

**LETTER OF RECOMMENDATION FOR THE  
PROPOSED TSHWANE BRT LINE UPGRADE,  
TSHAWANE, PRETORIA**

**FOR K2M ENVIRONMENTAL**

**DATE: 26 FEBRUARY 2017**

**By Gavin Anderson**

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## Abbreviations

|     |                                    |
|-----|------------------------------------|
| HP  | Historical Period                  |
| IIA | Indeterminate Iron Age             |
| LIA | Late Iron Age                      |
| EIA | Early Iron Age                     |
| ISA | Indeterminate Stone Age            |
| ESA | Early Stone Age                    |
| MSA | Middle Stone Age                   |
| LSA | Late Stone Age                     |
| HIA | Heritage Impact Assessment         |
| PIA | Palaeontological Impact Assessment |

## **INTRODUCTION**

The Bus Transit Line from Pretoria CBD to Atteridgeville Township will be upgraded. The project involves provision of the following infrastructure among others:

- BRT lanes preferably by acquiring existing lanes and strengthening the pavement structure for BRT Traffic
- Mixed traffic lanes
- Provision of traffic signals at junctions
- Walkways
- Cycle lanes
- BRT stations
- Storm water/drainage
- Services (water, sewer, power, data, etc.) to the BRT stations
- Streetlighting
- Landscaping
- Relocation of existing services
- Structures/Bridges
- Ancillary works including road signs and markings

Construction of the pavement structure shall include excavating of the existing pavement layers to a depth of about 890mm followed by construction of the pavement layers. The final pavement structures will be made available as the design progresses.

The Typical Pavement structure for the BRT Lanes will include  
40mm thick continuously graded Asphalt Surfacing (with A-P1 modified Binder)

- 140mm thick continuously graded Asphalt Base (with A-P1 modified Binder)

- 450mm thick cement stabilized C3 subbase
- 150mm thick G7 Gravel upper selected layer
- 150mm thick G9 Gravel Lower selected layer

For mixed traffic lanes the typical pavement structure will comprise

- 40mm thick continuously graded Asphalt Surfacing (with A-P1 modified Binder)
- 150mm thick Crushed Stone G1 Base
- 250mm thick cement stabilized C4 subbase
- 150mm thick G6 Gravel upper selected layer
- 150mm thick G7 Gravel Lower selected layer

At the BRT Bus stations, a typical Rigid/Concrete pavement will be provided comprising of

- 180mm thick concrete slab
- 300mm thick cement stabilized C4 subbase
- 150mm thick G7 Gravel upper selected layer
- 150mm thick G9 Gravel Lower selected layer
- Insitu Subgrade

On Transoranje between WF Nkomo and Quagga, two new lanes will be constructed to bring the total number of lanes to 4. A turning facility will be provided for the BRT on Maunde road in the vicinity of Khoza street in Atteridgeville.

Currently most of the roads on the BRT route do not have pedestrian and cycle lanes. Construction of the BRT route will include widening of the existing roads so as to include pedestrian and cycle lanes. The service provider shall

make an allowance for widening of 10m on each side of the road. Note that the City of Tshwane prefers that existing lanes be adopted for the BRT rather than construction of new lanes/widening of the road. Therefore, widening of the existing roads will only be done where space allows and will be kept to a minimum. In the Tshwane CBD, the existing public parking spaces are to be maintained.

Umlando was appointed by K2M Environmental to assess the need for an HIA for the proposed project.

Fig's 1 – 3 show the location of the proposed development.



FIG. 1 GENERAL LOCATION OF THE STUDY AREA

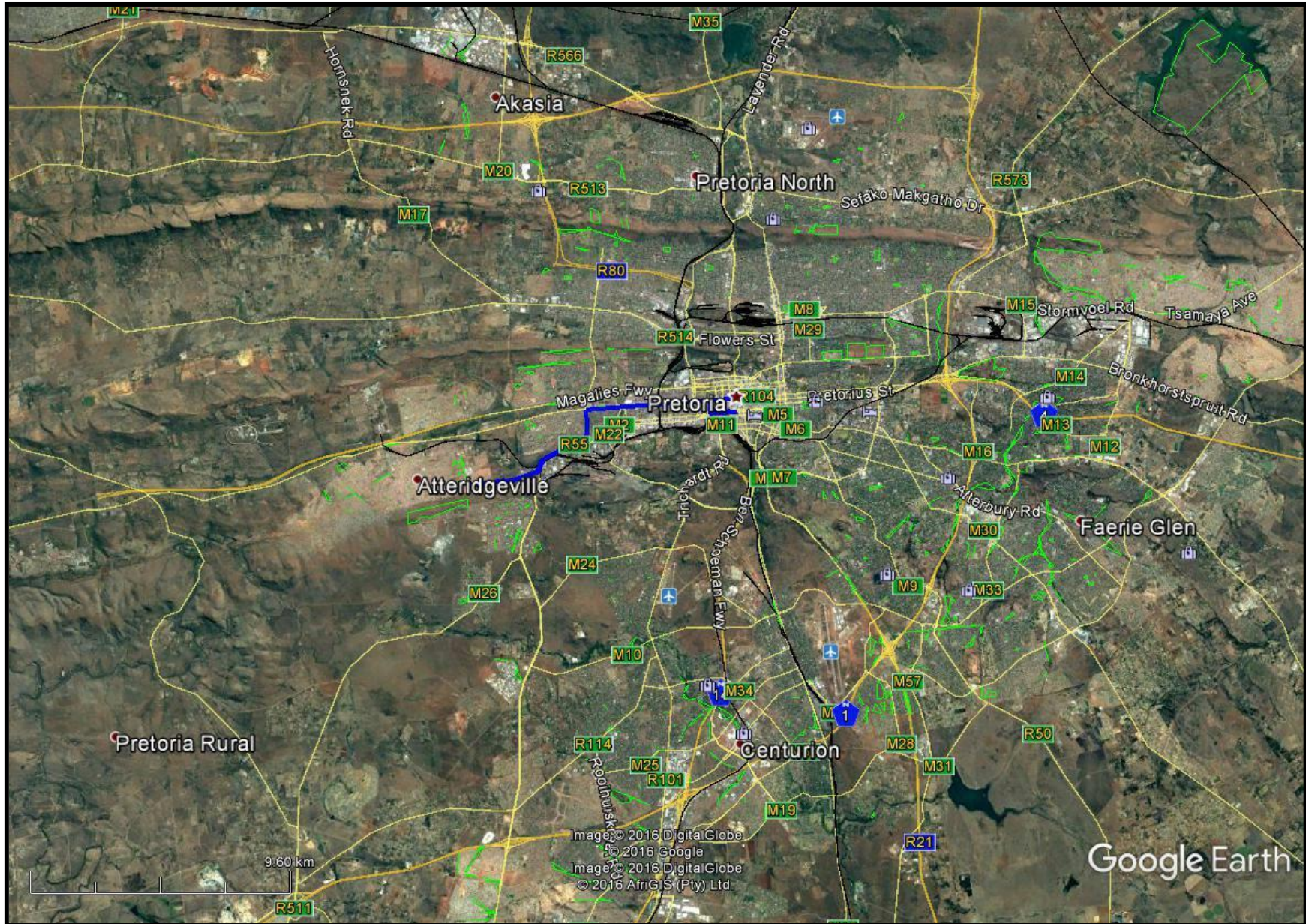




FIG. 2: AERIAL OVERVIEW OF THE STUDY AREA

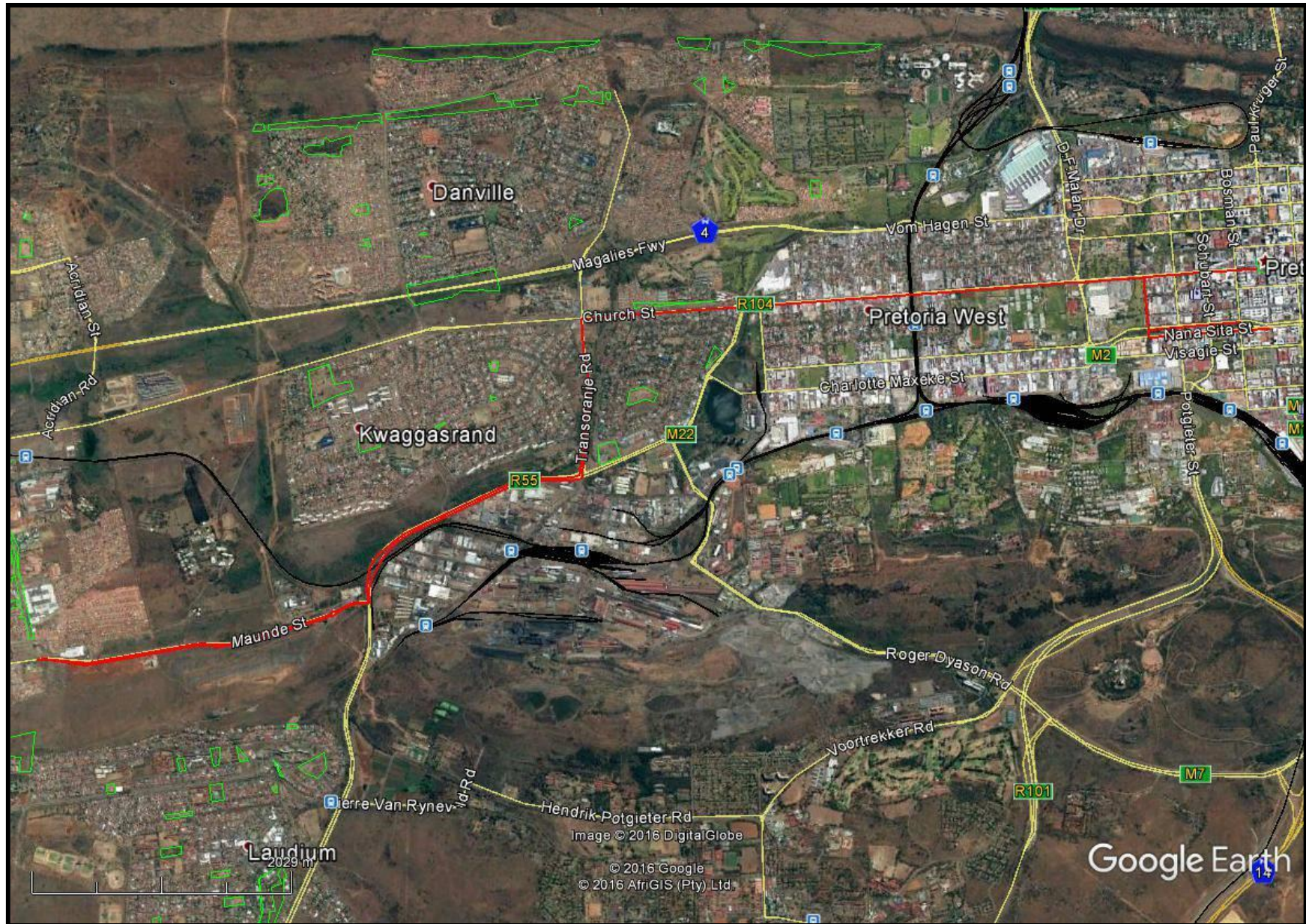




FIG. 3: TOPOGRAPHICAL OVERVIEW OF THE EASTERN STUDY AREA

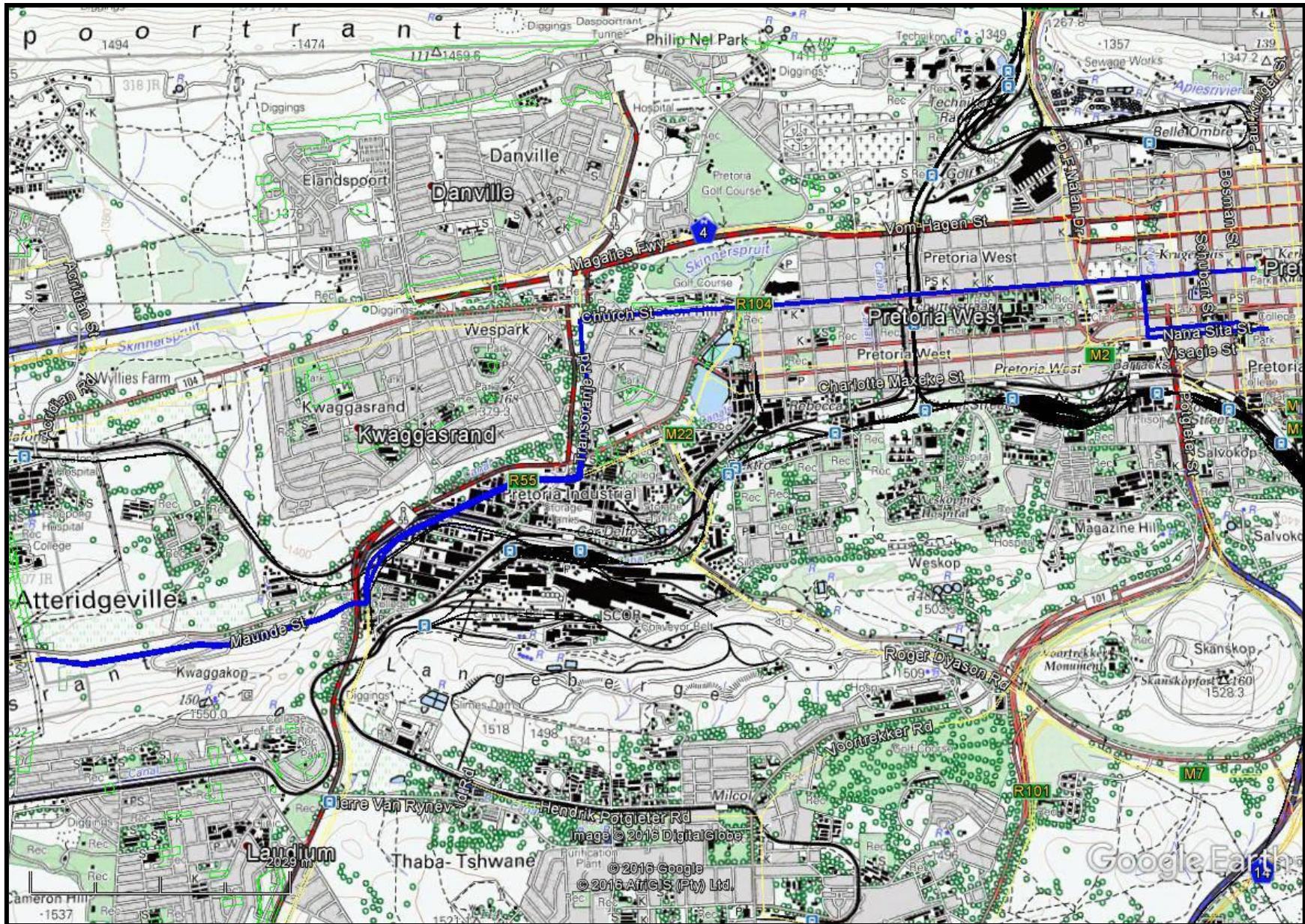




FIG. 4: SCENIC VIEWS OF THE STUDY AREA



## **DESKTOP STUDY**

The desktop study consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. The archaeological database indicates that there are no archaeological sites in the general area (fig. 5). This is a result of the densely populated and developed area. There are several National Monuments in the general area; however, none occur in the development footprint.

The area in the Pretoria CBD has several listed buildings. These will not be affected. If any buildings are to be affected, then they will need to be treated on an individual basis with Gauteng Provincial Heritage Resources Agency.

The palaeontology for this area is green and grey on the SAHRIS map (fig. 6). The desktop investigation confirms that there is deep (>2m) weathering probably present in most cases of excavation for this project. A High Palaeontological sensitivity is allocated to areas underlain by rocks of the Vaalian aged Timeball Hill Formation. This Formation might yield significant fossils during excavation if bedrock is exposed. Due to the nature of this project (widening of existing road infrastructure) it is unlikely that any significant fossils will be exposed. Exposure of Stromatolites must be reported to the HIA specialist and Palaeontologist for appropriate action if needed.

The EAP and ECO must be informed of the fact that a High and Moderate Palaeontological sensitivity is allocated to the areas underlain by the Vaalian aged Timeball Hill and Hekpoort Formations. If excavations will exceed 1.5m into underlying bedrock, the ECO must notify the HIA specialist and the Palaeontologist for appropriate action. These recommendations must be included in the EMPr of this project.



FIG. 5: LOCATION OF KNOWN HERITAGE SITES NEAR THE STUDY AREA

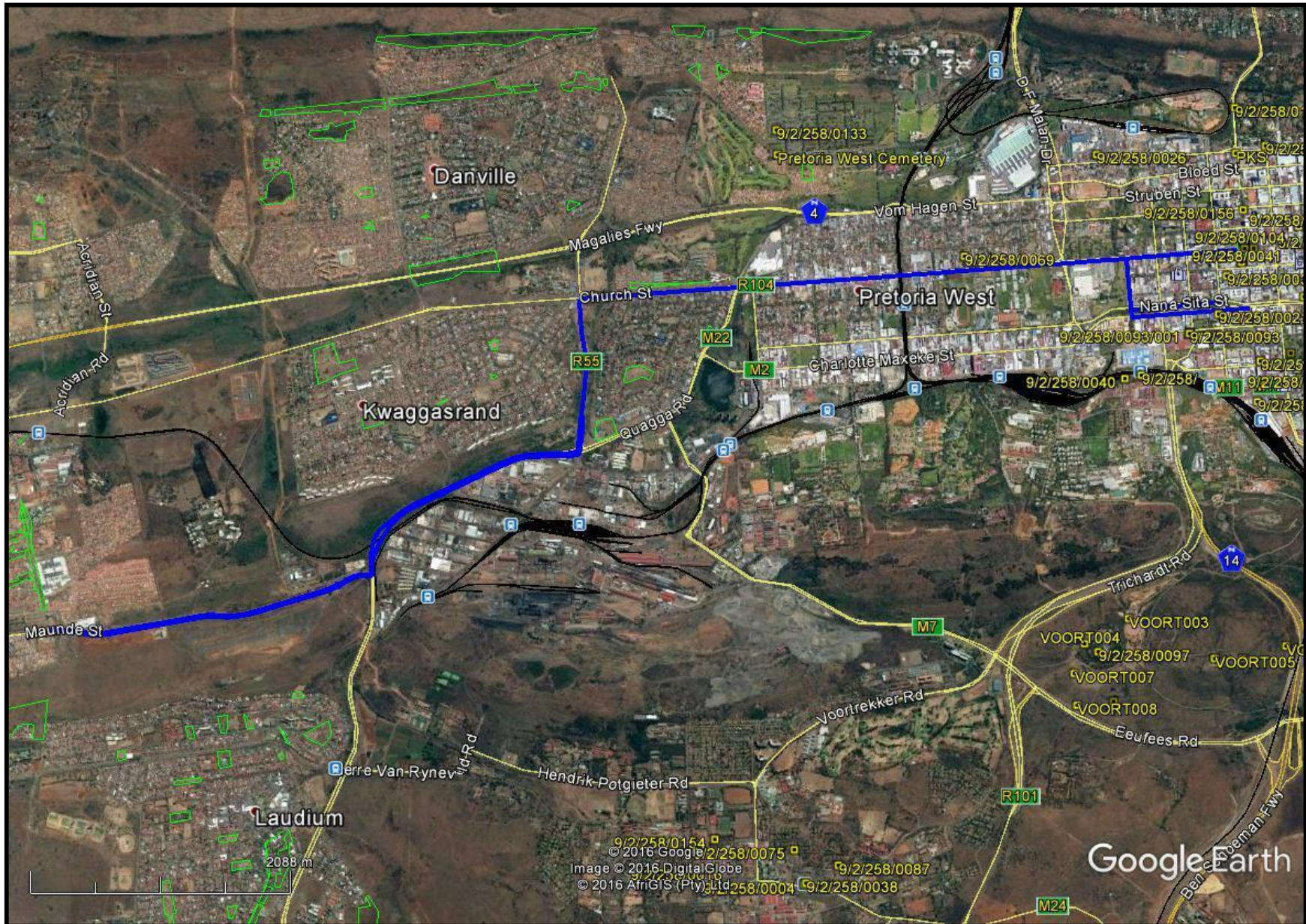




FIG. 6: STUDY AREA IN 1939

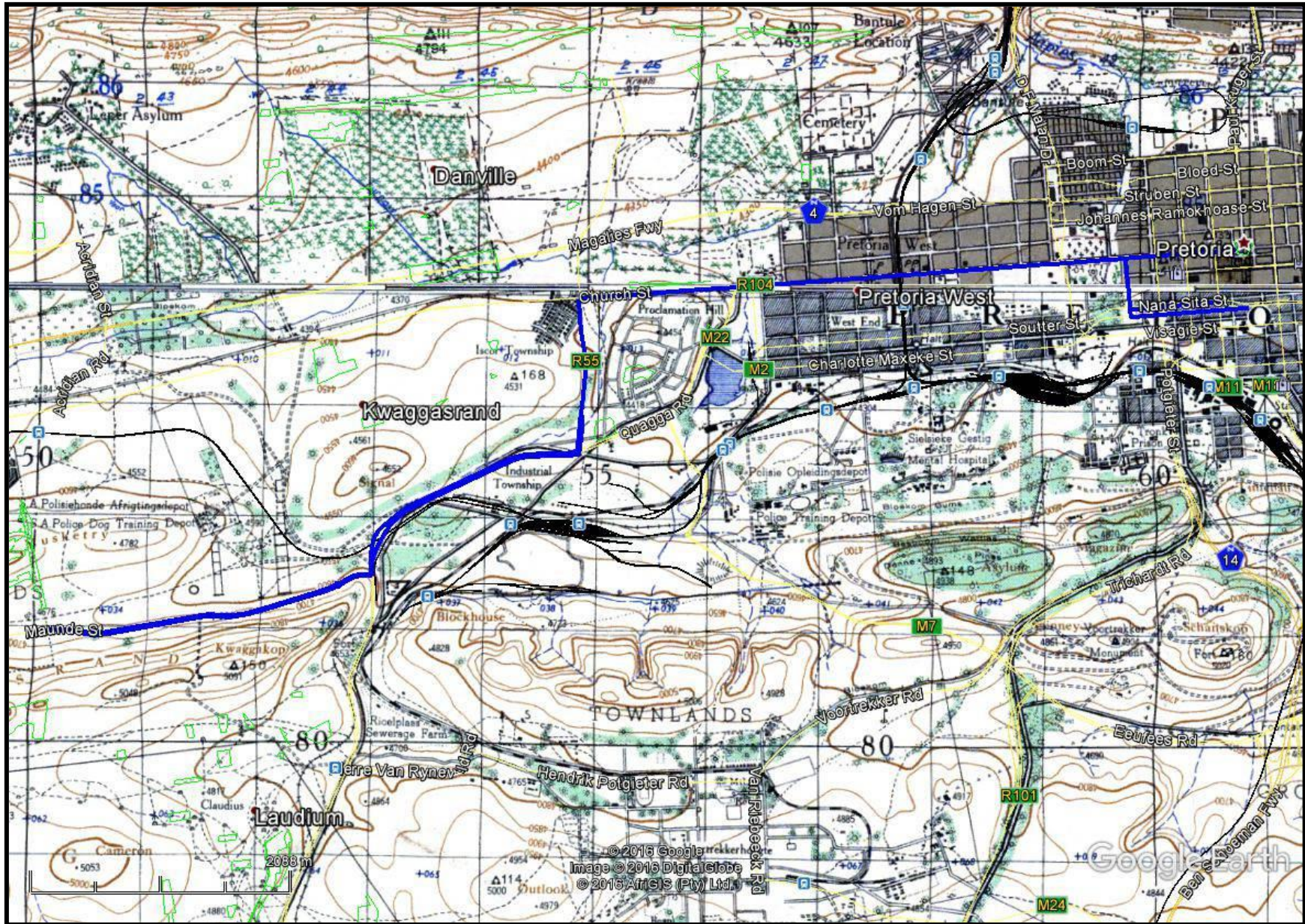
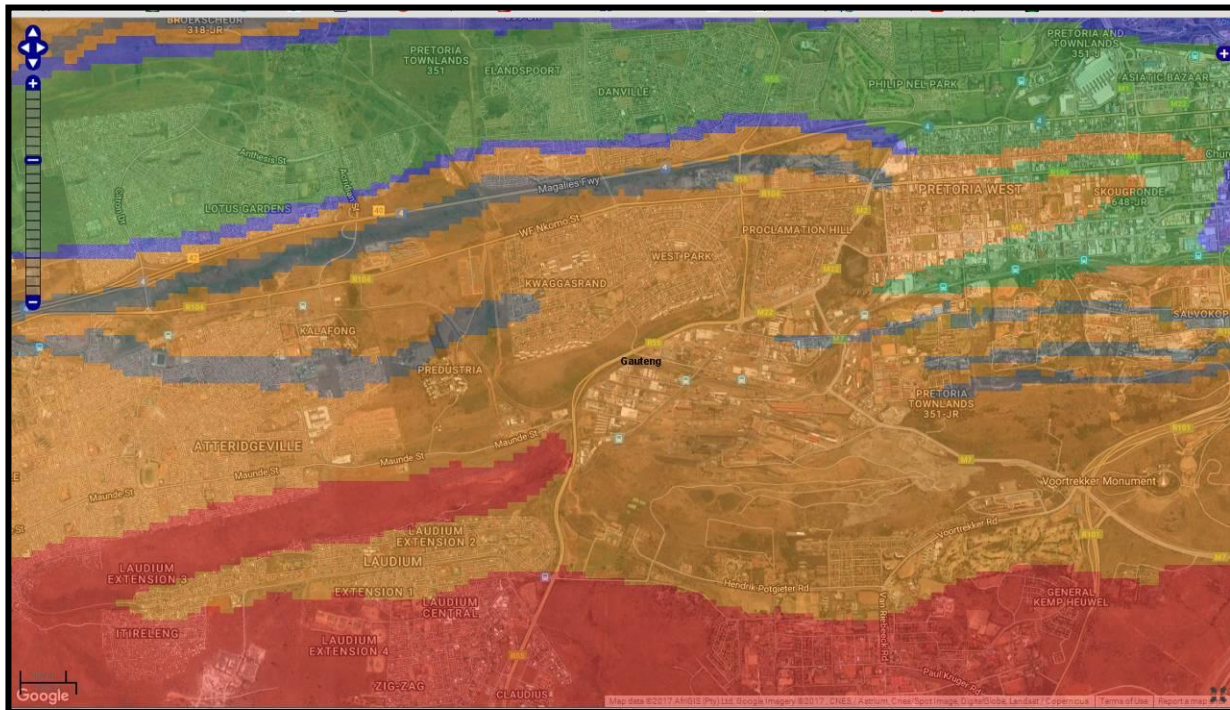




FIG. 7: PALAEOLOGICAL SENSITIVITY



| COLOUR        | SENSITIVITY        | REQUIRED ACTION   |
|---------------|--------------------|---|
| RED           | VERY HIGH          | field assessment and protocol for finds is required   |
| ORANGE/YELLOW | HIGH               | desktop study is required and based on the outcome of the desktop study, a field assessment is likely                               |
| GREEN         | MODERATE           | desktop study is required   |
| BLUE          | LOW                | no palaeontological studies are required however a protocol for finds is required   |
| GREY          | INSIGNIFICANT/ZERO | no palaeontological studies are required  |
| WHITE/CLEAR   | UNKNOWN            | these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map. |

## CONCLUSION

A brief desktop heritage survey was undertaken for the proposed Tshwane BRT line. No recorded heritage sites occur along the route apart from the buildings in town. These buildings will not be affected by the road upgrade. Similarly, while the PIA notes that the area is of high palaeontological sensitivity,



much of the area has been damaged by various infrastructures. Only excavations deeper than 2m could affect potential deposits.

I recommend that the Tshwane BRT line be exempt from further HIA mitigation.

## **REFERENCES**

2528CA Pretoria 1939, 1998

2528CC Centurion 1939, 2002

## EXPERIENCE OF THE HERITAGE CONSULTANT

Gavin Anderson has a M. Phil (in archaeology and social psychology) degree from the University of Cape Town. Gavin has been working as a professional archaeologist and heritage impact assessor since 1995. He joined the Association of Professional Archaeologists of Southern Africa in 1998 when it was formed. Gavin is rated as a Principle Investigator with expertise status in Rock Art, Stone Age and Iron Age studies. In addition to this, he was worked on both West and East Coast shell middens, Anglo-Boer War sites, and Historical Period sites.

## DECLARATION OF INDEPENDENCE

I, Gavin Anderson, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.



Gavin Anderson  
Archaeologist/Heritage Impact Assessor

**APPENDIX A  
PALAENTOLOGICAL DESKTOP STUDY**



**DESKTOP PALAEOLOGICAL  
ASSESSMENT FOR THE PROPOSED BRT  
ROUTE IN PRETORIA, CITY OF  
TSWANE METROPOLITAN  
MUNICIPALITY, GAUTENG PROVINCE.**

**FOR  
Umlando**

**DATE: 26 February 2017**

**By**

**Gideon Groenewald  
Cell: 078 713 6377**

## EXECUTIVE SUMMARY

- Gideon Groenewald was appointed by Umlando to undertake a Desktop Survey, assessing the potential Palaeontological Impact related to an application for the construction of the proposed BRT Route in Pretoria, City of Tswane Metropolitan Municipality, Gauteng Province.

### Legal Requirements

- This Desktop Palaeontological Assessment (PIA) forms part of the Basic Environmental Impact Assessment, which is part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999. In accordance with Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

- The development site applicable to the to an application for the construction of the proposed BRT Route in Pretoria, City of Tswane Metropolitan Municipality, Gauteng Province, is underlain by Vaalian aged sedimentary and volcanic rocks of the Pretoria Group, Transvaal Supergroup, with very little chance of finding significantly new fossils during the excavations for this project.

- No significant fossils are expected before deep excavation (>1.5m) are done but if fossils are recorded during excavations, it will contribute significantly to our knowledge of the Palaeontological Heritage of the Gauteng Province.

It is recommended that:

The EAP and ECO must be informed of the fact that a High and Moderate Palaeontological sensitivity is allocated to the areas underlain by the Vaalian aged Timeball Hill and Hekpoort Formations. If excavations will exceed 1.5m into underlying bedrock, the ECO must notify the HIA specialist and the Palaeontologist for appropriate action.

These recommendations must be included in the EMPr of this project.

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## INTRODUCTION

- Gideon Groenewald was appointed by Umlando to undertake a Desktop Survey, assessing the potential Palaeontological Impact related to an application for the construction of the proposed BRT Route in Pretoria, City of Tswane Metropolitan Municipality, Gauteng Province.

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Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens; and
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

### Aims and Methodology

A Desktop investigation is often the only opportunity to record the fossil heritage within the development footprint. These records are very important to understand the past and form an important part of South Africa's National Estate.

Following the "*SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports*" the aims of the palaeontological impact assessment are:

- to identifying exposed and subsurface rock formations that are considered to be palaeontologically significant;
- to assessing the level of palaeontological significance of these formations;
- to comment on the impact of the development on these exposed and/or potential fossil resources and



- to make recommendations as to how the developer should conserve or mitigate damage to these resources.

Prior to a field investigation a preliminary assessment (desktop study) of the topography and geology of the study area is made using appropriate 1:250 000 geological maps (2528 Pretoria) in conjunction with Google Earth. Potential fossiliferous rock units (groups, formations etc) are identified within the study area and the known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience.

Priority palaeontological areas are identified within the development footprint to focus the field investigator's time and resources. The aim of the desktop survey is to document any exposed fossil material and to assess the palaeontological potential of the region in terms of the type and extent of rock outcrop in the area.

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the minimal extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 below.

Table 1 Palaeontological sensitivity analysis outcome classification

| <b>PALAEONTOLOGICAL SIGNIFICANCE/VULNERABILITY OF ROCK UNITS</b>   |  |
|--|--|
| The following colour scheme is proposed for the indication of palaeontological sensitivity classes. This classification of sensitivity is adapted from that of Almond et al (2008) and Groenewald et al., (2014) |  |
| <b>RED</b>   | Very High Palaeontological sensitivity/vulnerability. Development will most likely have a very significant impact on the Palaeontological Heritage of the region. Very high possibility that significant fossil assemblages will be present in all outcrops of the unit. Appointment of professional palaeontologist, desktop survey, phase I Palaeontological Impact Assessment (PIA) (field survey and recording of fossils) and phase II PIA (rescue of fossils during construction ) as well as application for collection and destruction permit compulsory.  |
| <b>ORANGE</b>  | High Palaeontological sensitivity/vulnerability. High possibility that significant fossil assemblages will be present in most of the outcrop areas of the unit. Fossils most likely to occur in associated sediments or underlying units, for example in the areas underlain by Transvaal Supergroup dolomite where Cenozoic cave deposits are likely to occur. Appointment of professional palaeontologist, desktop survey and phase I Palaeontological Impact Assessment (field survey and collection of fossils) compulsory. Early application for collection permit recommended. Highly likely that a Phase II PIA will be applicable during the construction phase of projects. |
| <b>GREEN</b>   | Moderate Palaeontological sensitivity/vulnerability. High possibility that fossils will be present in the outcrop areas of the unit or in associated sediments that underlie the unit. For example areas underlain by the Gordonias Formation or undifferentiated soils and alluvium. Fossils described in the literature are visible with the naked eye and development can have a significant impact on the Palaeontological Heritage of the area. Recording of fossils will contribute significantly to the present knowledge of the development of life in the geological record of the region. Appointment of a   |

|                    |   |
|--------------------|---|
|                    | <p>professional palaeontologist, desktop survey and phase I PIA (ground proofing of desktop survey) compulsory.</p>   |
| <p><b>BLUE</b></p> | <p>Low Palaeontological sensitivity/vulnerability. Low possibility that fossils that are described in the literature will be visible to the naked eye or be recognized as fossils by untrained persons. Fossils of for example small domal Stromatolites as well as micro-bacteria are associated with these rock units. Fossils of micro-bacteria are extremely important for our understanding of the development of Life, but are only visible under large magnification. Recording of the fossils will contribute significantly to the present knowledge and understanding of the development of Life in the region. Where geological units are allocated a blue colour of significance, and the geological unit is surrounded by highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a blue colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. Collection of a representative sample of potential fossiliferous material recommended. At least a Desktop Survey and “Chance Find Protocol” is compulsory. The Chance Find Protocol must be included in the EMPr for the project.</p> |

|                    |  |
|--------------------|--|
| <p><b>GREY</b></p> | <p>Very Low Palaeontological sensitivity/vulnerability. Very low possibility that significant fossils will be present in the bedrock of these geological units. The rock units are associated with intrusive igneous activities and no life would have been possible during emplacement of the rocks. It is however essential to note that the geological units mapped out on the geological maps are invariably overlain by Cenozoic aged sediments that might contain significant fossil assemblages and archaeological material. Examples of significant finds occur in areas underlain by granite, just to the west of Hoedspruit in the Limpopo Province, where significant assemblages of fossils and clay-pot fragments are associated with large termite mounds. Where geological units are allocated a grey colour of significance, and the geological unit is surrounded by very high and highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a grey colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. It is important that the report should also refer to archaeological reports and possible descriptions of palaeontological finds in Cenozoic aged surface deposits. At least a Desktop Survey and “Chance Find Protocol” document is compulsory. The Chance Find Protocol must be included in the EMP of the project.</p> |
|--------------------|--|

When rock units of moderate to high palaeontological sensitivity are present within the development footprint, palaeontological mitigation measures must be incorporated into the Environmental Management Plan. All projects falling on Low to Very Low Palaeontological sensitivity geology must be discussed in a Phase 1 or a Chance Find Protocol document that must form part of the EMP of the project.



## **Scope and Limitations of the Desktop Study**

The study will include: i) an analysis of the area's stratigraphy, age and depositional setting of fossil-bearing units; ii) a review of all relevant palaeontological and geological literature, including geological maps, and previous palaeontological impact reports; iii) data on the proposed development provided by the developer (e.g. location of footprint, depth and volume of bedrock excavation envisaged) and iv) where feasible, location and examination of any fossil collections from the study area (e.g. museums).

The key assumption for this scoping study is that the existing geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps used were not intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing. There is also an inadequate database for fossil heritage for much of the RSA, due to the small number of professional palaeontologists carrying out fieldwork in RSA and the Kingdom of Lesotho. Most development study areas have never been surveyed by a palaeontologist.

These factors may have a major influence on the assessment of the fossil heritage significance of a given development and without supporting field assessments may lead to either:

- an underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or
- an overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by weathering, or are buried beneath a thick mantle of unfossiliferous “drift” (soil, alluvium etc.).

### locality and Proposed Development



Figure 1 Locality of the proposed BRT development in Pretoria (red line)

The project involves provision of the following infrastructure among others:

- i. Bus Route Transit (BRT) lanes preferably by acquiring existing lanes and strengthening the pavement structure for BRT Traffic
- ii. Mixed traffic lanes

- iii. Provision of traffic signals at junctions
- iv. Walkways
- v. Cycle lanes
- vi. BRT stations
- vii. Storm water/drainage
- viii. Services (water, sewer, power, data, etc.) to the BRT stations
- ix. Streetlighting
- x. Landscaping
- xi. Relocation of existing services
- xii. Structures/Bridges
- xiii. Ancillary works including road signs and markings

#### *Pavement Construction*

Construction of the pavement structure shall include excavating of the existing pavement layers to a depth of about 890mm followed by construction of the pavement layers proposed in item i ii and iii below. The final pavement structures will be made available as the design progresses..

*The Typical Pavement structure for the BRT Lanes will include:*

- i. 40mm thick continuously graded Asphalt Surfacing (with A-P1 modified Binder)
- ii. 140mm thick continuously graded Asphalt Base (with A-P1 modified Binder)
- iii. 450mm thick cement stabilized C3 subbase
- iv. 150mm thick G7 Gravel upper selected layer
- v. 150mm thick G9 Gravel Lower selected layer

*For mixed traffic lanes the typical pavement structure will comprise:*

- a. 40mm thick continuously graded Asphalt Surfacing (with A-P1 modified Binder)
- b. 150mm thick Crushed Stone G1 Base
- c. 250mm thick cement stabilized C4 subbase
- d. 150mm thick G6 Gravel upper selected layer
- e. 150mm thick G7 Gravel Lower selected layer

*At the BRT Bus stations, a typical Rigid/Concrete pavement will be provided comprising of:*

- a. 180mm thick concrete slab
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On Transoranje between WF Nkomo and Quagga, two new lanes will be constructed to bring the total number of lanes to 4.

A turning facility will be provided for the BRT on Maunde road in the vicinity of Khoza street in Atteridgeville.

*Anticipated Widening:*

Currently most of the roads on the BRT route do not have pedestrian and cycle lanes. Construction of the BRT route will include widening of the existing roads so as to include pedestrian and cycle lanes. The service provider shall make an allowance for widening of 10m on each side of the road. Note that the City of Tshwane prefers that existing lanes be adopted for the BRT rather than construction of new lanes/widening of the road. Therefore, widening of the existing roads will only be done where space allows and will be kept to a minimum. In the Tshwane CBD, the existing public parking spaces are to be maintained.

## **GEOLOGY**

The site of the development falls mainly on Vaalian aged sediments and volcanic rocks of the Pretoria Group, Transvaal Supergroup (Figure 2).

### **Transvaal Supergroup, Pretoria Group**

*Timeball Hill Formation (Vt) (with quartzite bands)*

The Vaalian aged Timeball Hill Formation comprises a sequence of shale, siltstone with several conglomerate and quartzites. In the study area these rock sequences are deeply weathered and highly disturbed by human development.

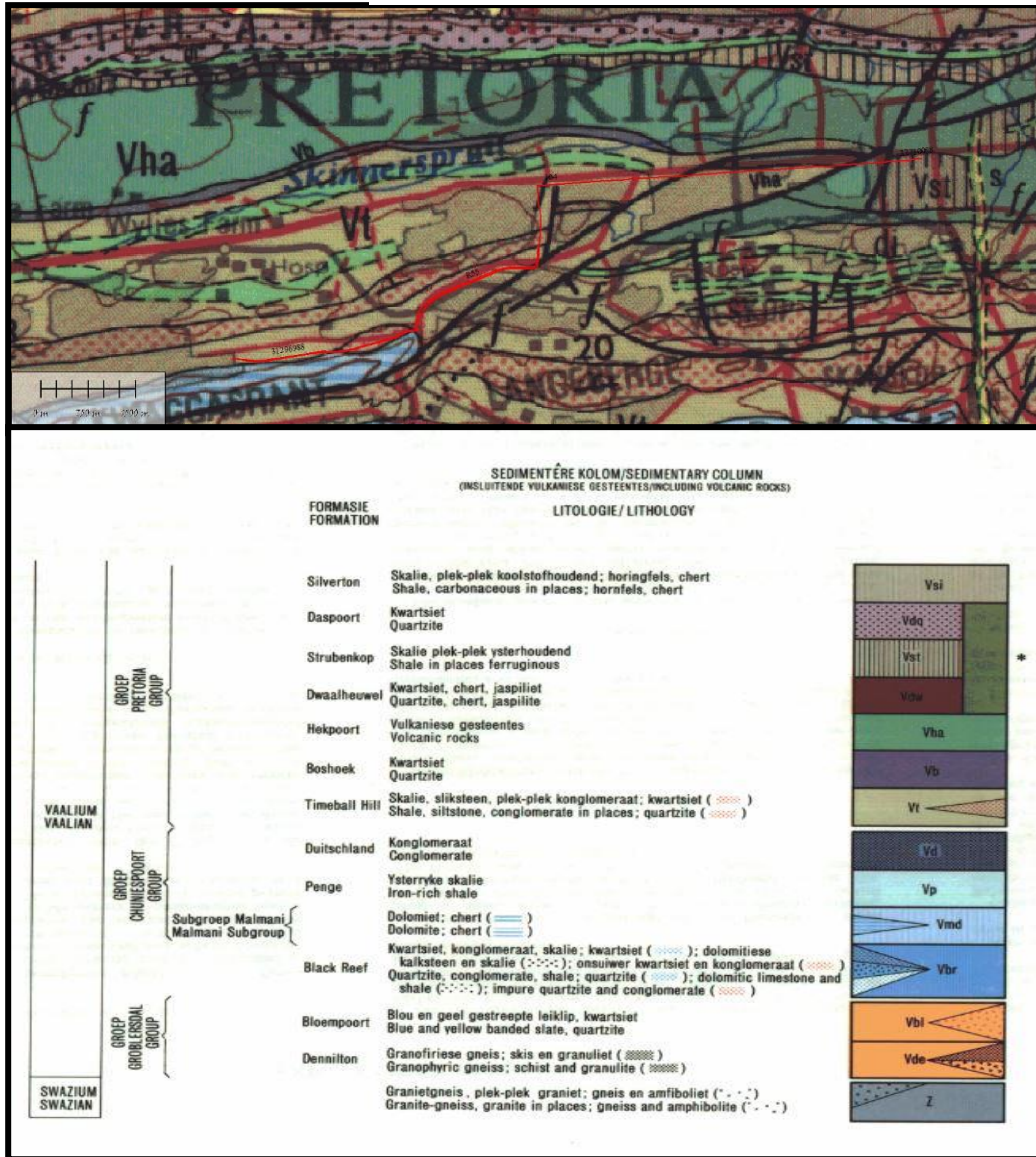
*Hekpoort Formation (Vha)*

The Vaalian aged Hekpoort Formation comprises a sequence of volcanic rocks and weathers to a deep clay-rich soil, mostly disturbed in the study area.

### Strubenkop Formation (Vst)

The Vaalian aged Strubenkop Formation consists predominantly of shale that can be significantly enriched in iron, leading to a ferruginous red coloured sequence of rocks in the study area (Johnson et al, 2009).

Figure 2 Geology underlying the Development of the BRT



### Diabase (Vdi)

A very small area is underlain by diabase (Figure 2).

## **PALAEONTOLOGY**

### **Transvaal Supergroup, Pretoria Group**

#### *Timeball Hill Formation (Vt) (with quartzite bands)*

The Vaalian aged Timeball Hill Formation represents a deposit of lacustrine and fluvio-deltaic mudrocks with diamictite, conglomerates, quartzite and minor lavas. Stromatolites and other micro-fossils have been recorded from these rocks and a High Palaeontological sensitivity is allocated to the areas underlain by the Formation. The fact that significant vertebrate fossils have been recorded from cave breccias associated with thin dolomite zones in this unit warrants a careful inspection of excavated bedrock in all the excavations for foundations that are deeper than 1.5m in this area.

#### *Hekpoort Formation (Vha)*

The Vaalian aged Hekpoort Formation comprises a sequence of volcanic rocks with minor lacustrine shales in which micro-fossils have been recorded. The Formation weathers to a deep clay-rich soil, mostly disturbed in the study area and no significant fossils are expected in these areas. Due to the possibility of fossils in the shales on site a Moderate Palaeontological sensitivity is allocated to areas underlain by the Formation.

#### *Strubenkop Formation (Vst)*

The Vaalian aged Strubenkop Formation consists predominantly of ferruginous shale and micro fossils are associated in places of good outcrop. No significant fossils are expected in these areas and a Low Palaeontological sensitivity is allocated to this part of the study site.

#### **Diabase (Vdi)**

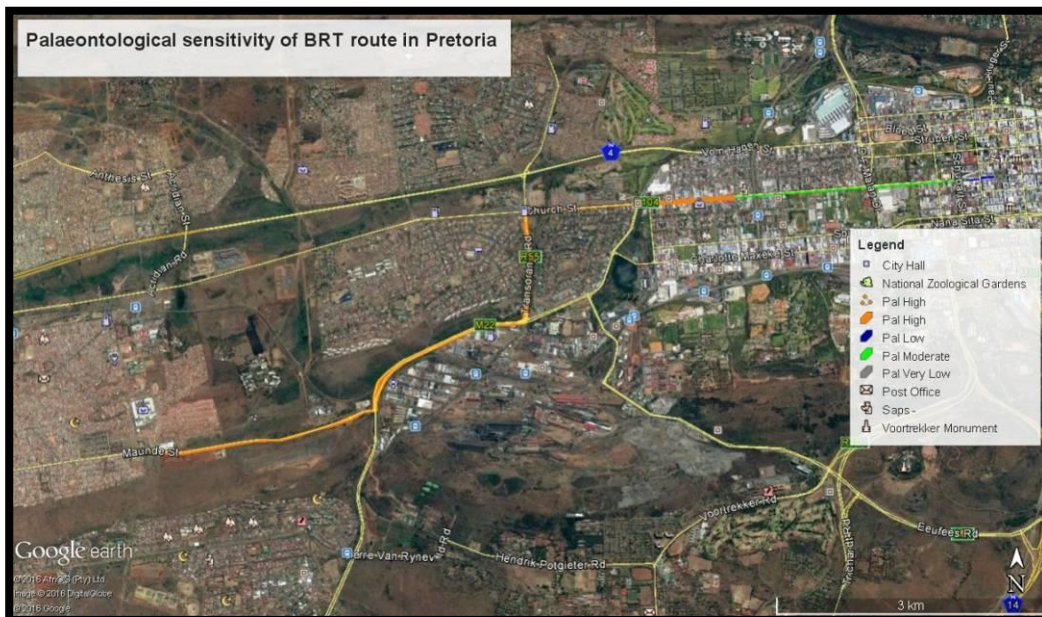
Due to the igneous nature of diabase it will not contain fossils.

## **PALAEONTOLOGICAL IMPACT AND MITIGATION**

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews as well as information gathered during the desktop investigation. The desktop investigation confirms that the study area is underlain by relatively deep highly disturbed by human



development and existing roads and infrastructure with deep (>2m) weathering probably present in most cases of excavation for this project. A High Palaeontological sensitivity is allocated to areas underlain by rocks of the Vaalian aged Timeball Hill Formation. This Formation might yield significant fossils during excavation if bedrock is exposed. Due to the nature of this project (widening of existing road infrastructure) it is unlikely that any significant fossils will be exposed. Exposure of Stromatolites must be reported to the HIA specialist and Palaeontologist for appropriate action if needed.



**Figure 3 Palaeontological sensitivity of the study area. For colour coding see Table 1.**

The excavations for the construction in areas underlain by Hekpoort Formation lavas and shale might expose some micro fossils of stromatolites and a Moderate sensitivity for Palaeontological Heritage is allocated to these areas. No significant finds are expected.

Excavation into shale and quartzite of the Strubenkop Formation is allocated a Low sensitivity whereas the areas underlain by diabase is allocated a Very Low sensitivity for Palaeontological Heritage and no further mitigation for palaeontology is required in these areas (Figure 3).

## **CONCLUSION**

- The development site applicable to the application for the construction of the proposed BRT Route in Pretoria, City of Tswane Metropolitan Municipality, Gauteng Province, is underlain by Vaalian aged sedimentary and volcanic rocks of the Pretoria Group, Transvaal Supergroup, with very little chance of finding significantly new fossils during the excavations for this project.
- No significant fossils are expected before deep excavation (>1.5m) are done but if fossils are recorded during excavations, it will contribute significantly to our knowledge of the Palaeontological Heritage of the Gauteng Province.

It is recommended that:

The EAP and ECO must be informed of the fact that a High and Moderate Palaeontological sensitivity is allocated to the areas underlain by the Vaalian aged Timeball Hill and Hekpoort Formations. If excavations will exceed 1.5m into underlying bedrock, the ECO must notify the HIA specialist and the Palaeontologist for appropriate action.

These recommendations must be included in the EMP of this project.

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## **QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR**

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeo-ecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

## **DECLARATION OF INDEPENDENCE**

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.



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