Monitor daily
		To prevent the loss of topsoil To prevent siltation & water pollution.	1) Stockpiling will only be done in designated places where it will not interfere with the natural drainage paths of the environment. 2) In order to minimize erosion and siltation and disturbance to existing vegetation, it is recommended that stockpiling be done/ equipment is stored in already disturbed/exposed areas. 3) Cover stockpiles and surround downhill	Excavated materials correctly stockpiled No visible signs of erosion and sedimentation Minimal invasive	Contractor of the Individual Developer	Monitor daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<p>sides with a sediment fence to stop materials washing away.</p> <p>4) Remove vegetation only in areas designated during the planning stage.</p> <p>5) Rehabilitation/ landscaping are to be done immediately after the involved works are completed.</p> <p>6) All compacted areas should be ripped prior to them being rehabilitated/ landscaped by the contractor as appointed by the developer/ individual erf owner.</p> <p>7) The top layer of all areas to be excavated must be stripped and stockpiled in areas where this material will not be damaged, removed or compacted. This stockpiled material should be used for the rehabilitation of the site and for landscaping purposes.</p> <p>8) Strip topsoil at start of works and store in stockpiles no more than 1,5 m high in a designated materials storage area.</p> <p>9) During the laying of any cables, pipelines or infrastructure (on or adjacent to the site) topsoil shall be kept aside to cover the disturbed areas immediately after such activities are completed.</p>	<p>weed growth</p> <p>Vegetation only removed in designated areas</p>		
	Erosion and siltation	To prevent erosion and siltation	<p>1) It is recommended that the construction of the development be done in phases.</p> <p>2) Each phase should be rehabilitated immediately after the construction for that phase has been completed. The rehabilitated areas should be maintained by the appointed rehabilitation contractor until a vegetative coverage of at least 80% has been achieved as appointed by the developer/ individual erf owner.</p> <p>3) Mark out the areas to be excavated.</p> <p>4) Large exposed areas during the</p>	<p>No erosion scars</p> <p>No loss of topsoil</p> <p>All damaged areas successfully rehabilitated</p>	Contractor ESO	Monitor daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<p>construction phases should be limited. Where possible areas earmarked for construction during later phases should remain covered with vegetation coverage until the actual construction phase. This will prevent unnecessary erosion and siltation in these areas.</p> <p>5) Unnecessary clearing of flora resulting in exposed soil prone to erosive conditions should be avoided.</p> <p>6) All embankments must be adequately compacted and planted with grass to stop any excessive soil erosion and scouring of the landscape if required.</p> <p>7) The eradication of alien vegetation should be followed up as soon as possible by replacement with indigenous vegetation to ensure quick and sufficient coverage of exposed areas by the individual erf owner.</p> <p>8) Storm water outlets shall be correctly designed to prevent any possible soil erosion.</p> <p>9) All surface run-off shall be managed in such a way so as to ensure erosion of soil does not occur.</p> <p>10) Implementation of temporary storm water management measures that will help to reduce the speed of surface water by the individual erf owner / developer.</p> <p>11) All surfaces that are susceptible to erosion shall be covered with a suitable vegetative cover as soon as construction is completed by the individual erf owner / developer.</p>			
	Stability of structures due to geology	To ensure stability of structures	Preventative foundation designs shall be done. Detailed foundation inspections should be carried out at the time of		Engineers / Contractor / Individual	When required

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<p>construction to identify any variances and adjust foundation designs accordingly if need be. The foundation recommendations from the geotechnical engineers must be adhered to.</p> <p>-G5 or G6 foreign class materials must be imported to the site for construction purposes.</p> <p>-A reinforced concrete raft design of 5m must be constructed for all buildings of two stories or higher.</p> <p>- An experienced Geotechnical Engineer must inspect the foundations prior to any construction activity is to take place.</p> <p>-All foundations must be constructed according to the recommendations of a structural engineer.</p> <p>-Only HDPE quality materials may be used for all water and sewer. No piping is allowed under floor slabs.</p>		Developer	
	Dolomite	To ensure stability of structures	<p>-A reinforced concrete raft design of 5m must be constructed for all buildings of two stories or higher.</p> <p>- An experienced Geotechnical Engineer must inspect the foundations prior to any construction activity is to take place.</p> <p>-All foundations must be constructed according to the recommendations of a structural engineer</p> <p>Site should be landscape to facilitate with runoff control and prevent ponding.</p> <p>-All road surfaces and water courses must be sealed to prevent water seepage.</p> <p>-Ponding must be prevented by all means available.</p> <p>-All water must be carried in sleeves and ducts.</p>			

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<ul style="list-style-type: none"> -All storm water must be discharged into the municipal system. -A minimum 1:15 gradient must be used for all storm water systems. -Paving must be used immediately against buildings, and should be shaped to fall in excess of 75mm over the first 1,0m beyond the perimeter of the building. -Water use on the site must be checked on a regular basis for any leaks. -All pipes on the site must be inspected every 6 months. -No plants that use large amounts of water may be used on the site for landscaping purposes. -Water supply must be checked regularly to ensure there are no leakages. -Sewer lines should be checked monthly to ensure there are no leakages. 			
	Water and Sewer	To ensure stability of systems.	<ul style="list-style-type: none"> -Only HDPE quality materials may be used for all water and sewer. No piping is allowed under floor slabs -Rodding eyes must be used on the sewer line. -Pressure release leaking system must be constructed as part of the sewer system. - All piping must be inspected every 6 months. 			
	Seepage of groundwater into excavations	To ensure that excavations do not become flooded	Provision should be made for the removal of groundwater from excavations.		Contractor	Monitor daily
	Cracking of structures	To ensure that built structures do not crack due to collapsible soils and settlement	1)The floors of foundation excavations should be compacted by a hand-operated vibratory roller or else by a machine equivalent to a Wacker Rammer (a mechanised tamping device); a test section	Built structures show no sign of cracks	Engineer/ Contractor	As required

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<p>should firstly be compacted under supervision of the Engineer in order to determine the number of roller passes. The structures may then be constructed by conventional means.</p> <p>Additional precautionary measures that can be employed are: 2) The provision of expansion joints in the walls of structures; 3) A concrete walkway of 1, 0m in width around the perimeter of each structure; and 4) The shaping of the walkway and the ground surface in the vicinity of the structures so as to drain water away from each structure so that no ponding of surface water can take place in the vicinity of the structures.</p>			
	Hydrology	To minimise pollution of soil, surface and groundwater	<p>1) Increased run-off during construction must be managed using berms and other suitable structures as required to ensure flow velocities are reduced. 2) The contractor shall ensure that excessive quantities of sand, silt and silted water do not enter the storm water system. 3) The site should be landscaped to aid in the flow control of storm water and prevent ponding. 4) Brick and pre-cast walls must be designed as to provide drainage ports at ground level permitting passage of water.</p>	<p>No visible signs of erosion. No visible signs of pollution</p>	Contractor	Monitor daily
	Fauna and flora	To protect the existing fauna and flora.	<p>1) All exotic invaders and weeds must be eradicated on a continuous basis. 2) Exotic invaders must be included in an alien management program for the site. Eradication must occur every 3 months. 3) No plants that are not indigenous to the</p>	No exotic plants used for landscaping	Contractor ESO / Home Owners Association / Design	<p>As and when required Every 6 months</p>

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<p>area, or exotic plant species, especially lawn grasses and other ground-covering plants, should be introduced in the communal landscaping of the proposed site, as they will drastically interfere with the nature of the area.</p> <p>4) Where possible, trees naturally growing on the site should be retained as part of the landscaping.</p> <p>5) No plant species that require large amounts of water should be allowed on the site.</p>		Review Committee	
		To protect the existing fauna and flora.	<p>1) Trees that are intended to be retained shall be clearly marked on site.</p> <p>2) Snaring and hunting of fauna by construction workers on or adjacent to the study area are strictly prohibited and the Council shall prosecute offenders.</p> <p>3) All mitigation measures for impacts on the indigenous flora of the area should be implemented in order to limit habitat loss as far as possible and maintain and improve available habitat, in order to maintain and possibly increase numbers and species of indigenous fauna.</p> <p>4) Wood harvesting of any trees or shrubs on the study area or adjacent areas shall be prohibited.</p> <p>5) Where possible, work should be restricted to one area at a time.</p> <p>6) Noise should be kept to a minimum and the development should be done in phases to allow faunal species to temporarily migrate into the conservation areas in the vicinity.</p> <p>7) The integrity of remaining wildlife should be upheld, and no trapping or hunting by</p>	No measurable signs of habitat destruction	Contractor ESO	As and when required

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<p>construction personnel should be allowed. Caught animals should be relocated to the conservation areas in the vicinity.</p> <p>8) Entrance by vehicles, especially off-road cars and bakkies, off-road bicycles and quad bikes and construction staff into the application site should be prohibited, both during the construction phase and during the lifespan of the project.</p>			
Social	Noise impact	To maintain noise levels below "disturbing" as defined in the national Noise Regulations.	<p>1) Site workers must comply with the Provincial noise requirements as outlined in Provincial Notice No. 5479 of 1999: Gauteng Noise Control Regulations.</p> <p>2) Noise activities shall only take place during working hours</p>	No complaints from surrounding residents and I & APs	Contractor	Monitored daily
	Dust impact	Minimise dust from the site	<p>1) Dust pollution could occur during the construction works, especially during the dry months. Regular and effective damping down of working areas (especially during the dry and windy periods) must be carried out to avoid dust pollution that will have a negative impact on the surrounding environment.</p> <p>2) When necessary, these working areas should be damped down in the mornings and afternoons.</p>	<p>No visible signs of dust pollution</p> <p>No complaints from surrounding residents and I & APs</p>	Contractor	Monitored daily
	Safety and security	To ensure the safety and security of the public.	<p>1) Although regarded as a normal practice, it is important to erect proper signs indicating the operations of heavy vehicles in the vicinity of dangerous crossings and access roads or even in the development site if necessary.</p> <p>2) With the exception of the appointed security personnel, no other workers, friends or relatives will be allowed to sleep on the construction site (weekends included)</p> <p>3) Construction vehicles and activities to</p>	No incidences reported	Contractor ESO	Monitored daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			avoid peak hour traffic times 4) Presence of law enforcement officials at strategic places must be ensured 5) Following actions would assist in management of safety along the road <ul style="list-style-type: none"> ▪ Adequate road marking ▪ Adequate roadside recovery areas ▪ Allowance for pedestrians and cyclists where necessary ▪ Although regarded as a normal practice, it is important to erect proper signs indicating the danger of the excavation in and around the development site. Putting temporary fencing around excavations where possible. 			
	Infrastructure and services	Installation of services	Determine areas where services will be upgraded and relocated well in advance. Discuss possible disruptions with affected parties to determine the most convenient times for service disruptions and warn affected parties well in advance of dates that service disruptions will take place.	No complaints from I & AP	Contractor ESO	When required
	Cultural Resources		If any graves or archaeological sites are exposed during construction work it should immediately be reported to a museum. The report from the archaeologist must be provided to GDARD if any graves are recovered.	No destruction of or damage to graves or known archaeological sites	Contractor ESO	Monitor daily
	Visual impact	In order to minimise the visual impact.	1) The disturbed areas shall be rehabilitated immediately after the involved construction works are completed. 2) Shade cloth must be used to conceal and minimise the visual impact of the site camps and storage areas	Visual impacts minimized	Contractor ESO	Monitor daily
	Vegetation	Landscaping	1) When planting trees, care should be taken to avoid the incorrect positioning of	Landscaping done according	Landscape architect	When required

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<p>trees and other plants, to prevent the roots of trees planted in close proximity to the line of water-bearing services from causing leaking in, or malfunctioning of the services.</p> <p>2) The proposed planting materials for the areas to be landscaped should preferably be endemic and indigenous.</p> <p>3) All new trees and shrubs to be planted on the study area shall be inspected for pests and diseases prior to them being planted.</p> <p>4) The inspection shall be carried out by the maintenance contractor at the property of the supplier and not on the study area.</p> <p>5) All trees to be planted shall be in minimum 100L containers with a height of approximately 3 metres and a main stem diameter of approximately 80 mm.</p>	to landscape development plan	Contractor / Individual Developer	
		Loss of plants	<p>1) Aerate compacted soil and check and correct pH for soils affected by construction activities.</p> <p>2) Make sure plant material will be matured enough and hardened off ready for planting. Water in plants immediately as planting proceeds.</p> <p>3) Apply mulch to conserve moisture. Plant according to the layout and planting techniques specified by the Landscape Architect in the Landscape Development plans for the site.</p>	Landscaping done according to landscape development plan	Landscape architect Contractor / Individual Developer	When required
		Spread of weeds	<p>Ensure that materials used for mulching and topsoil/ fertilisers are certified weed free. Collect certifications where available. Control weed growth that appears during construction.</p>	Weed growth controlled	Landscape architect Contractor	When required
		To ensure rehabilitation of the site	<p>1) Compacted soils shall be ripped at least 200mm.</p> <p>2) All clumps and rocks larger than 30mm</p>	Grass have hardened off	Landscape architect Contractor	Once a day Then every 4 days

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<p>diameter shall be removed from the soil to be rehabilitated.</p> <p>3) The soil shall be levelled before seeding</p> <p>4) Hydroseed the soil with a Potch mixture</p> <p>5) Watering shall take place at least once per day for the first 14 days until germination of seeds have taken place</p> <p>6) Thereafter watering should take place at least for 20 minutes every 4 days until grass have hardened off.</p>			
		Rehabilitation of area directly surrounding new river crossing	<p>1) Vehicles and workers associated with construction should not have free access to the river bed and unnecessary disturbance to the river bed should be avoided.</p> <p>2) Areas where vegetation has been cleared for construction should be replanted with indigenous vegetation upon completion of construction.</p> <p>3) Erosion control measures should be implemented on all open soils and steep slopes.</p> <p>4) Upon completion of the construction in the area, the area should be rehabilitated to a level that will ensure that wetland vegetation can become re-established. In this regard special mention of the following is made:</p> <ul style="list-style-type: none"> • All areas of disturbed and compacted soils need to be compacted and reprofiled. • Ongoing removal of alien vegetation from the area must take place after the completion of the structure to prevent the uncontrollable recruitment of these species. 	No erosion surrounding new river crossing	Landscape architect Contractor	Immediately after construction

4.3 Operational Phase

TYPE	Environmenta I risk or issue	Objective or requirement	Mitigation measure	Responsibility	Frequency of Action
Site cleanup and preparation for use	Storm water pollution	Do not allow any materials to wash into the storm water system.	Remove erosion and sediment controls only if all bare soil is sealed, covered or re-vegetated. Sweep roadways clean and remove all debris from kerb and gutter areas. Do not wash into drains.	Contractor	-
		Minimise waste	Decontaminate and collect waste in storage area ready for off-site recycling or disposal. Arrange for final collection and removal of excess and waste materials.	Contractor	-
Establishing plants	Slow or no re-vegetation to stabilise soil; loss or degradation of habitat	To ensure re-vegetation to stabilize soil	Agreed schedule for regular follow-up watering, weed control, mulch supplements and amenity pruning, if needed. Replace all plant failures within three month period after planting.	Contractor	To be agreed
Materials failure	Structural damage. Loss of site materials.		Inspect all structures monthly to detect any cracking or structural problems. Confirm with the designer if there are design problems. Rectify with materials to match, or other agreed solution.	Contractor	-
Drainage failure	On-site and downstream drainage pollution or flooding	Storm water management plan	Inspect all site drainage works and repair any failures. Confer with design engineer and to correct site problems.	Contractor / Dolomite Risk manager as appointed by the home owner	-
Site audit	Eventual project failure	Successful project establishment	Routinely audit the works and adjust maintenance schedule accordingly.	Contractor	-
General			Open fires and smoking during maintenance works are strictly prohibited.	Contractor	-

5 Procedures for environmental incidents

5.1 Leakages & spills

- Identify the source of problem.
- Stop goods leaking, if it is safe to do so.
- Contain spilt material, using spills kit or sand.
- Notify Environmental Control Officer
- Remove spilt material and place in a sealed container for disposal (if possible).
- Environmental Control Officer to follow Incident Management Plan.

5.2 Failure of erosion/sediment control devices

- Prevent further escape of sediment.
- Contain escaped material using silt fence, hay bales, pipes, etc.
- Notify ECO.
- Repair or replace failed device as appropriate.
- Dig/scrape up escaped material; take care not to damage vegetation.
- Remove escaped material from site.
- ECO to follow Incident Management plan.
- Monitor for effectiveness until re-establishment.

5.3 Bank/slope failure

- Stabilize toe of slope to prevent sediment escape using aggregate bags, silt fence, logs, hay bales, pipes, etc.
- Notify ECO.
- ECO to follow Incident Management plan.
- Divert water upslope from failed fence.
- Protect area from further collapse as appropriate.
- Restore as advised by ECO.
- Monitor for effectiveness until stabilized.

5.4 Discovery of rare or endangered species

- Stop work.
- Notify ECO.
- If a plant is found, mark location of plants.
- If an animal, mark location where sighted.
- ECO to identify or arrange for identification of species and or the relocation of the species if possible.
- If confirmed significant, ECO to liaise with Endangered Wildlife Trust.
- Recommence work when cleared by ECO.

5.5 Discovery of archeological or heritage items

- Stop work.
- Do not further disturb the area.

- Notify ECO.
- ECO to arrange appraisal of specimen.
- If confirmed significant, ECO to liaise with National, Cultural and History Museum
P.O. Box 28088
SUNNYSIDE
0132
Contact Mr. J. van Schalkwyk
or
Mr. Naude
- Recommence work when cleared by ECO.

6 EMP review

1. The Site Supervisor is responsible for ensuring the work crew is complying with procedures, and for informing the work crew of any changes. The site supervisor is responsible for ensuring the work crew is aware of changes that may have been implemented by GDARD before starting any works.
2. If the contractor cannot comply with any of the activities as described above, they should inform the ECO with reasons within 7 working days.

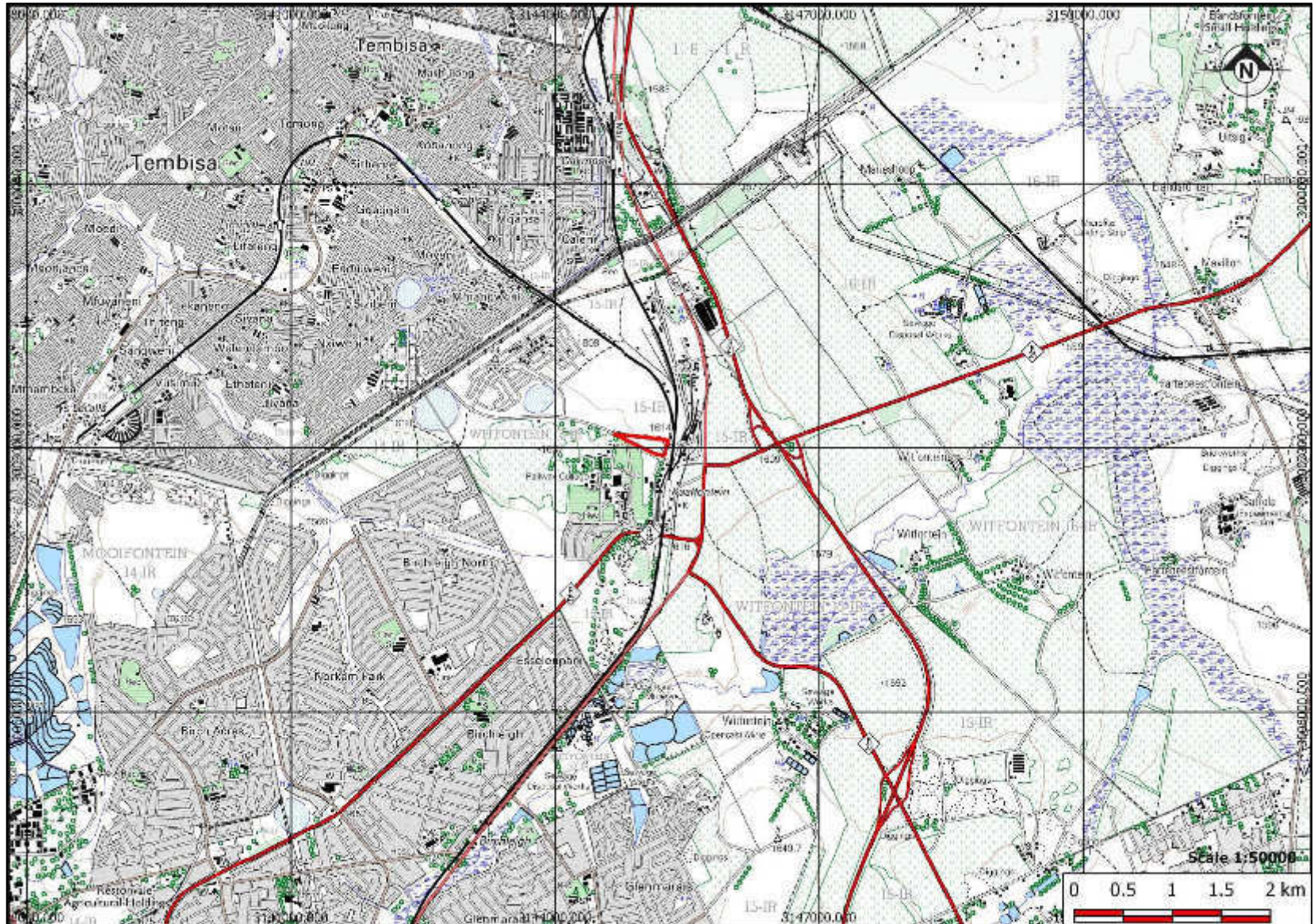
Enlarged Figures



**Locality Map
Figure 1**



Tembisa Licencing Hub Locality Map



Projection – Transverse Mercator
Datum - Hartebeeshoek 1994
Reference Ellipsoid –WGS 1984
Central Meridian -29

**Aerial Map
Figure 2**



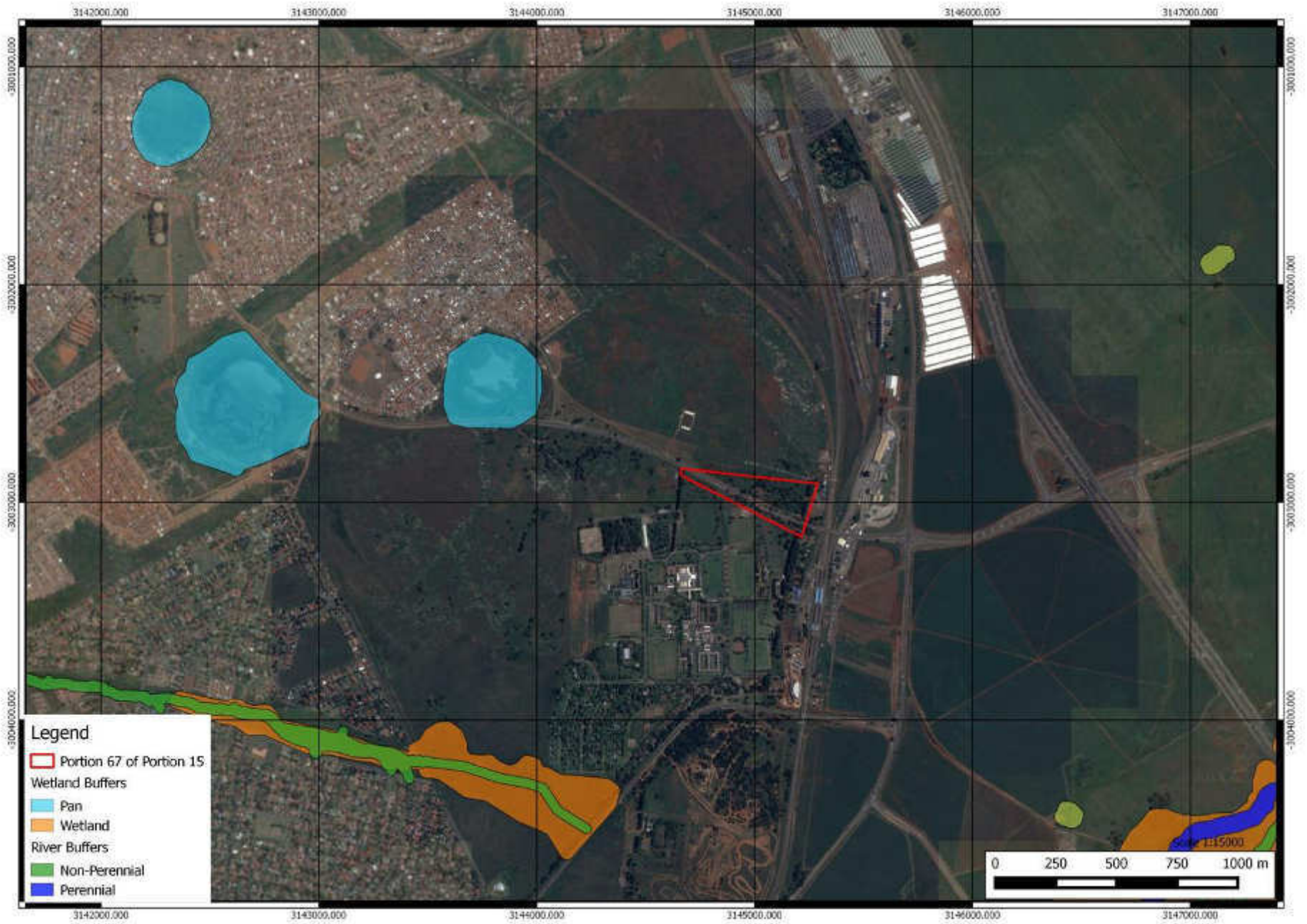
Tembisa Licencing Hub Aerial Map



Projection – Transverse Mercator
Datum - Hartebeeshoek 1994
Reference Ellipsoid – WGS 1984
Central Meridian -29

Hydrology Map Figure 3

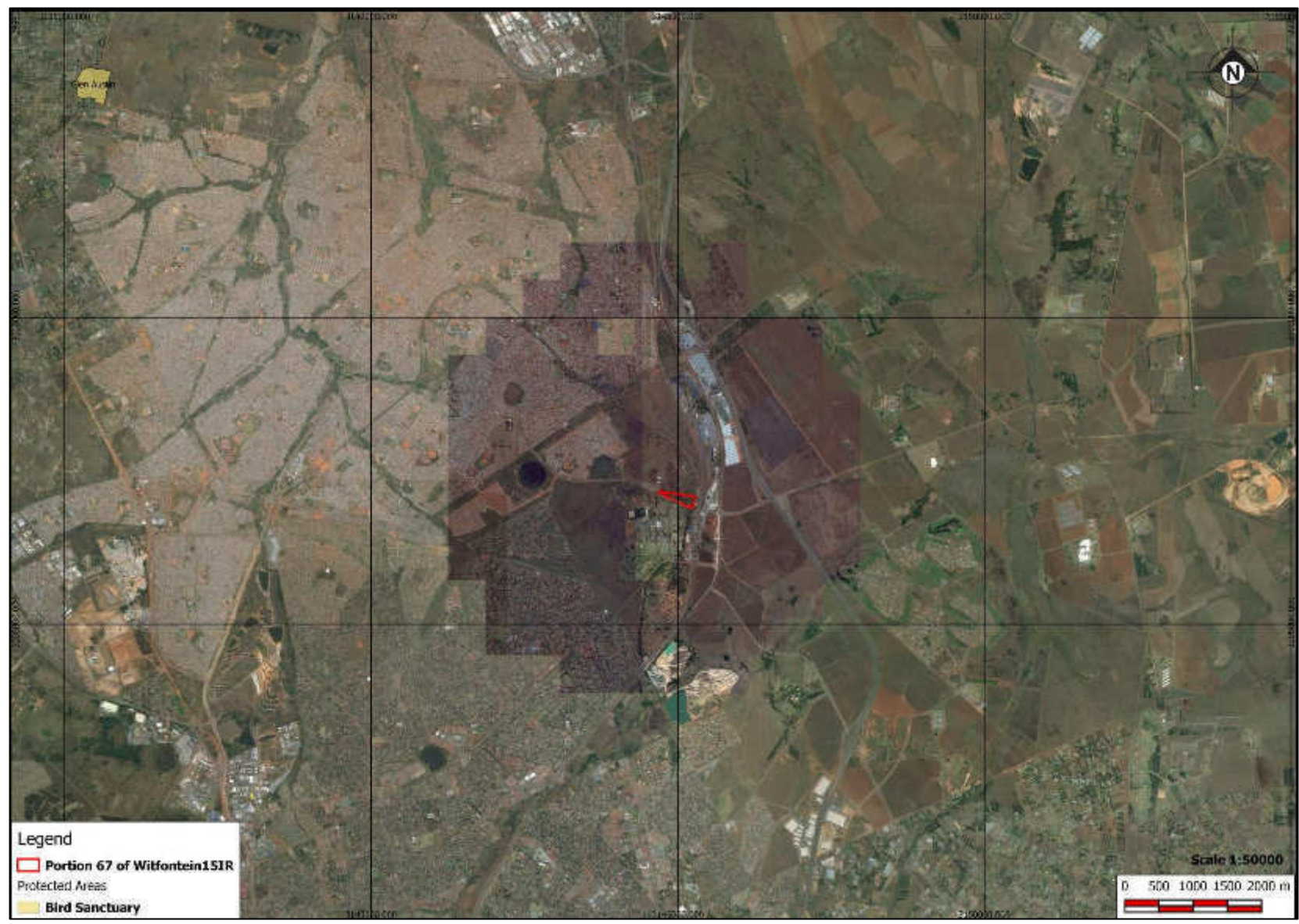




Protected Areas Map Figure 4



Tembisa Licencing Hub Protected Areas



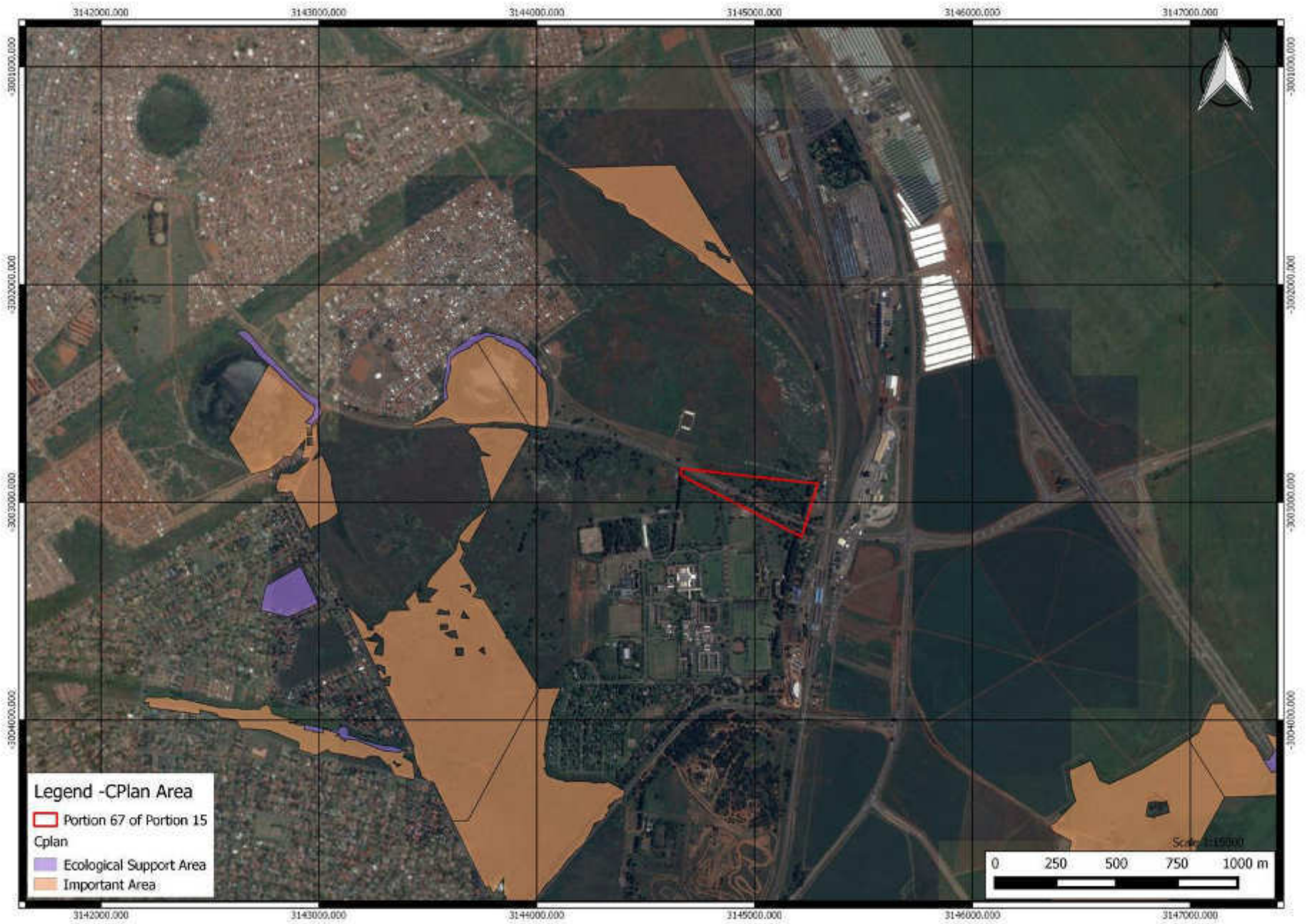
Legend
[Red Outline] Portion 67 of Witfontein151R
Protected Areas
[Yellow Outline] Bird Sanctuary

Scale 1:50000
0 500 1000 1500 2000 m

Projection – Transverse Mercator
Datum- Hartebeeshoek 1994
Reference Ellipsoid –WGS 1984
Central Meridian -29

**GDARD C-Plan Areas Map
Figure 5**

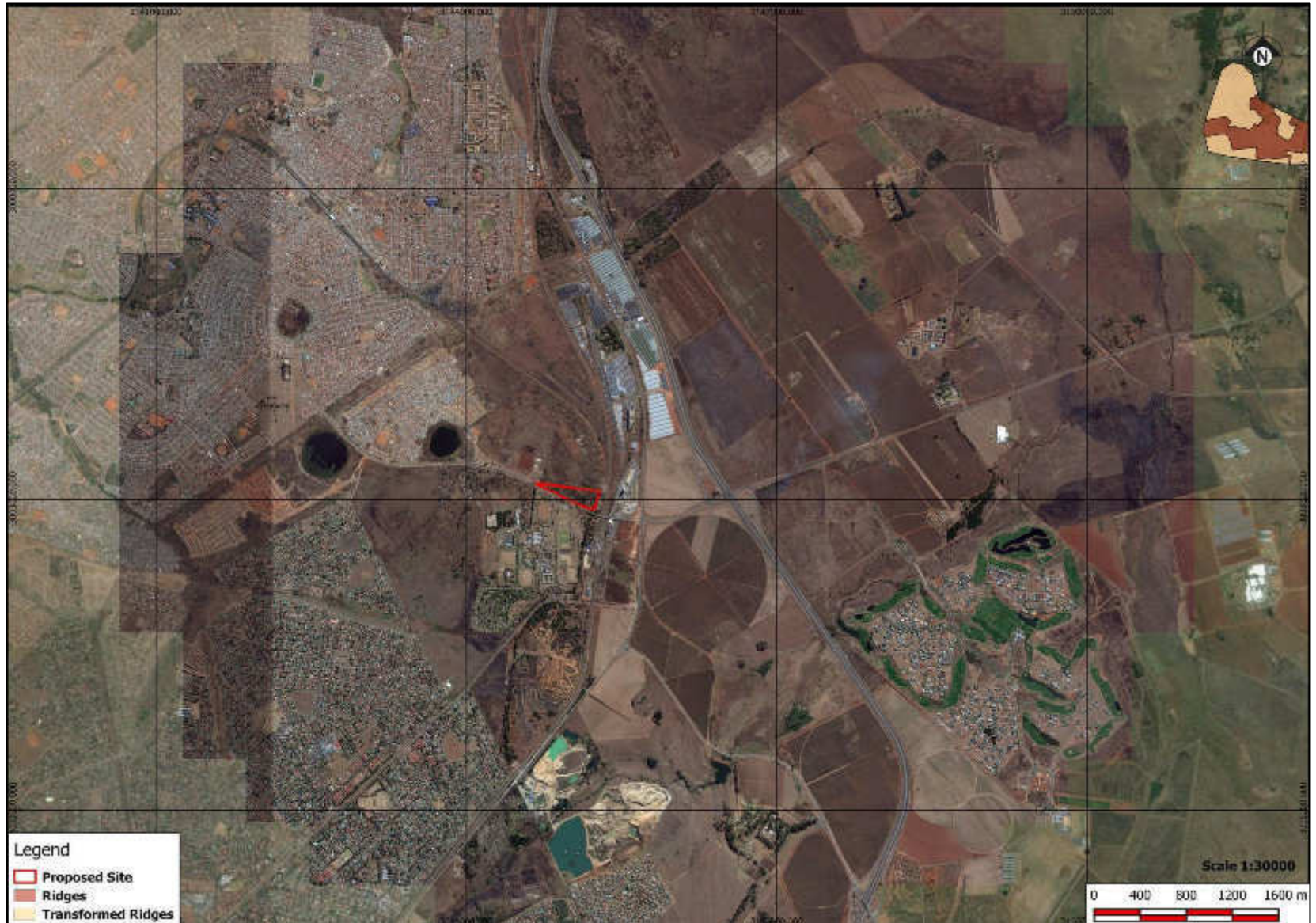




**Ridges Map
Figure 6**



Tembisa Licencing Hub Ridges Map



Legend
[Red Box] Proposed Site
[Brown Box] Ridges
[Yellow Box] Transformed Ridges

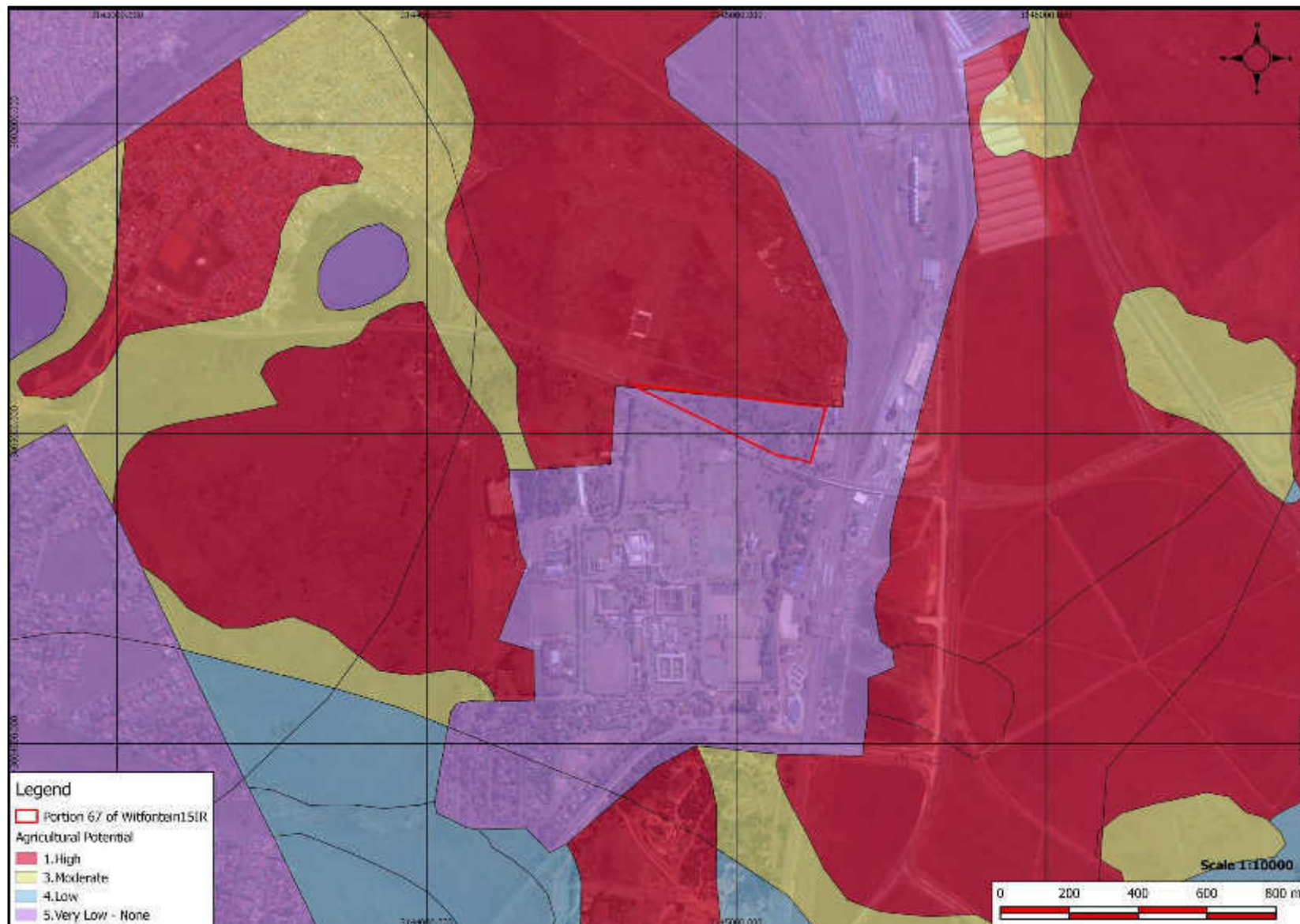
Projection – Transverse Mercator
Datum- Hartebeeshoek 1994
Reference Ellipsoid –WGS 1984
Central Meridian -29

Agricultural Potential Map

Figure 7



Tembisa Licencing Hub Agricultural Potential

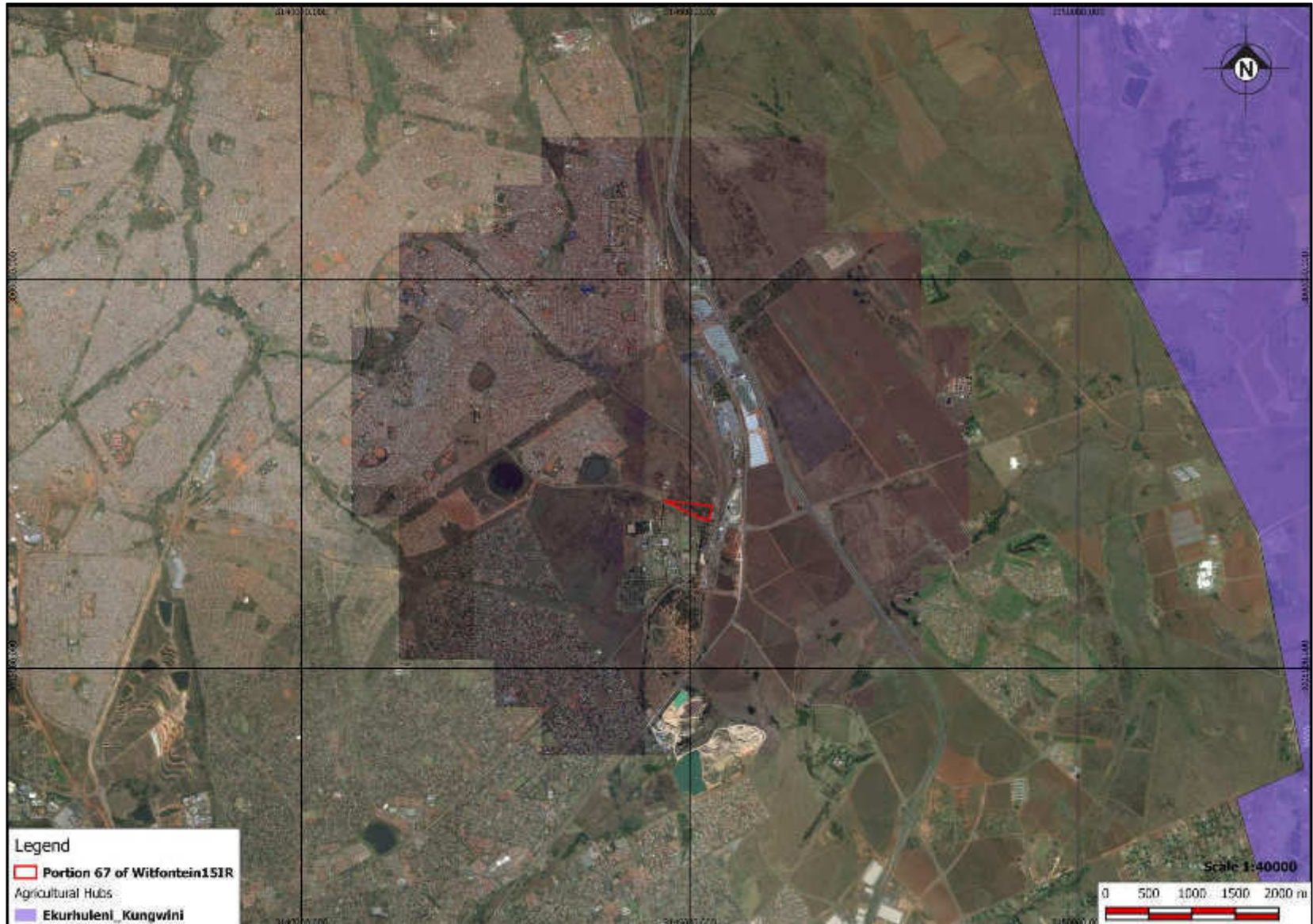


Agricultural Hubs

Figure 8



Tembisa Licencing Hub Agricultural Hubs



**Urban Edge Map
Figure 9**

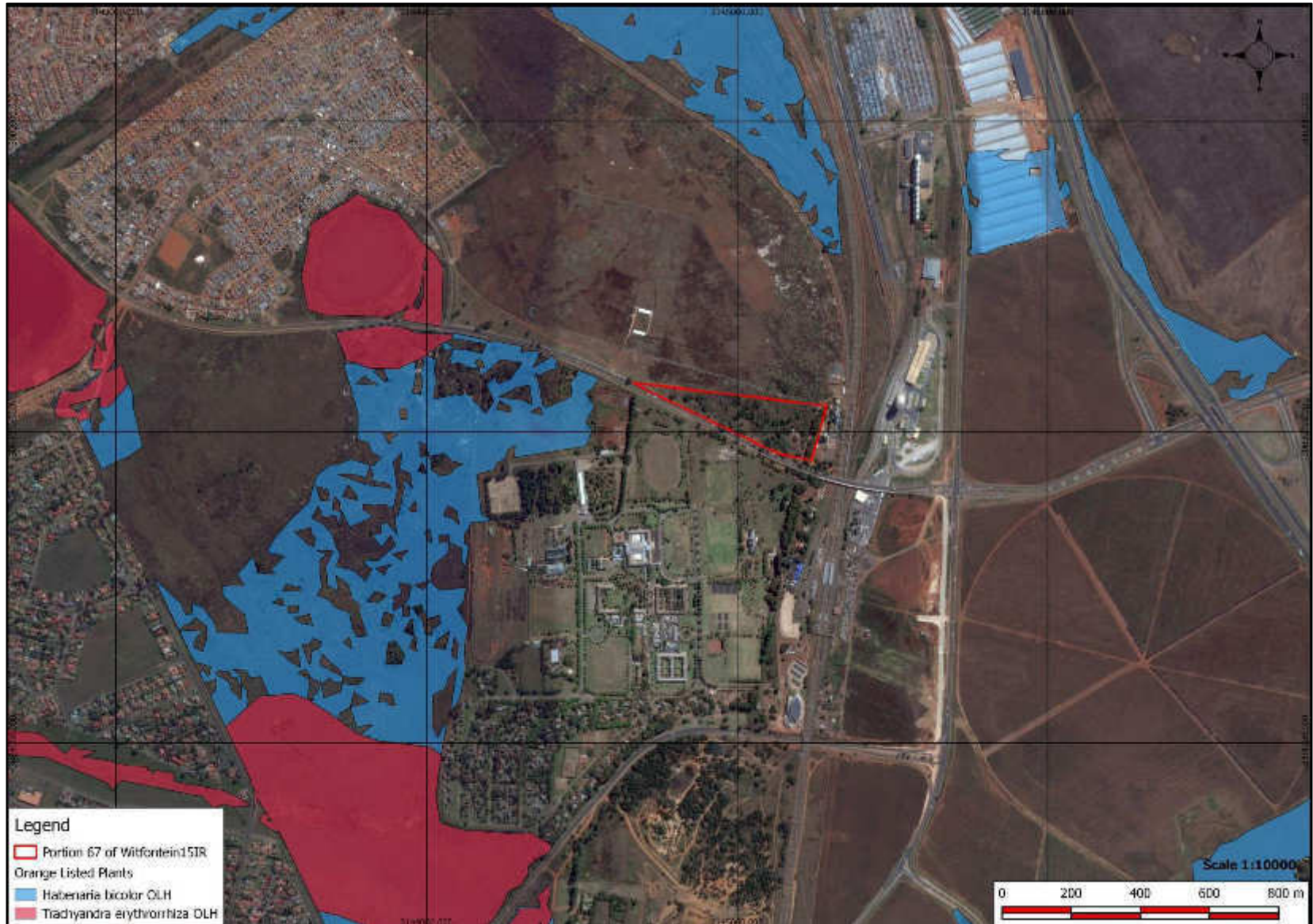


Orange Listed Plant Species Map Figure 10



Tembisa Licencing Hub

Orange Listed Plants



**Streets Map
Figure 11**



Tembisa Licencing Hub Street Map



Legend
[Red Polygon] Portion 67 of Portion 15

Projection – Transverse Mercator
Datum - Hartebeeshoek 1994
Reference Ellipsoid – WGS 1984
Central Meridian -29

**Layout Map
Figure 12**



**Alternatives Map
Figure 13**



Thembisa Licencing Hub Alternatives



- Legend**
- Proposed Site
 - Alternative 1
 - Alternative 2

Projection – Transverse Mercator
Datum – Hartebeeshoek 1994
Reference Ellipsoid – WGS 1984
Central Meridian -29

**Alternative 1 Map
Figure 14**



Thembisa Licencing Hub

Alternative 1



**Alternative 2 Map
Figure 15**



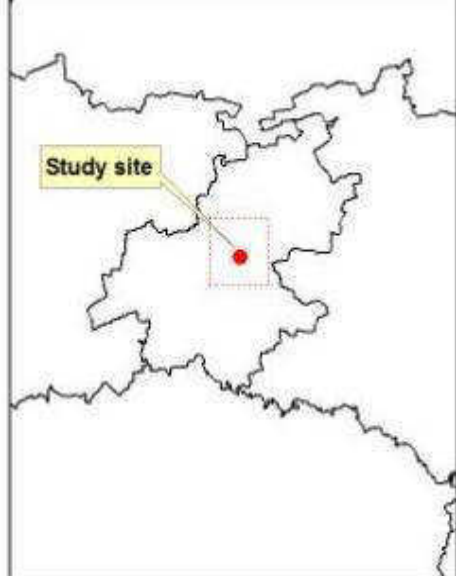
Thembisa Licencing Hub

Alternative 2



Sensitivity Maps
Figure 16





Legend

— Proposed site

Ecological Sensitivity

Low

Negligible



Enviro
INSIGHT

GCS_WGS_1984

Datum: D_WGS_1984

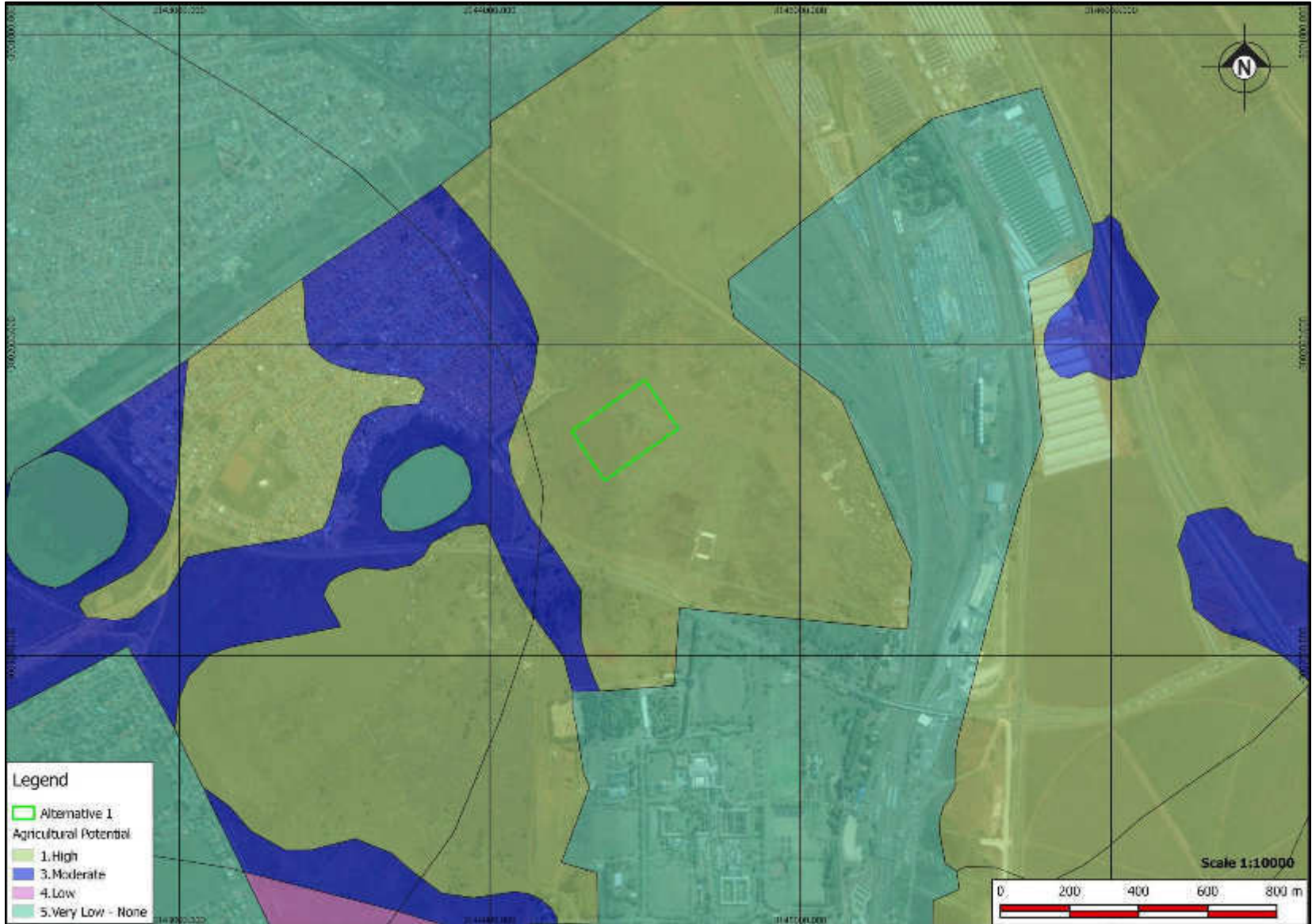


**Alternative 1: Agricultural Potential Map
Figure 17**



Tembisa Licencing Hub

Agricultural Potential

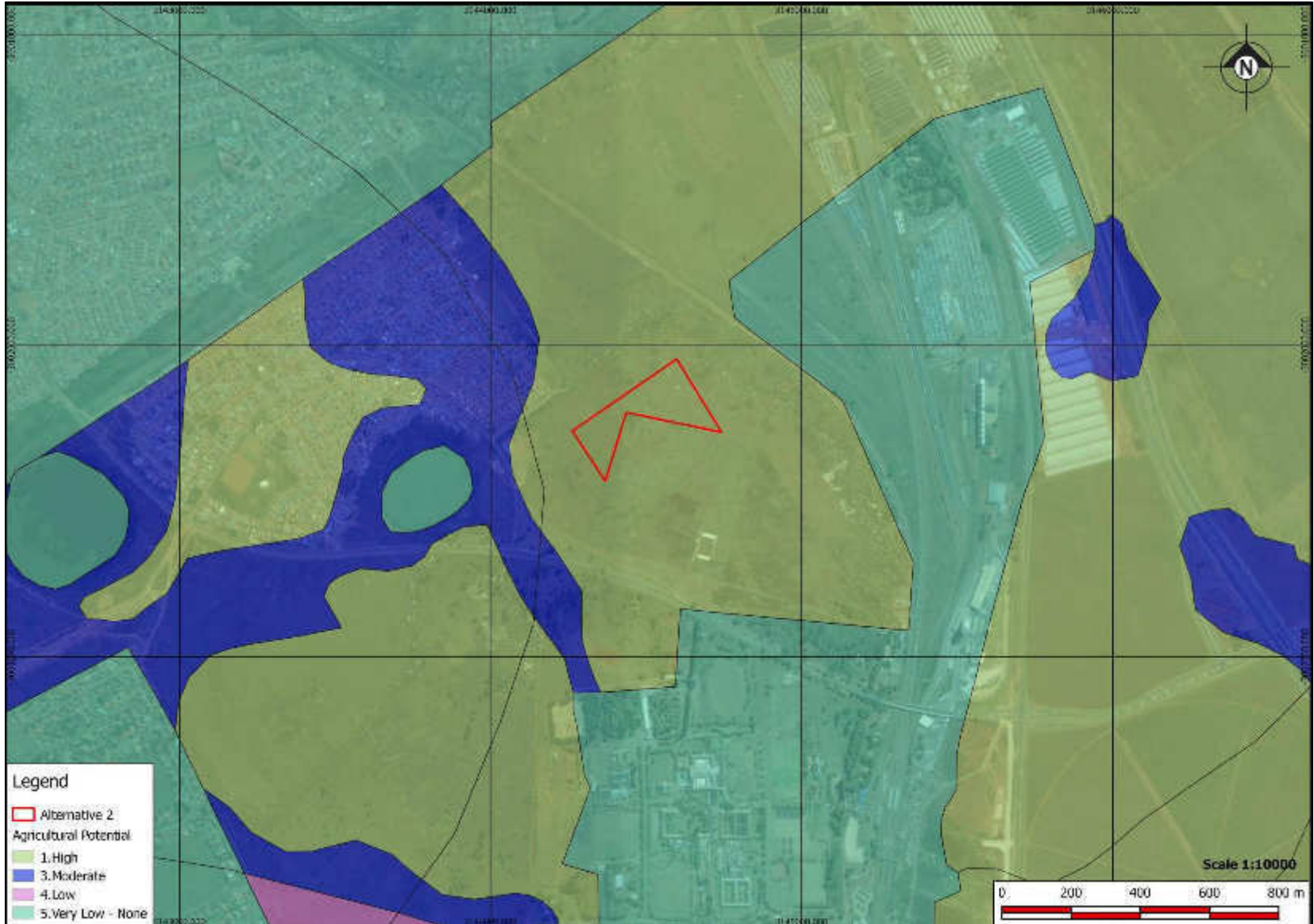


**Alternative 2: Agricultural Potential Map
Figure 18**



Tembisa Licencing Hub

Agricultural Potential



Company Profile and CV of Ms Gregory (Environmental Assessment Practitioner)



Qualifications And Experience In The Field Of Environmental Planning And Management (Lizelle Gregory (Member Bokamoso)):

Qualifications:

- Qualified as **Landscape Architect** at UP 1991;
- Qualified as **Professional Landscape Architect in 1997**;
- A Registered Member at The **South African Council for the Landscape Architect Profession (SACLAP)** with Practise Number: **PrLArch97078**;
- A Registered Member at the **International Association for Impact Assessment Practitioners (IAIA)**;
- Qualified as an **Environmental Auditor in July 2008** and also became a Member of the International Environmental Management Association (IEMAS) in 2008.

Working Experience:

- Worked part time at Eco-Consult – 1988-1990;
- Worked part time at **Plan Associates as Landscape Architect in training** – 1990-1991;
- Worked as Landscape Architect at **Environmental Design Partnership (EDP)** from 1992 - 1994
- Practised under **Lizelle Gregory Landscape Architects** from 1994 until 1999;
- Lectured** at Part-Time at **UP** (1999) – Landscape Architecture and **TUT** (1998- 1999)- Environmental Planning and Plant Material Studies;
- Worked as **part time Landscape Architect and Environmental Consultant at Plan Associates** and **managed their environmental division for more than 10 years** – 1993 – 2008 (assisted the **PWV Consortium** with various road planning matters which amongst others included environmental Scans, EIA's, Scoping reports etc.)
- Renamed business as **Bokamoso in 2000** and is the only member of Bokamoso Landscape Architects and Environmental Consultants CC;
- More than 20 years experience in the compilation of Environmental Reports**, which amongst others included the compilation of various **DFA Regulation 31 Scoping Reports**, EIA's for EIA applications in terms of the applicable environmental legislation, Environmental Management Plans, Inputs for Spatial Development Frameworks, DP's, EMF's etc. Also included EIA Application on and adjacent to mining land and slimes dams (i.e. Brahm Fisherville, Doornkop)

Qualifications And Experience In The Field Of Landscape Architecture (Lizelle Gregory (Member Bokamoso)):

Landscape Architecture:

-Compiled landscape and rehabilitation plans for more than 22 years.

The most significant landscaping projects are as follows:

-Designed the Gardens of the Witbank Technicon (a branch of TUT). Also supervised the implementation of the campus gardens (2004);

-Lizelle Gregory was the Landscape Architect responsible for the paving and landscape design at the UNISA Sunnyside Campus and received a Corobrick Golden Award for the paving design at the campus (1998-2004);

-Bokamoso assisted with the design and implementation of a park for the City of Johannesburg in Tembisa (2010);

-The design and implementation of the landscape gardens (indigenous garden) at the new Coca-Cola Valpre Plant (2012-2013);

-Responsible for the rehabilitation and landscaping of Jukse River area at the Norwood Shopping Mall (Johannesburg) (2012-2013);

-Designed and implemented a garden of more than 3,5ha in Randburg (Mc Arthurpark). Bokamoso also seeded the lawn for the project (more than 2,5 ha of lawn successfully seeded) (1999);

-Bokamoso designed and implemented more than 800 townhouse complex gardens and submitted more than 500 Landscape Development Plans to CTMM for approval (1995 – 2013);

-Assisted with Landscape Designs and the Masterplan at Eco-Park (M&T Developments) (2005-2011);

-Bokamoso designed and implemented an indigenous garden at an office park adjacent to the Bronberg. In this garden it was also necessary to establish a special garden for the Juliana Golden Mole. During a recent site visit it was established that the moles are thriving in this garden. Special sandy soils had to be imported and special indigenous plants had to be established in the natural section of the garden.

-Lizelle Gregory also owns her own landscape contracting business. **For the past 20 years she trained more than 40 PDI jobless people (sourced from a church in Mamelodi)** to become landscape contracting workers. All the workers are (on a continuous basis) placed out to work at nurseries and other associated industries;

-Over the past 20 years the Bokamoso team compiled more than 800 landscape development plans and also implemented most of the gardens. Bokamoso also designed and implemented the irrigation for the gardens (in cases where irrigation was required). Lizelle regarded it as important to also obtain practical experience in the field of landscape implementation.



Bokamoso

**Landscape Architects &
Environmental consultants**

**P.O.BOX 11375
Maroelana
0161**

**Tel: (012) 346 3810
Fax: (086) 570 5559**

**E-mail: lizelle@mweb.co.za
Website: www.bokamoso.biz**

- 01** Executive Summary
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- 06** Corporate Highlights
- 07** Environmental Projects
- 08** Indicative Clients
- 09** Tools

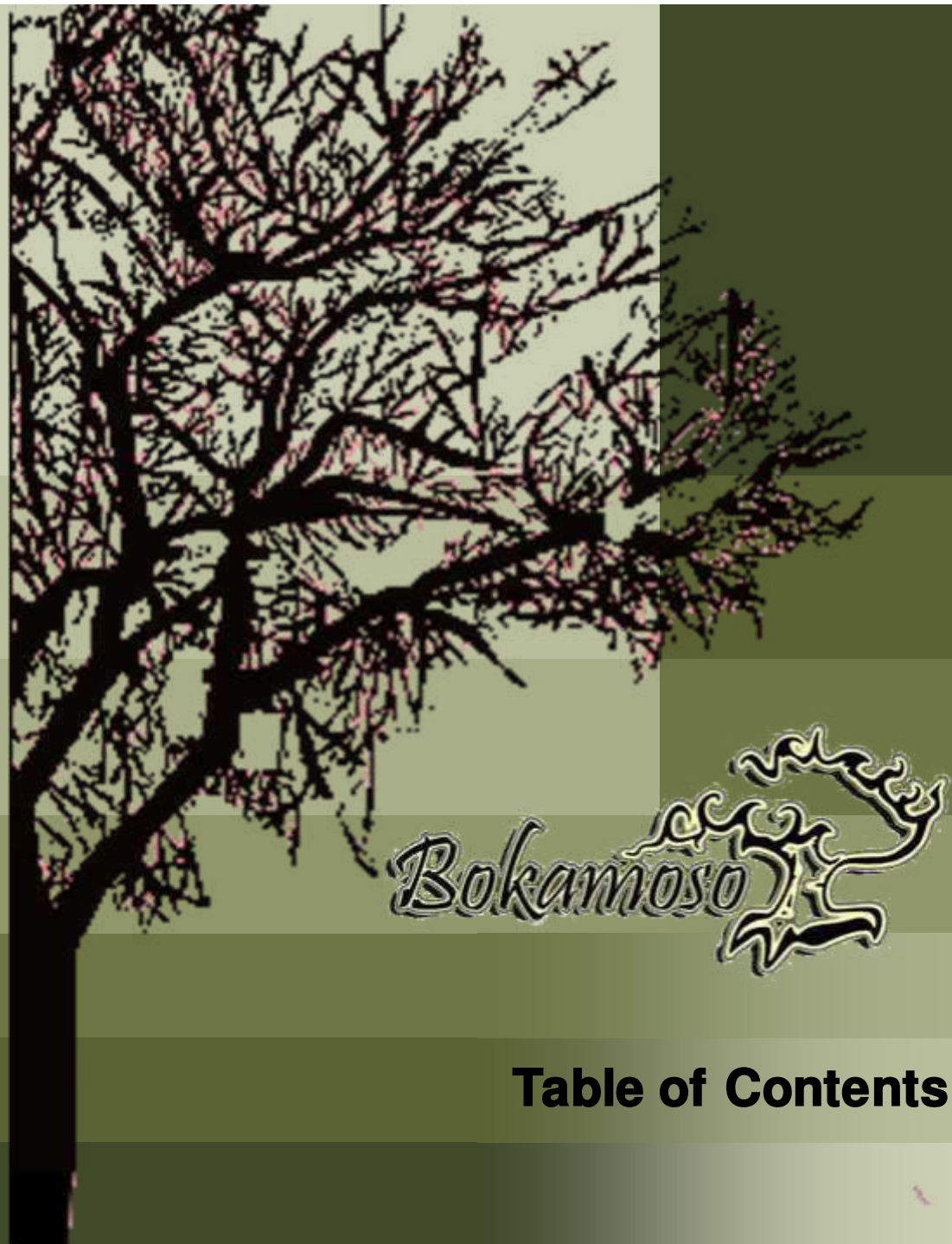


Table of Contents

Bokamoso specialises in the fields of Landscape Architecture and all aspects of Environmental Management and Planning. Bokamoso was founded in 1992 and has shown growth by continually meeting the needs of our clients. Our area of expertise stretches throughout the whole of South Africa. Our projects reflect the competence of our well compiled team. The diversity of our members enables us to tend to a variety of needs. Our integrated approach establishes a basis for outstanding quality. We are well known to clients in the private, commercial as well as governmental sector.

At Bokamoso we stand on a firm basis of environmental investigation in order to find unique solutions to the requirements of our clients and add value to their operations.



01 Executive Summary

011 Company Overview



Vision:

At Bokamoso we strive to find the best planning solutions by taking into account the functions of a healthy ecosystem. Man and nature should be in balance with each other.

Mission:

We design according to our ethical responsibility, take responsibility for successful completion of projects and constitute a landscape that contributes to a sustainable environment. We add value to the operations of our clients and build long term relationships that are mutually beneficial.

Values:

Integrity

Respect



Bokamoso stands on the basis of fairness. This include respect within our multicultural team and equal opportunities in terms of gender, nationality and race.

We have a wide variety of projects to tend to, from complicated reports to landscape installation. This wide range of projects enables us to combine a variety of professionals and skilled employees in our team.

Bokamoso further aids in the development of proficiency within the working environment. Each project, whether in need of skilled or unskilled tasks has its own variety of facets to bring to the table.

We are currently in the process of receiving our BEE scorecard. We support transformation in all areas of our company dynamics.



03 Human Resources

031 Employment Equity

Lizelle Gregory (100% interest)

Lizelle Gregory obtained a degree in Landscape Architecture from the University of Pretoria in 1992 and passed her board exam in 1995.

Her professional practice number is PrLArch 97078.

Ms. Gregory has been a member of both the Institute for Landscape Architecture in South Africa (ILASA) and South African Council for the Landscape Architecture Profession (SACLAP), since 1995.

Although the existing Environmental Legislation doesn't yet stipulate the academic requirements of an Environmental Assessment Practitioner (EAP), it is recommended that the Environmental Consultant be registered at the International Association of Impact Assessments (IAIA). Ms. Gregory has been registered as a member of IAIA in 2007.

Ms. Gregory attended and passed an International Environmental Auditing course in 2008. She is a registered member of the International Environmental Management and Assessment Council (IEMA).

She has lectured at the Tshwane University of Technology (TUT) and the University of Pretoria (UP). The lecturing included fields of Landscape Architecture and Environmental Management.

Ms. Gregory has more than 20 years experience in the compilation of Environmental Evaluation Reports:

Environmental Management Plans (EMP);

Strategic Environmental Assessments;

All stages of Environmental input ;

EIA under ECA and the new and amended NEMA regulations and various other Environmental reports and documents.

Ms. Gregory has compiled and submitted more than 600 Impact Assessments within the last 5-6 years. Furthermore, Ms. L. Gregory is also familiar with all the GDARD/Provincial Environmental policies and guidelines. She assisted and supplied GAUTRANS/former PWV Consortium with Environmental input and reports regarding road network plans, road determinations, preliminary and detailed designs for the past 12 years.



03 Human Resources

032 Members

Consulting

Anè Agenbacht

Introduction to Sustainable Environmental Management—An overview of Principles, Tools, & Issues (Potch 2006)
Leadership Training School (Lewende Woord 2010)
BA Environmental Management (UNISA 2011)
PGCE Education (Unisa 2013) - CUM LAUDE
Project Manager
More than 10 years experience in the compilation of various environmental reports

Mary-Lee Van Zyl

Msc. Plant Science (UP)
BSc (Hons) Plant Science (UP)
BSc Ecology (UP)
More than 3 years working experience in the Environmental field
Specialises in ECO works, Basic Assessments, EIA's, and Flora Reports
Compilation of various Environmental Reports

Dashentha Naidoo

BA Honours Degree in Environmental Management (UNISA) - CUM LAUDE
Bachelor Social Science in Geography & Environmental Management (UKZN)
More than 4 years experience in WUL Application & Integrated Environmental Management within water resource management.
Senior Environmental Practitioner & Water Use Licences Consultant
Specialises in Water Use License & Compilation of various Env. Reports

Ben Bhukwana

BSc Landscape Architecture (UP)
More than 5 years experience in the field of Landscape Architecture (Design, Construction, and Implementation).
Specialises in Landscape Design, ECO, Rehabilitation Plans and Compilation Basic Assessment Reports
Compilation of Tender documents



03 Human Resources

033 Personnel

Anton Nel

**B-Tech Landscape Technology (TUT)
N Dip Landscape Technology (TUT)
Hazardous Waste Management Short Course**
2 years experience in ECO.
Specialises in Basic Assessment Reports.

Juanita de Beer

Diploma Events Management and Marketing (Damelin)
Specializes in Public relations and Public Participation Processes (3 years experience)

Alfred Thomas

CIW Foundation & Internet Marketing (IT Academy)
12 years experience in GIS and IT in general.
GIS Operator and Multimedia Specialist.

Bianca Reyneke

**Applying SHE Principles and Procedures (NOSA)
Intro to SAMTRAC Course (NOSA)
SHEQ Coordinator and compilation of environmental reports**
Specialises in compiling various environmental reports

A.E. van Wyk

BSc. Environmental Sciences (Zoology and Geography)
Specialises in compiling various environmental reports



03 Human Resources

034 Personnel

Elsa Viviers

Interior Decorating (Centurion College)

(Accounting/ Receptionist) and Secretary to Lizelle Gregory

Loura du Toit

N. Dip. Professional Teacher (Heidelberg Teachers Training College)

Librarian and PA to Project Manager

Merriam Mogalaki

Administration Assistant with in-house training in bookkeeping

Landscape Contracting

Elias Maloka

Site manager overseeing landscape installations.

Irrigation design and implementation.

Landscape maintenance

18 years experience in landscape contracting works.

The contracting section comprises of six permanently employed black male workers. In many cases the team consists of up to 12 workers, depending on the quantity of work.



03 Human Resources

035 Personnel



01 Environmental Management Services

- Basic Assessment Reports
- EIA & Scoping Reports
- Environmental Management Plans
- Environmental Scans
- Strategic Environmental Assessments
- EMP for Mines
- Environmental Input and Evaluation of Spatial Development Frameworks
- State of Environmental Reports
- Compilation of Environmental Legislation and Policy Documents
- Environmental Auditing and Monitoring
- Environmental Control Officer (ECO)
- Visual Impact assessments
- Specialist Assistance with Environmental Legislation Issues and Appeals
- Development Process Management
- Water Use License applications to DWA
- Waste License Application



04 Services

041 Consulting Services

02 Landscape Architecture

- Master Planning
- Sketch Plans
- Planting Plans
- Working Drawings
- Furniture Design
- Detail Design
- Landscape Development Frameworks
- Landscape Development Plans (LDP)
- Contract and Tender Documentation
- Landscape Rehabilitation Works

03 Landscape Contracting

Implementation of Plans for:

- Office Parks
- Commercial/ Retail / Recreational Development
- Residential Complexes
- Private Residential Gardens
- Implementation of irrigation systems



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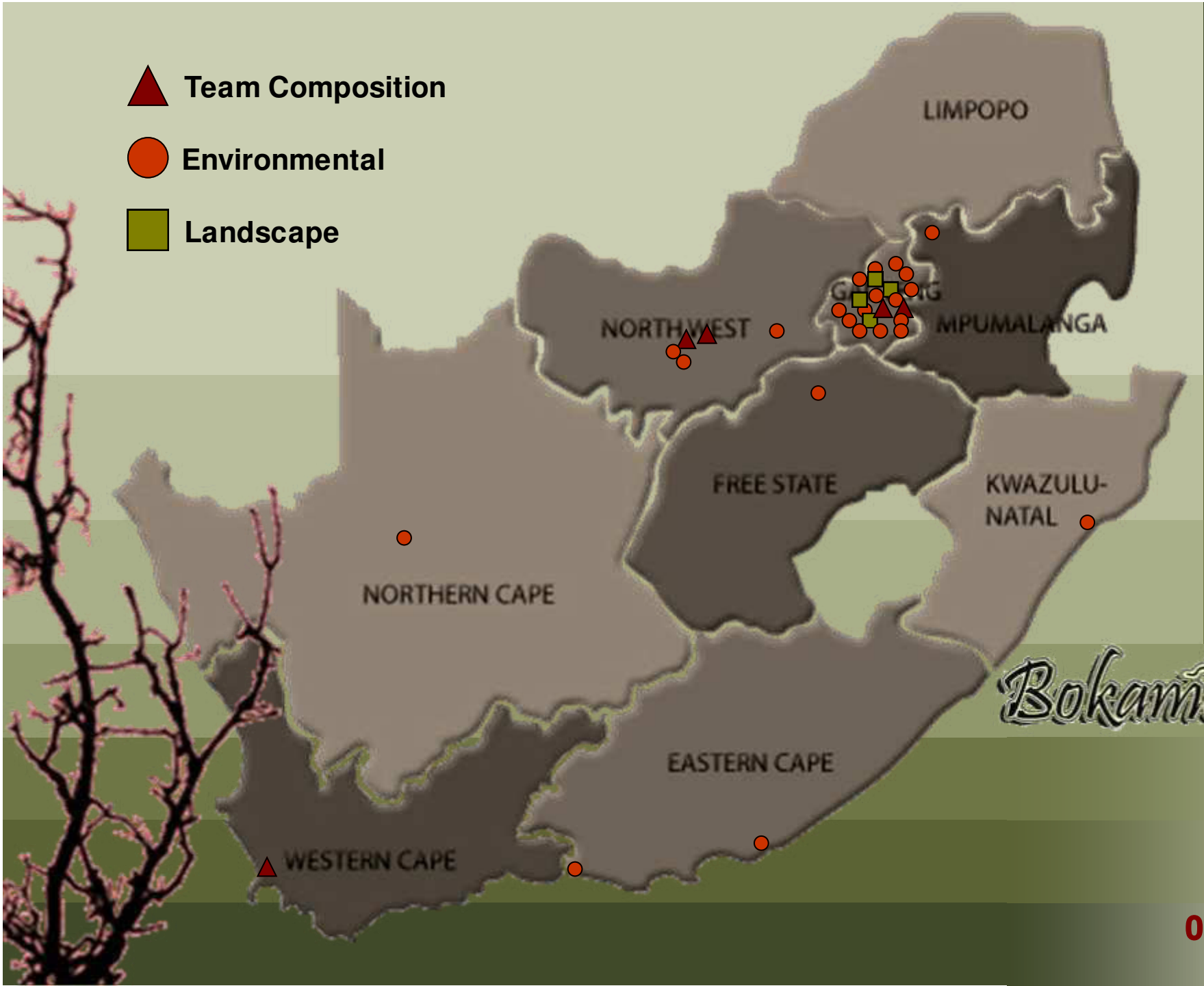
04 Services

042 Contracting Services

▲ Team Composition

● Environmental

■ Landscape



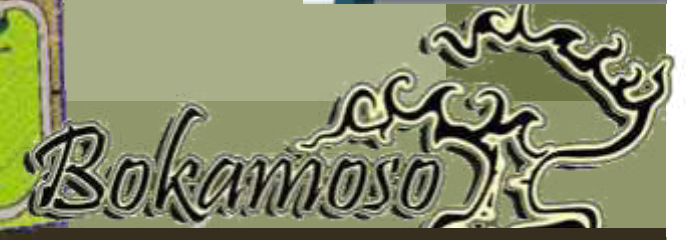
04 Services

043 Orientation

01 Valpre Bottling Plant, Heidelberg



project
shelter- site plan

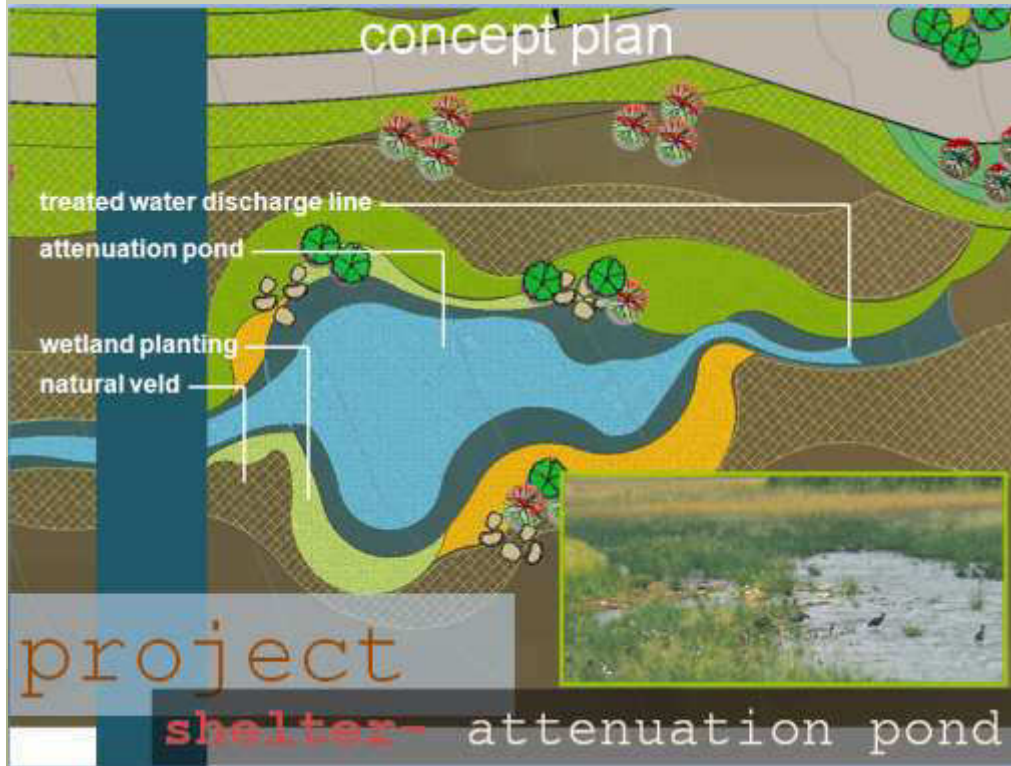


05 Landscape Projects- Current

051 Commercial



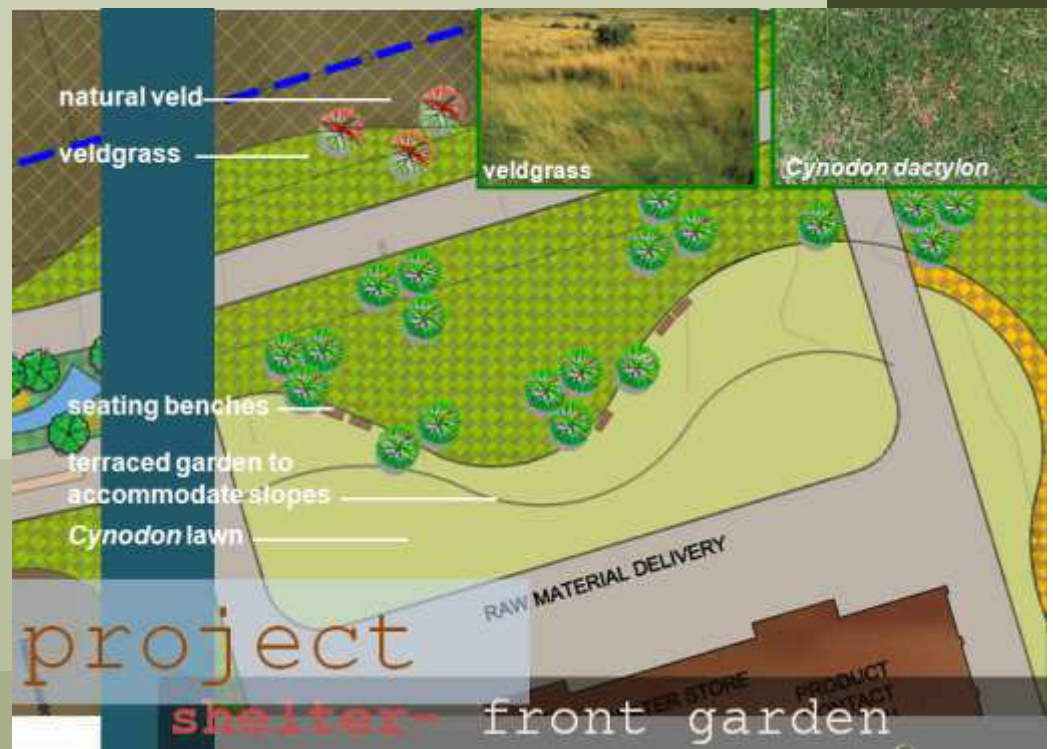
01 Valpre Bottling Plant, Heidelberg



05 Landscape Projects— Current

051 Commercial

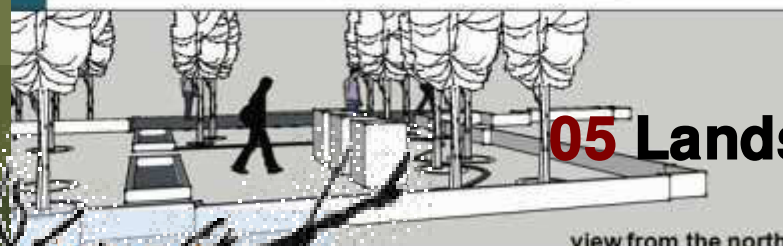
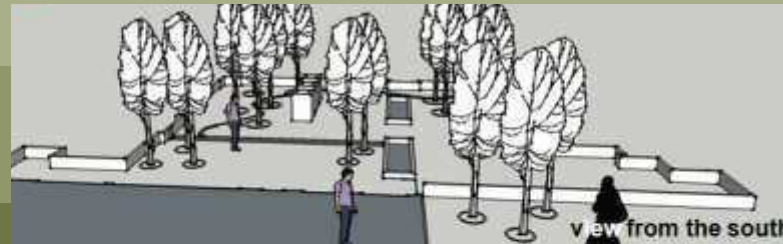
01 Valpre Bottling Plant, Heidelberg



05 Landscape Projects– Current

051 Commercial

01 Valpre Bottling Plant, Heidelberg



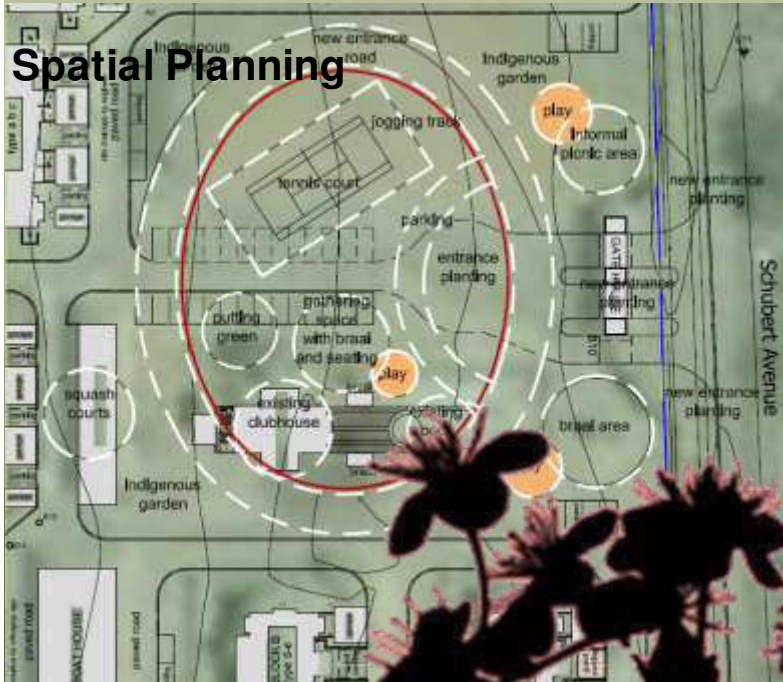
05 Landscape Projects– Current

051 Commercial

02 Melodie Waters, Hartebeespoortdam



Spatial Planning



Streetscape

Indigenous Planting



05 Landscape Projects – Current

052 Commercial/Recreational



02 Melodie waters, Hartebeestpoortdam



Rehabilitation



Area Layout

Development Framework



05 Landscape Projects– Current

052 Commercial/Recreational

03 Grain Building, Pretoria



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05 Landscape Projects– Completed

053 Offices

04 Ismail Dawson offices, Pretoria



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05 Landscape Projects – Conceptual

053 Offices

05 Celtic Manor, Pretoria



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05 Landscape Projects - Completed

054 Complex Development

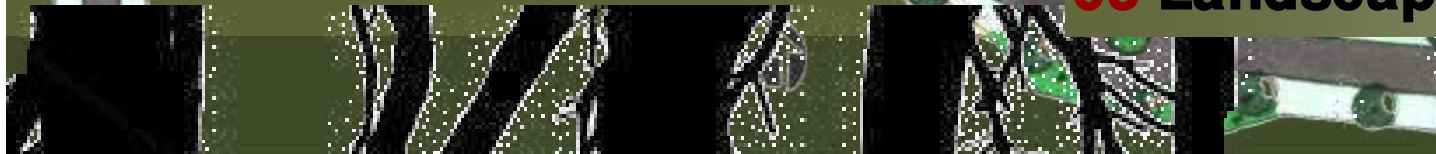
06 The Wilds, Pretoria



Bokamoso

05 Landscape Projects – Completed

054 Complex Development



07 The Wilds, Pretoria

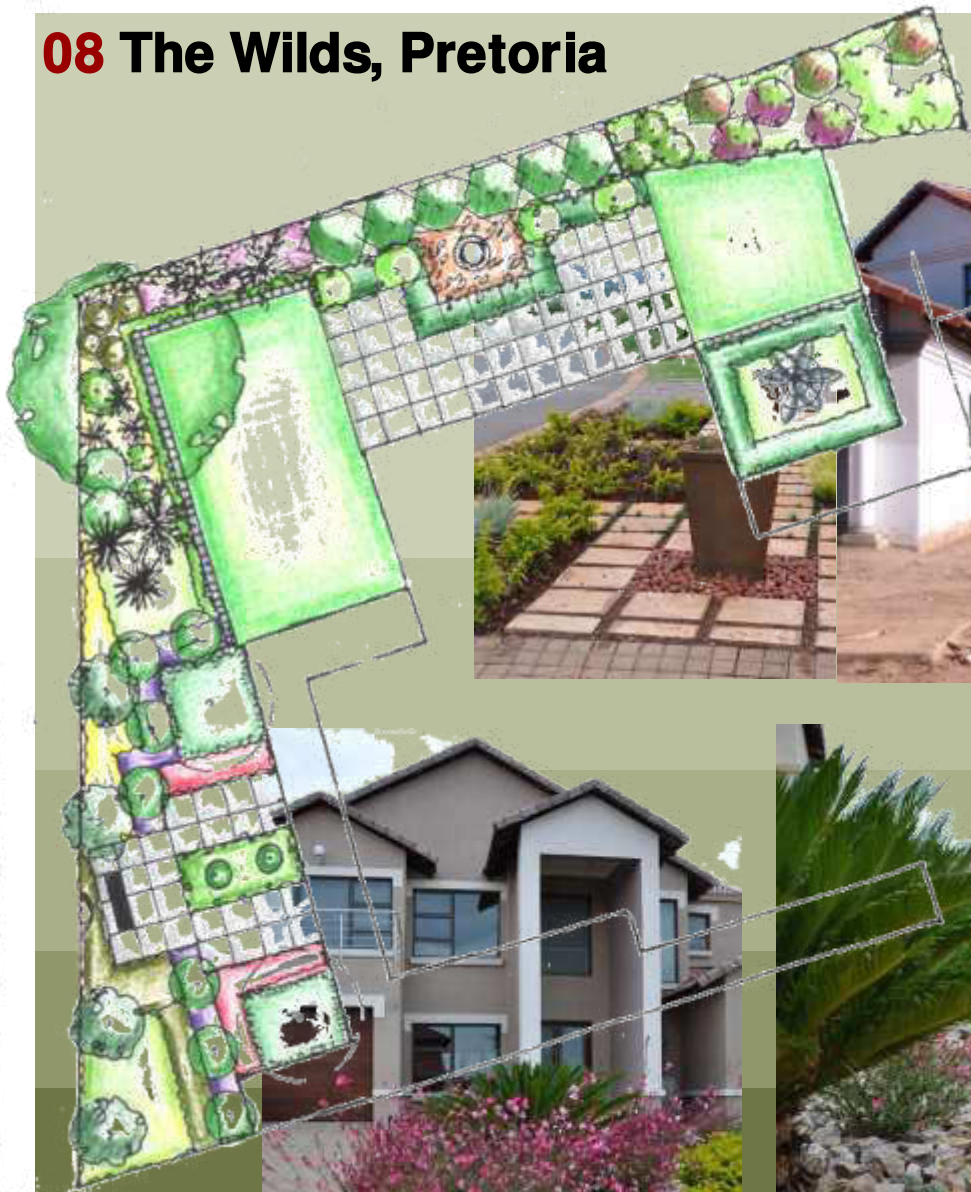


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05 Landscape Projects – Completed

055 Residential

08 The Wilds, Pretoria



Bokamoso

05 Landscape Projects – Completed

055 Residential

09 The Wilds, Pretoria

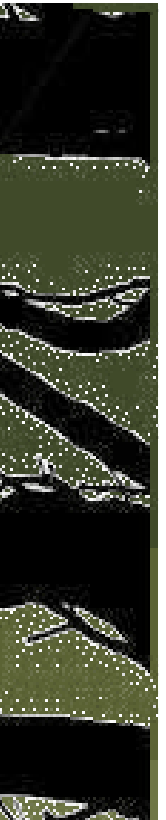


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05 Landscape Projects – Completed

055 Residential

010 The Wilds, Pretoria



Bokamoso

05 Landscape Projects – Completed

055 Residential



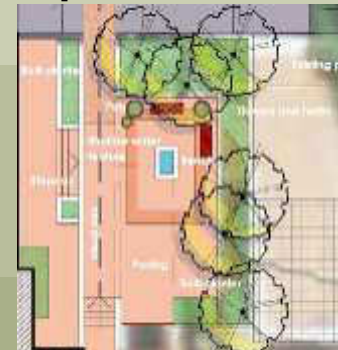
011 Governor of Reserve Bank's Residence, Pretoria



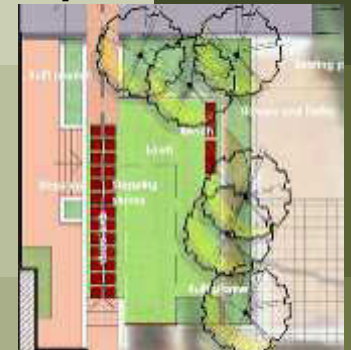
Plant Palette



Option 1



Option 2



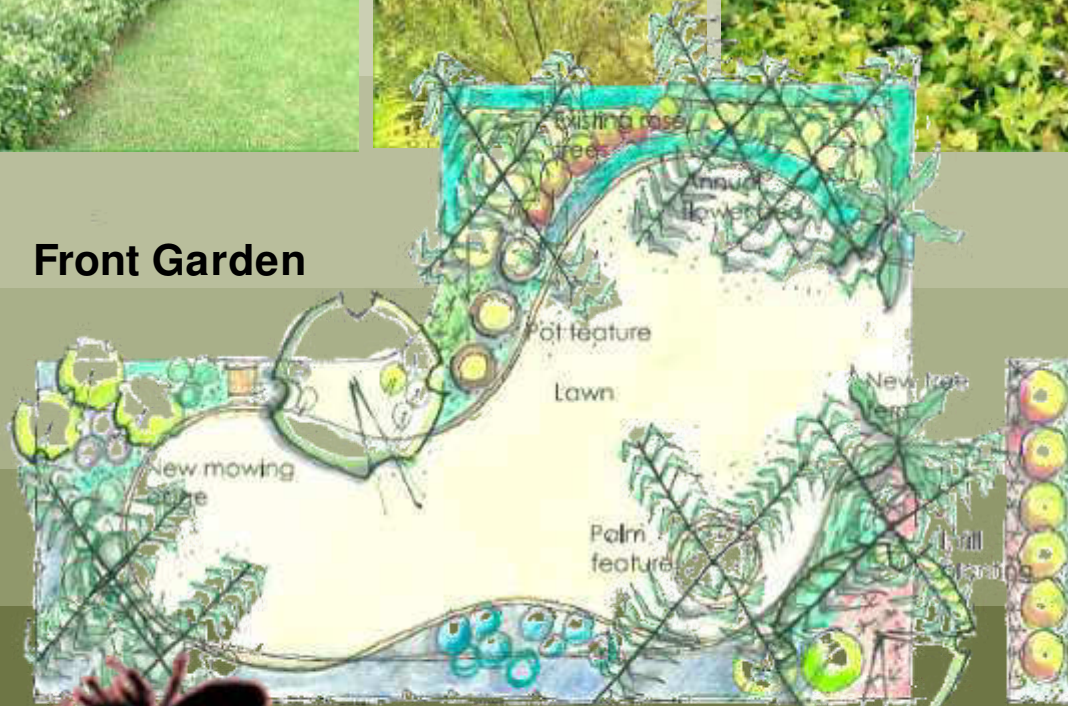
05 Landscape Projects – Conceptual

055 Residential

012 House Ismail, Pretoria



Front Garden

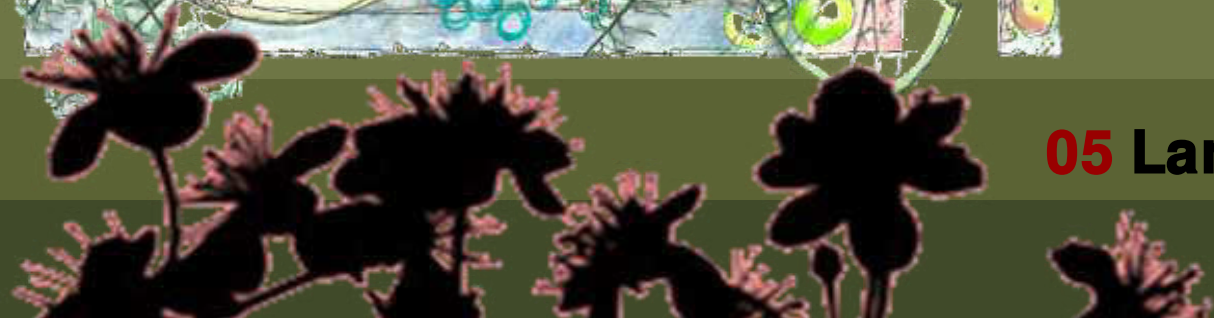


Back Garden



05 Landscape Projects - Conceptual

055 Residential



013 Forest Garden, Pretoria



05 Landscape Projects – Completed

055 Residential

015 Forest Garden, Pretoria



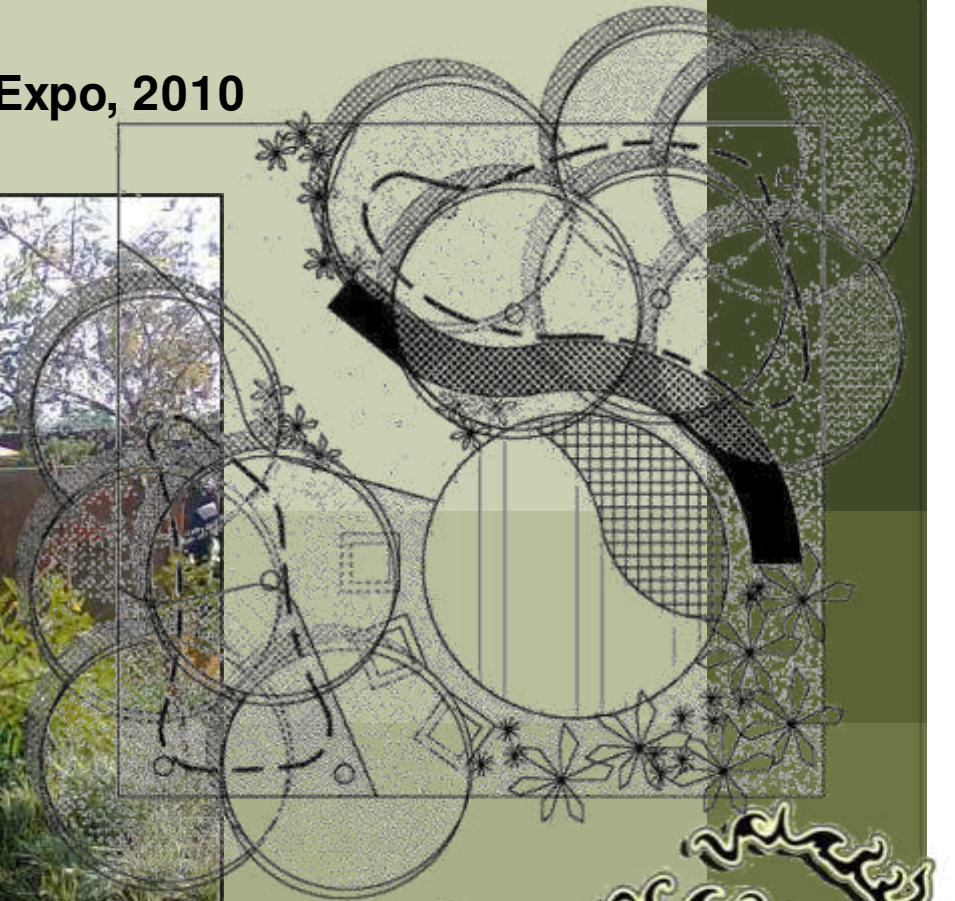
Bokamoso

05 Landscape Projects - Completed

055 Residential

01 Safari Garden Expo

Received a Silver Certificate at the Safari Garden Expo, 2010



Bokamoso 

06 Corporate Highlights

061 Awards

02 UNISA Sunnyside Campus, Pretoria

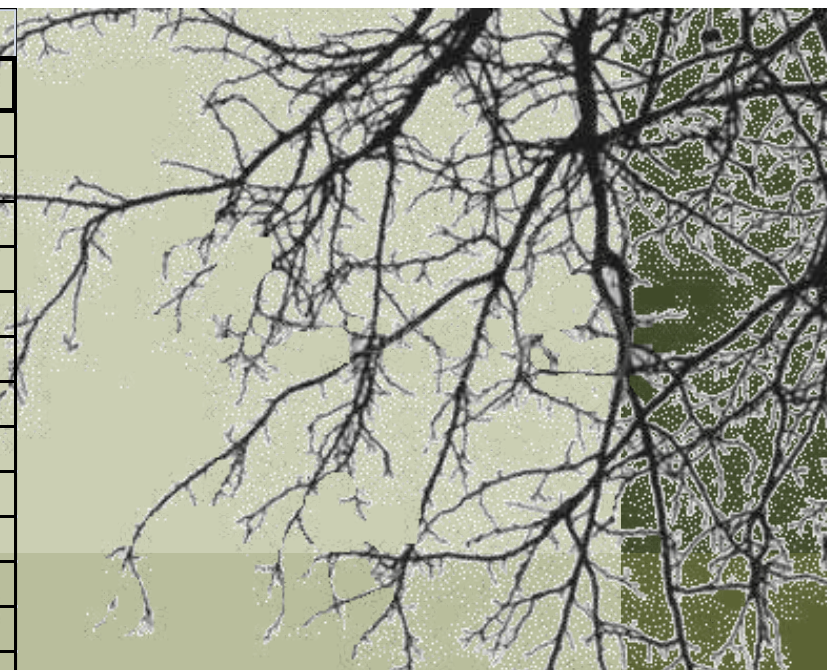
Best Commercial Paving Plan in Gauteng, 1997



06 Corporate Highlights

061 Awards

Project Name	Status	Project
Environmental Impact Assessment(EIA) and Scoping Report		
Junction 21	ROD	EIA
5 O'clock site access	In Progress	EIA
Bokamoso X 1	In Progress	Scoping & EIA
Doornvallei Phase 6 & 7	In Progress	EIA
Engen Interchange	In Progress	Scoping & EIA
Erasmia X15	In Progress	EIA
Franschkloof	In Progress	EIA
K113	Amendment of ROD	EIA
K220 East	ROD	EIA
K220 West	ROD	EIA
K54 ROD conditions	In Progress	EIA
Knopjeslaagte 95/Peachtree	ROD	EIA
Knopjeslaagte portion 20 & 21	ROD	EIA
Lillieslief/Nooitgedacht	In Progress	EIA
Mooiplaats 70 (Sutherland)	In Progress	EIA
Naauwpoort 1 - 12/Valley View	In Progress	EIA
PeachTree X5	In Progress	EIA
Strydfontein 60	In Progress	EIA
Thabe Motswere	In Progress	Scoping & EIA
Vlakplaats	In Progress	EIA
Waterval Valley	In Progress	EIA
Environmental Opinion		
Doornkloof 68 (Ross)	In Progress	Opinion
Monavoni X 53	In Progress	BA & Opinion
Mooikloof (USN)	In Progress	Opinion
Norwood Mall/Sandspruit	In Progress	Opinion
Riversong X 9	In Progress	Opinion
Sud Chemie	In Progress	Opinion
USN Benjoh Fishing Resort	In Progress	Opinion



The adjacent list host the status of our current projects. Only a selected amount of projects are displayed.



07 Current Environmental Projects

071 EIA, Scoping & Opinion

Project Name	Status	Project
Basic Assessment(BA)		
Annlin X 138	In Progress	BA
Clubview X 29	ROD	BA
Darrenwood Dam	In Progress	BA
Durley Holding 90 & 91	In Progress	BA
Elim	In Progress	BA
Fochville X 3	In Progress	BA
Hartebeeshoek 251	In Progress	BA
Klerksdorp (Matlosana Mall)	In Progress	BA
Monavoni External Services	ROD	BA
Monavoni X 45	Amendment of ROD	BA
Montana X 146	In Progress	BA
Rooihuiskraal X29	In Progress	BA
Thorntree Mall	In Progress	BA

Environmental control officer (ECO)		
Grace Point Church	In Progress	ECO
R 81	In Progress	ECO
Highveld X 61	In Progress	ECO
Mall of the North	In Progress	ECO
Olievenhoutbosch Road	In Progress	ECO
Orchards 39	In Progress	ECO
Pierre van Ryneveld Reservoir	In Progress	ECO
Project Shelter	In Progress	ECO

S24 G		
Wonderboom	In Progress	S24 G
Mogwasi Guest houses	Completed	S24 G



07 Current Environmental Projects

072 BA, ECO & S24 G

Project Name	Status	Project
Objection		
Colesberg WWTW	In Progress	Objection
Nigel Steelmill	Completed	Objection
Chantilly Waters	Completed	Objection

Development facilitation Act- Input (DFA)		
Burgersfort	In Progress	DFA & BA
Doornpoort Filling Station	In Progress	DFA & EIA & Scoping
Eastwood Junction	In Progress	DFA
Ingersol Road (Erf 78, 81 - 83)	In Progress	DFA
Roos Senekal	In Progress	DFA & EIA & Scoping
Thaba Meetse 1	In Progress	DFA & EIA & Scoping

Water Use License Act (WULA)		
Britstown Bulk Water Supply	In Progress	WULA
Celery Road / Green Channel	In Progress	WULA
Clayville X 46	In Progress	WULA
Dindingwe Lodge	In Progress	WULA
Doornpoort Filling Station	In Progress	WULA+DFA+EIA+SC
Eco Park Dam	In Progress	WULA
Groote Drift Potch	In Progress	WULA
Jozini Shopping Centre	In Progress	WULA+BA
K60	Completed	WULA
Maloto Roads	In Progress	WULA
Kwazele Sewage Works	In Progress	WULA
Monavoni External Services	In Progress	WULA+BA
Nyathi Eco Estate	In Progress	WULA
Prairie Giants X 3	In Progress	WULA
Waveside Water Bottling Plant	Completed	WULA



07 Current Environmental Projects

073 Objection, DFA & WULA

Project Name	Status	Project
Environmental Management Plan(EMP)		
Heidelberg X 12	ROD	EMP
Monavoni Shopping Centre	Completed	EMP
Forest Hill Development	Completed	EMP
Weltevreden Farm 105KQ	Completed	EMP+EIA
Raslouw Holding 93	Completed	EMP+BA
Durley Development	Completed	EMP+BA
Rooihuiskraal North X 28	Completed	EMP

Rehabilitation Plan		
Norwood Mall/Sandspruit	In Progress	Rehabilitation
Project Shelter Heidelberg	In Progress	Rehabilitation
Sagewood Attenuation Pond	ROD	Rehabilitation
Velmore Hotel	Completed	Rehabilitation
Grace Point Church	Completed	Rehabilitation
Mmamelodi Pipeline	Completed	Rehabilitation

Visual Impact Assessment		
Swatzkop Industrial Developme	Completed	Assessment +DFA
Erasmia	Completed	Assessment

Signage Application		
Menlyn Advertising	Completed	Signage
The Villa Mall	Completed	Signage+EMP+BA



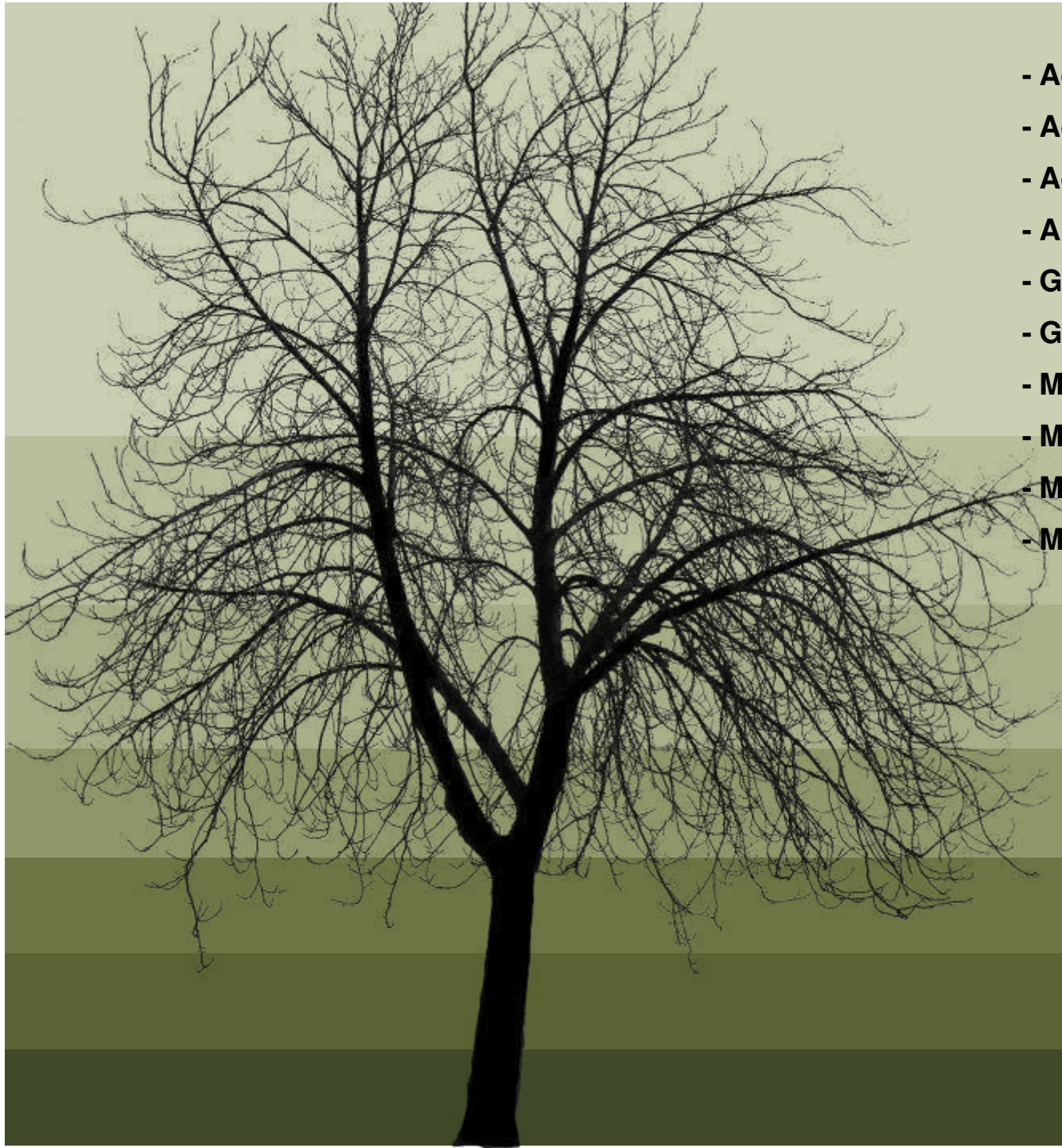
07 Current Environmental Projects

074 EMP, Rehabilitation , Waste Management & Signage Application

- Billion Property Group
- Cavaleros Developments
- Centro Developers
- Chaimberlains
- Chieftain
- Century Property Group
- Coca Cola
- Elmado Property Development
- Flanagan & Gerard
- Gautrans
- Hartland Property Group
- Moolman Group
- MTN
- M&T Development
- Old Mutual
- Property Investment Company
- Petroland Developments
- RSD Construction
- SAND
- Stephan Parsons
- Twin City Developments
- Urban Construction
- USN



08 Indicative Clients



- Adobe Illustrator CS3
- Adobe Photoshop CS3
- Adobe InDesign CS3
- AutoCAD
- Google SketchUP
- GIS
- Microsoft Office Word
- Microsoft Office Excel
- Microsoft Office Publisher
- Microsoft Office Power Point

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