DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PROPOSED NEW TONK METER ROAD
GLB^{+} / CLASS B WASTE DISPOSAL FACILITY
AT RIETFONTEIN, SPRINGS

GDARD WASTE LICENCE REF NO: GAUT: 002/11-12/W0016

GDARD EIA REF NO: GAUT: 002/11-12/E0228

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TITLE	***:***	***DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT: PROPOSED NEW TONK METER ROAD GLB+ / CLASS B WASTE DISPOSAL FACILITY AT RIETFONTEIN, SPRINGS***
Project Team	***:***	*BKS (Pty) Ltd*
Client	***:***	*Vereeniging Refractories (Pty) Ltd*
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For BKS (Pty) Ltd

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Approved by	:	P Teurlings		2 April 2013
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EXECUTIVE SUMMARY

BACKGROUND TO THE PROJECT

Vereeniging Refractories (Pty) Ltd (Verref) proposes to develop the new Tonk Meter Road Waste Disposal Facility (WDF) for the disposal of general and non-hazardous industrial waste at Rietfontein, Springs. The proposed new WDF is considered a waste management activity that may have a detrimental effect on the environment and for which authorisation in the form of a Waste Management Licence is required in terms of the National Environmental Management: Waste Act (Act 59 of 2008) [NEM:WA]. The proposed development also comprises activities listed in the National Environmental Management Act (Act 107 of 1998) [NEMA] for which environmental authorisation is also required. For both the NEM:WA and NEMA activities, a Scoping and Environmental Impact Assessment (EIA) process is required, as described in the NEMA EIA Regulations in GN 543 of 2010.

BKS (Pty) Ltd (BKS) was appointed by Verref in November 2011 as the independent Environmental Assessment Practitioner (EAP) to undertake the Waste Management Licence and EIA processes for the proposed private WDF. BKS meets the requirements for an independent EAP in terms of the EIA Regulations of 2010.

The relevant environmental authority is the Gauteng Department of Agriculture and Rural Development (GDARD). The GDARD reference number for the waste management licence application (received on 10 January 2012) is Gaut: 002/11-12/W0016. The GDARD reference number for the NEMA EIA environmental authorisation (received on the 23 January 2012) is Gaut: 002/11-12/E0228. The Final Scoping Report including the Plan of Study for EIA was accepted by GDARD on 10 August 2012.

ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The EIA process is currently in the EIA Phase and this report, the Draft EIA Report, documents the outcomes of the EIA Phase and the accompanying draft Environmental Management Programme (EMPr). The Draft EIA Report aims to address the potential impacts associated with the proposed WDF, and to provide an assessment of the project in terms of the biophysical, social and economic environmental factors.

This assessment aids both the environmental authority, in this case the GDARD, and the Applicant, Verref, in making decisions regarding the future of the project.

Associated with the Draft EIA Report is a draft EMPr which will serve as a means to ensure that the issues highlighted in the Draft EIA Report that can be mitigated, are mitigated in a sustainable and effective manner. That is, the Draft EMPr acts as the constraints under which the construction, operation and potential eventual decommissioning phases of the project are controlled, monitored and assessed.

OVERVIEW OF PROPOSED PROJECT

The proposed WDF entails the development of a new, privately owned and operated WDF, and associated infrastructure with a GLB+ / Class B classification for the disposal of general and non-hazardous industrial waste. The proposed WDF will receive more than 500 tons per day of general domestic and non-hazardous industrial waste when fully operational and will have an estimated lifetime of 60 years.

The intention is to utilise previously mined or disturbed areas, i.e. clay quarries, as well as future proposed mining areas and undeveloped areas for the disposal cells. This will provide a cost effective means of rehabilitating the mined areas from which clay was and will continue to be mined lawfully in terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002).

The greater site is located on Remainder of Portion 81of the Farm Rietfontein 128 IR. This Portion is divided into three areas, namely Areas D, E and F and these Areas are specifically the proposed sites for the new Tonk Meter Road WDF. Area E is currently being mined for clay by Verref and Corobrik, whereas Area F and Area D will be mined in the future for clay by Verref and Corobrik. Areas D, E and F will provide airspace for waste disposal as part of the new Tonk Meter Road WDF.

Portions of the Farm Rietfontein 28 IR located adjacent to the proposed Tonk Meter Road WDF are also referred to as Area A (on Portion 204), Area B (Rehabilitation Area (old waste disposal site)), Area C (on Portion 202), and Area G (on Remainder of Portion 81). Areas A and C comprise the Rietfontein WDF previously licensed and currently operated by the EMM. Area A is at closure stage and Area C is still operational. Area B, used for waste disposal pre inception of DWAF's "Minimum Requirements for Waste Disposal by Landfill", is currently being rehabilitated by Anglo American.

The following presents a list of infrastructure for the proposed new GLB+ / Class B WDF:

a) *waste disposal cells;*
b) *site access and security facilities, including an access control building and perimeter fencing;*
c) *laboratory to test and verify the classification of incoming waste;*
d) *external access road (from Rietfontein Road) and internal access roads;*
e) *weighbridges and weighbridge control room;*
f) *leachate collection system and leachate ponds to prevent surface and groundwater contamination;*
g) *pollution control ponds to collect contaminated stormwater runoff and prevent surface and groundwater contamination;*

h) stormwater berms around the upstream side of the site to keep clean stormwater off the site;

i) leachate treatment facility to treat leachate and contaminated stormwater runoff or disposal to sewer facilities (where approved by the DWA);

j) screening berms;

k) public drop-off area (for future use);

l) administration and ablution buildings;

m) weather/meteorological station;

n) workshop and stores;

o) fuel storage facilities for the refuelling of WDF plant and equipment; and

p) reticulation electricity, sewage and potable water infrastructure and connections.

Additional waste management components relating to the treatment, re-use and recovery of waste have been considered subject to its financial viability and include the extraction of landfill gas facilities for flaring or energy recovery; a Materials Recovery Facility (MRF), storage facilities for recyclable materials and a compost area.

PROJECT ALTERNATIVES

The EIA process also requires the identification and analysis of alternatives in order to satisfy the project's need. Therefore, the following items have been identified and are included as part of this EIA Report:

a) 'Do-Nothing' approach, i.e. no development.
b) Waste management alternatives for waste minimisation, waste treatment, re-use, recovery and recycling and waste-to-energy.
c) Buffer zone alternatives
d) Site access alternatives.
e) Location alternatives.

PUBLIC PARTICIPATION

The Public Participation Process (PPP) included the distribution of documents by post and electronic mail, printed media, meetings with stakeholders and I&APs. All the issues and concerns that have been raised by the I&APs, through the various channels during the EIA process to date, including I&AP registration forms, e-mail communications and the Public Open Day, were captured in the Issues and Response Report.

In keeping with environmental legislation, it is the responsibility of the EAP to ensure that the public is provided the opportunity to participate meaningfully in the environmental investigation process. This includes identification of issues and review of reports. Accordingly, interested and

affected parties (I&APs) are invited to review the Draft EIA Report and the site-specific EMPr from 9 April to 10 June 2013 at the Springs, Kwa-Thema and Bakerton libraries.

The comments received during the review period of the Draft EIA Report will be incorporated into the Final EIA Report and submitted to the GDARD for review, acceptance and potential authorisation.

EIA PHASE

All potential significant environmental issues (i.e. social, economic and biophysical) associated with the proposed waste disposal facility that were identified in the Scoping Phase have been further investigated through specialist studies in the EIA Phase, specifically for the proposed Tonk Meter Road WDF (landfill).

Associated with the Draft EIA Report is a draft Site-Specific Environmental Management Programme (EMPr) which will serve as a means to ensure that the issues highlighted in the Draft EIA Report that can be mitigated, are mitigated in a sustainable and effective manner. That is, the EMPr acts as the constraints under with the construction, operation and potential eventual decommissioning (or closure) phases of the project are controlled, monitored and assessed.

THE WAY FORWARD (DECISION MAKING PHASE)

Once all issues have been addressed by the EAP and presented in the Final EIA Report, the report will be submitted to GDARD along with the draft EMPr for GDARD's decision as to whether or not to authorise the proposed Tonk Meter Road WDF.

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Explanation
amsl	above mean sea level
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMM	Ekurhuleni Metropolitan Municipality
EMPr	Environmental Management Programme (i.t.o. NEMA)
EMPR	Environmental Management Programme (i.t.o. M&PRDA)
HIA	Heritage Impact Assessment
GDARD	Gauteng Department of Agricultural and Rural Development
GLB+	General Large Class B Landfill
GN	Government Notice
HDPE	High-density polyethylene
I&AP(s)	Interested and Affected Party (-ies)
IDP	Integrated Development Plan
km	kilometre(s)
LOS	Level of Service
m	metre(s)
M&PRDA	Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)
MRF	Materials Recovery Facility
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
NHRA	National Heritage Resources Act, 1999 (Act 25 of 1999)
NWA	National Water Act, 1998 (Act 36 of 1998)
OHS	Occupational, Health and Safety Act (No. 85 of 1993)
PES	Present Ecological State
PPP	Public Participation Process
PM	Particulate Matter
SAHRA	South African Heritage Resource Agency
SANS	South African National Standards
WASP	Waste–Aquifer Separation Principle

1. INTRODUCTION

1.1 BACKGROUND OF STUDY

1.1.1 Project Background

Vereeniging Refractories (Pty) Ltd (Verref) proposes to develop the Tonk Meter Road Waste Disposal Facility (WDF) for the disposal of general and non-hazardous industrial waste at Rietfontein, Springs. The intention is to utilise previously mined or disturbed areas, i.e. quarries, as well as future proposed mining areas for the disposal cells.

The proposed privately owned and operated WDF will be located at the Remaining Extent of Portion 81 of the Farm Rietfontein No. 128, Registration Division IR, Gauteng Province. It is located adjacent to the existing Ekurhuleni Metropolitan Municipality's (EMM) Rietfontein Waste Disposal Facility, south of Rietfontein Road, west of Tonk Meter Road and east of Kwa-Thema in the southern part of Springs. Refer to **Figure 1-1**.

The proposed Tonk Meter Road WDF is considered a waste management activity that may have a detrimental effect on the environment and for which, authorisation in the form of a Waste Management Licence is required in terms of the National Environmental Management: Waste Act (Act 59 of 2008) [NEM:WA]. The proposed development also comprises activities listed in the National Environmental Management Act (Act 107 of 1998) [NEMA], for which environmental authorisation is also required. For both the NEM:WA and NEMA activities, a Scoping and Environmental Impact Assessment (EIA) process is required, as described in the NEMA EIA Regulations in GN 543 of 2010.

1.1.2 Environmental Assessment Practitioner

BKS (Pty) Ltd (BKS) was appointed by Verref in November 2011 as the independent Environmental Assessment Practitioner (EAP) to undertake the Waste Management Licence and EIA processes for the proposed WDF. BKS meets the requirements for an independent EAP in terms of the EIA Regulations of 2010.

1.1.3 Environmental Authority

The relevant environmental authority is the Gauteng Department of Agriculture and Rural Development (GDARD).

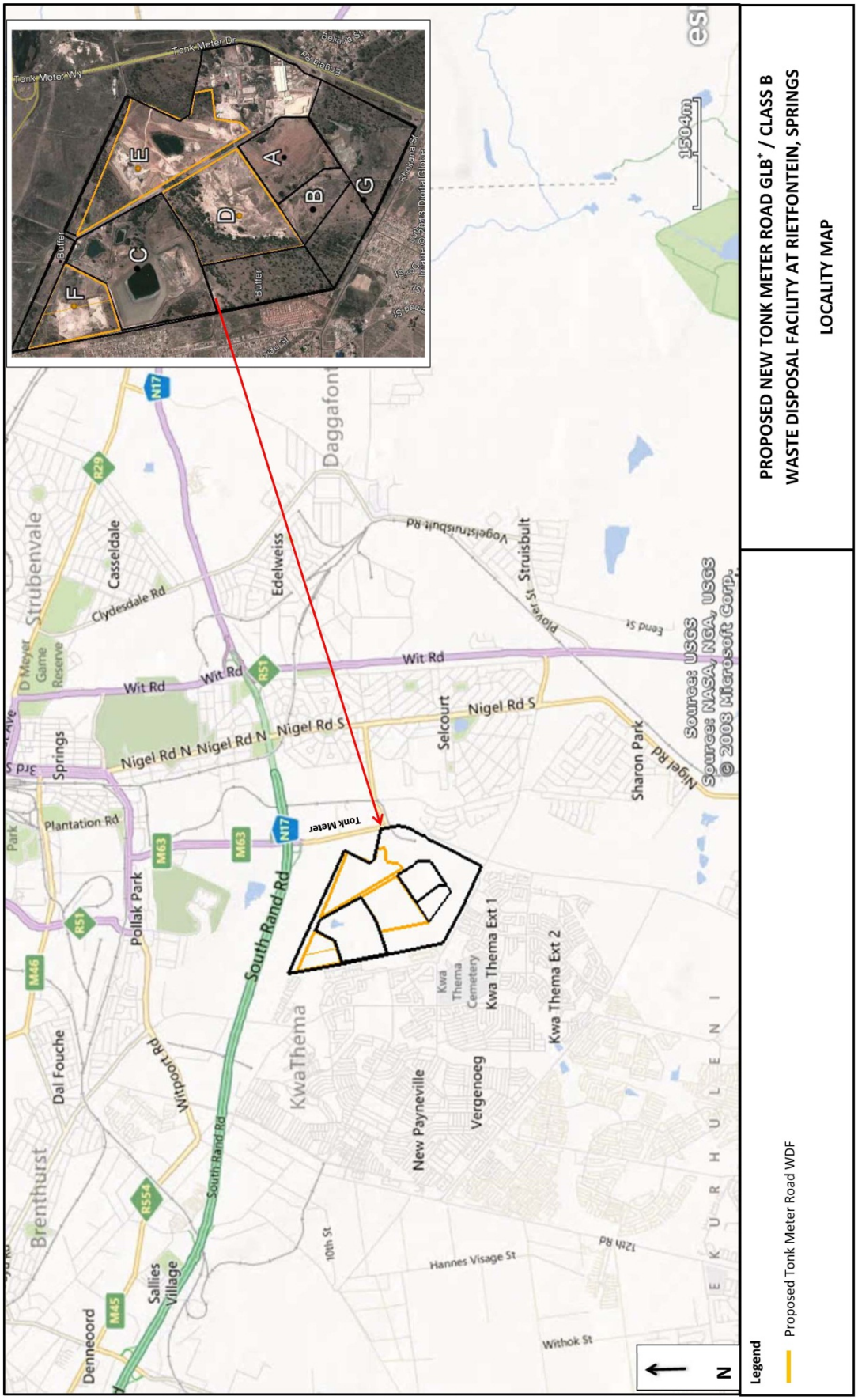

Figure 1-1: Locality Map

A request for a change to the project title was made to GDARD on 5 March 2012 (refer to **Appendix 1** for a copy of the letter). This is due to the applications initially allowed for a section of the proposed site to be developed as an extension to the EMM Rietfontein WDF. Since the applications were submitted and discussions held with both GDARD and the EMM, this has changed as the land negotiations between Verref and the EMM have not progressed sufficiently. As a result the entire proposed site will be developed as a private WDF, thus the request for the change in the project title.

The Final Scoping Report including the Plan of Study for EIA was accepted by GDARD on 10 August 2012 (refer to **Appendix 1**).

BKS requested an extension of time on the submission of the Final EIA Report to GDARD, in terms of Regulation 67 of the 2010 EIA Regulations, on 28 February 2013. GDARD granted this request for both the EIA and Waste Licence applications on 12 March 2013. The Final EIA Report is to be submitted by the 13 June 2013 (refer to **Appendix 1**).

1.2 PURPOSE OF STUDY

An EIA is a planning and decision-making tool. It identifies potential negative and positive impacts of a proposed Tonk Meter Road WDF and recommends ways to enhance the positive impacts and minimise the negative ones. The EIA addresses the impacts associated with the project, and provides an assessment of the project in terms of the biophysical, social and economic environments to assist both the environmental authority (i.e. the GDARD) and the applicant (i.e. Verref) in making decisions regarding implementation of the proposed Tonk Meter Road WDF.

An EIA consists of three phases:

a) the Scoping Phase;
b) the EIA Phase; and
c) the Decision-Making Phase.

The main purpose of the Scoping Phase of the project was to identify and define the issues that need to be addressed in the EIA Phase. In this regard, inputs from the project team, the authorities, specialists and Interested and Affected Parties (I&APs) were considered and integrated into the Final Scoping Report.

The main purpose of the phase at hand, the EIA Phase, is to undertake the specialist studies identified in the Scoping Phase, to integrate the findings and present recommendations for the project.

The draft Environmental Management Programme (EMPr) is also generated during this phase, which takes the findings of the EIA Report and presents these in a series of measurable controls that will serve to mitigate impacts to acceptable levels through the

provision of controls for the construction, operation and decommissioning phases of the project's life cycle.

The information provided from the EIA Phase is passed on to the competent authority, GDARD, for consideration during the decision-making phase.

1.3 PURPOSE OF THIS REPORT

The purpose of the EIA Report is to present a summary of the findings of the specialist studies and provide recommendations on how the project can be implemented in a way that minimises the negative and maximises the positive impacts.

The Draft EIA Report is submitted to GDARD and the public simultaneously for a 60 day review period (as per Section 56(9)(a) of the EIA Regulations, 2010). Following the public review period (9 April – 10 June 2013), the Draft EIA Report will be finalised and the Final EIA Report will be submitted to GDARD for decision-making.

1.4 STRUCTURE OF THIS REPORT

The structure of the EIA Report is presented in **Table 1-1** and includes a cross-reference to the information requirements per Section 31 of Government Notice R.543 (of 18 June 2010, NEMA EIA Regulations).

Table 1-1: Structure of Report

Description	NEMA EIA Regulations (GN R543) Sect 31	Chapter
Introduction and background to the project.	*(2)(b)*	**Chapter 1**
Details of the Applicant, EAP (including expertise) and project team	*(2)(a)*	**Chapter 2**
A description of the proposed project, including the need and desirability.	*(2)(b), (c) & (f)*	**Chapter 3**
Legislation and guidelines that pertain to the project.	*(2)(r)*	**Chapter 4**
A description of the EIA process including the PPP, assumptions, uncertainties and gaps in knowledge.	*(2)(e) & (m)*	**Chapter 5**
A description of the receiving affected environment.	*(2)(c) & (d)*	**Chapter 6**
A summary of the findings and recommendations of the specialist studies, the studies included in the Addenda.	*(2)(j) & (q)*	**Chapter 7**
A description and comparative assessment of all project alternatives identified.	*(2)(g) & (i)*	**Chapter 8**
A description of the methodology used to determine significance ratings.	*(2)(h)*	**Chapter 9**
A description of all environmental issues identified and an assessment of significance.	*(2)(k) & (l)*	**Chapter 10**
A consideration of the draft Environmental Management Programme, the draft EMPr included in the Addenda.	*(2)(p)*	**Chapter 11**
Environmental Impact Statement, including a summary of key findings.	*(2)(o)*	**Chapter 12**
Conclusion and recommendations.	*(2)(n)*	**Chapter 13**

2. PROJECT TEAM

2.1 APPLICANT

Details of the Applicant are presented in **Table 2-1**.

Table 2-1: Applicant Details

Applicant	Vereeniging Refractories (Pty) Ltd
Contact Person	Mr M Yeats
Postal Address	P.O. Box 117, Vereeniging, 1930
Telephone	033 347-1071
Fax	016 421 2481
Email Address	my@ty.co.za

2.2 ENVIRONMENTAL CONSULTANT

The independent EAP for the project is BKS, further details are presented in **Table 2-2**.

Table 2-2: Environmental Consultant Details

Environmental Consultant	BKS (Pty) Ltd
EAP	Mr Peter Teurlings
Contact Person	Mrs Lucille Behrens
Postal Address	P.O. Box 272, Port Elizabeth, 6000
Telephone	041 585 2514
Fax	041 585 8478
Email Address	lucilleb@bks.co.za / lucille.behrens@aecom.com

2.3 DETAILS OF THE AUTHORS

The project is managed by and the reports have s been drafted by Lucille Behrens, Senior Environmental Scientist of BKS. Lucille has a BSc (Honours) in Environmental Monitoring and Modelling, and specialises in environmental assessment processes and the compilation and monitoring of EMPrs. Lucille has drafted the Scoping and EIA reports for the Grants Valley residential development in the Eastern Cape, for a confidential Department of Defence project in the Northern Cape, and the Scoping Report for the Oranje-Riet balancing dam. Lucille has also undertaken Basic Assessments for upgrades to various roads and stormwater infrastructure within the Nelson Mandela Bay Municipality. She was involved as an Environmental Control Officer (ECO) in the Coega IDZ, Cluster E Road and Stormwater Upgrades, Van Der Kemps Kloof Nature Reserve and at the Nelson Mandela Bay Multi-Purpose Stadium. Lucille is also a member of the South African Chapter of the International Association of Impact Assessments (ID No. 2668).

The reports are technically reviewed by Mike Howard, Project Technical Manager of BKS. Mike has a BSc degree in Limnology. He has over 30 years experience on multi-disciplinary projects in the fields of environmental management, water resource management, waste

management, community development programmes, spatial planning and project management.

The reports are approved by Peter Teurlings, Project Director and EAP of BKS. Peter is registered as a Professional Natural Scientist (Registration No. 400027/95) in the Environmental Science field of practice in terms of Section 18(1) of the Natural Scientific Professions Act (2003), is a member of the South African Chapter of the International Association of Impact Assessments (ID No. 1398), and is a founding member of the Environmental Assessment Practitioners Association of South Africa (EAPASA). He has also recently become a member of the Environmental Law Association. Peter has an MSc (Biogeography) and specialises in environmental assessment processes and project management. He has been involved in a variety of different types of EIA processes (over 100) including residential developments, transmission power lines, wastewater treatment projects, water supply projects, dams, roads and airports in Southern Africa.

2.4 PROJECT TEAM

Peter and Lucille are supported by other BKS personnel as indicated in **Table 2-3** below. Input from the applicant is also important for the completeness of the EIA process and accuracy of project related information. The project team will be updated once additional specialists are incorporated during the EIA phase.

Table 2-3: Project Team

Name	Role on the team	Company
Applicant Team		
M Yeats	Applicant	Verref
K Otto	Project Manager	Kobus Otto & Associates
Environmental Team		
P M F G Teurlings	Project Director & EAP	BKS
M R Howard	Principal Technical Manager	BKS
L Behrens	Project Manager; Assistant EAP, Senior Environmental Scientist	BKS
M Maimane	Public Participation Officer	BKS
Specialists		
M Howard	Visual Impact Specialist	BKS
C E le Roux	Biodiversity and Wetland Specialist	BKS
Dr D de Waal	Social Reviewer	BKS
G Edwards	Traffic Impact Specialist	BKS
L Gallagher	GIS	BKS
Dr J P Venter	Geologist	J P Venter Consulting Services
R Meyer	Geohydrologist	R Meyer Geohydrological Consultants
J A van Schalkwyk	Heritage Specialist	J A van Schalkwyk Heritage Consultant
P Legg	Civil Engineer	Peter Legg Consulting
Dr R Watson	Air Quality Specialist	Royal Haskoning DHV

3. OVERVIEW OF THE PROPOSED PROJECT

3.1 NEED AND DESIRABILITY

The proposed Tonk Meter Road WDF entails the development of a new WDF and associated infrastructure, adjacent to the existing Ekurhuleni Metropolitan Municipality's (EMM) Rietfontein WDF, for the disposal of general and non-hazardous industrial waste.

A sanitary WDF (landfill) is a facility for the disposal of waste on land using technologies that reduce impacts on the environment and nuisances or hazards to public health and safety by using the principles of engineering to confine waste to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of soil or other suitable material at the conclusion of each day's operations, or at more frequent intervals, if deemed necessary. Once cells are full, they are covered or "capped" with amongst others a clay layer and vegetated. Note that capping is described simplistically in the previous sentence; the full capping layer consists of a landfill gas layer, a clay layer and finally a topsoil layer, which is vegetated so as to limit / prevent erosion of capping material.

The Department of Environmental Affairs (DEA) has, in general, established that waste disposal is becoming a problem due to the rapid increase in population and the resultant decline in available disposal capacity. The proposed Tonk Meter Road WDF will assist in addressing this shortage in airspace for waste disposal in Gauteng, while providing an environmentally acceptable waste facility for its growing population. The existing EMM Rietfontein WDF, located adjacent to the proposed new WDF, has approximately 10 years of life remaining in prepared airspace (i.e. available waste disposal capacity) and approximately 5 years in un-prepared airspace (EMM, 2012a). Based on the current demand, the proposed new Tonk Meter Road WDF will ensure sufficient waste disposal capacity for the next 60 years.

In addition to addressing the waste disposal needs, limited employment will be created during the construction and operational phases. Approximately 50 short term (temporary) positions will be created during the construction of the proposed Tonk Meter Road WDF. Approximately 15 permanent positions will be created as part of the operations. Once waste separation at source becomes a reality in Gauteng, approximately 40 additional permanent positions may be created through the addition of a Material Recovery Facility (MRF) at the proposed Tonk Meter Road WDF.

3.2 PROPOSED AREAS FOR DEVELOPMENT

The intention is to utilise previously mined or disturbed areas, i.e. clay quarries, as well as future proposed mining areas for the disposal cells. This will provide a cost effective means of rehabilitating the mined areas from which clay was, presently and will be mined for brickmaking in terms of the M&PRDA, whilst at the same time providing much needed additional airspace for waste disposal in Gauteng.

The greater site is located on Remainder of Portion 81of the Farm Rietfontein 128 IR. This Portion is divided into three areas, namely **Areas D, E** and **F** and these Areas are specifically the proposed sites for the new Tonk Meter Road WDF.

Area E is currently being mined for clay by Verref and Corobrik, whereas Area F and Area D will be mined in the future for clay by Verref and Corobrik. Please note that only **Areas D, E and F** are the proposed sites for the new Tonk Meter Road WDF.

Portions of the Farm Rietfontein 128 IR located adjacent to the proposed Tonk Meter Road WDF are also referred to as Area A (on Portion 204), Area B (Rehabilitation Area (old waste disposal site)), Area C (on Portion 202), and Area G (on Remainder of Portion 81).

Areas A and C comprise the Rietfontein WDF previously licensed and currently operated by the EMM. Area A is at closure stage and Area C is still operational. Area B, used for waste disposal pre inception of DWAF's "Minimum Requirements for Waste Disposal by Landfill", is currently being rehabilitated by Anglo American. Areas D, E and F will provide airspace for the waste disposal as part of the new Tonk Meter Road WDF. Refer to **Figure 3-1**.

Figure 3-1: Proposed Areas D, E and F for Landfill Development as part of the new Tonk Meter Road WDF.

3.3 REQUIREMENTS FOR THE DESIGN AND CLASSIFICATION OF LANDFILLS

Verref proposes to develop an environmentally sound large general waste disposal facility to serve public and industrial waste generators in the EMM.

Currently the legal requirements for the design and classification of landfills within South Africa are as per the Department of Water Affairs' (DWAF) "*Minimum Requirements for Waste Disposal by Landfill*" (DWAF, 2009, 2nd Edition) (Minimum Requirements).

The Conceptual Design (Appendix 4) for the proposed Tonk Meter Road landfill will adhere to the requirements set out in the Minimum Requirements but will also meet the requirements detailed in the Draft National Standards described in Government Gazette Notice Regulations (GNR) 432, 433 and 435 of 2011, as updated by GNR 613, 614 and 615 of 2012 (per list below), as well as the National Environmental Management: Waste Act (Act 59 of 2008, as amended).

The DEA is in the process of establishing Regulations and Standards to regulate various aspects of waste management, including the design and classification of landfills. In addition to the existing Minimum Requirements, the following draft documents will be applicable once promulgated:

a) Draft National Standard for Disposal of Waste to Landfill (GN 432 of 2011).
b) Draft Standard for Assessment of Waste for Landfill (GN 433 of 2011).
c) Draft Waste Classification and Management Regulations (GN 435 of 2011).
d) Draft Standard for Assessment of Waste for Landfill Disposal (GNR 613 of 2012).
e) Draft Waste classification and Management Regulations (GNR 614 of 2012).
f) Draft Standard for Disposal of Waste to Landfill (GNR 615 of 2012).

As a result of the above, the design and classification of the proposed new WDF will take the existing Minimum Requirements as well as the new Regulations and Standards (future) into account. Until the new standards and regulations are legislated, the exact requirements can only be approximated. However, the design of the Tonk Meter Road WDF as proposed complies with the latest revision of the draft regulations as well as recommendations from the authorities based on those proposed regulations, and will be amended during final design of the Tonk Meter Road WDF to meet the required standards once legislated.

The description of the conceptual design of the landfill is provided in Appendix 4 which includes specific considerations of the site in the context of the specialist studies undertaken and provides diagrams showing specific items of direct relevance.

The classification of the proposed new Tonk Meter Road WDF is presented in **Table 3-1.** No hazardous waste will be disposed of at the proposed new Tonk Meter Road WDF.

Table 3-1: Landfill Classification of the Proposed Tonk Meter Road WDF

Aspect	Minimum Requirements (DWA)	Draft New Regulations and Standards (DEA)
Landfill Classification	GLB+	Class B
Size	Large (>500 tons per day)	Large (>500 tons per day)
Typical Types of Waste Accepted	General waste and delisted (treated) industrial waste: a) Domestic, commercial and certain industrial waste. b) Uncontaminated builder's rubble. c) Garden waste. d) Waste containing insignificant quantities of batteries, insecticides, weed killers, medical waste discarded on domestic and commercial premises. e) Delisted hazardous (industrial) waste treated and considered safe for disposal at a B+ landfill.	Type 2 – Moderate Risk: a) Domestic waste. b) Post-consumer packaging. c) Non-hazardous business waste. d) Uncontaminated builder's rubble and excavated earth material. e) Waste tyres. f) Garden waste. g) Non-infectious animal carcasses. h) Waste classified as non-hazardous in terms of SANS 10234. i) Waste where the leachable concentration of specific contaminants falls within acceptable thresholds (as per GN 433). j) Waste where the total concentration of a specific contaminant falls below total contamination thresholds (as per GN 443).
Typical Liner Design	In accordance with **B+** requirements: • Both liners have leachate collection and leachate detection layers. • The difference between the two liners is that a geotextile has been provided above the leachate collection layer in the **Class B liner** to prevent clogging of the stone leachate collection layer. • A 1.5mm HDPE geomembrane (or silty sand), protected against mechanical damage from the rock leachate collection layer, has been added above the clay layers. This geomembrane acts as a primary barrier, preventing leachate from coming into direct contact with the secondary clay barrier and through this offering better protection to the clay layer than with the design in the DWA's *Minimum Requirements for Waste Disposal by Landfill*.	

3.4 DESCRIPTION OF DISPOSAL CELL DEVELOPMENT

3.4.1 Typical Cell Development

A WDF is typically divided into different cells for disposal in order to control the day-to-day workings. Waste received at the WDF is directed to the active cell for disposal. A cell is an area (typically 150m x 150m) that is excavated and lined (see **Section 3.6**) to receive general waste. The number and size of cells at a WDF is dependent on the local conditions of the site.

A phased approach is typically undertaken in excavating, lining and filling of each cell used at the WDF. The first cell is usually excavated with the excavated material stockpiled for when the final cells need to be backfilled and rehabilitated. Once the first cell is ready to accept waste, excavation on the second cell will begin. The next disposal cell is prepared by shaping and constructing liners in order to receive waste once the previous active cell is nearing

capacity. Where cells are developed in mined quarries, the quarries are typically shaped and lined to prevent the release of pollutants.

Waste received on the landfill is deposited in horizontal layers approximately 2m thick and is continuously compacted. Typically excavated cover material (usually subsoil) from the second cell is used daily to cover the waste that is deposited and compacted in the first cell in layers of cover material approximately 150mm thick. Once the first cell has reached capacity, it is domed, capped and rehabilitated. The second cell would have been prepared (i.e. shaped and lined) by this time and will begin to accept waste. Once the second cell is active, excavations on the third cell begin. This process of excavation, filling and rehabilitation of cells continues, depending on the number of cells proposed. Typically clay is reserved from each cell excavated for stockpile and use as liners and to progressively cap each cell once it has been closed. Topsoil from each cell excavated (where available) is stockpiled separately for use during the capping and rehabilitation of each cell.

The volume of airspace available for waste disposal and the life of a disposal site depend on the size of the area of land that is suitable for waste disposal, on the potential depth to which cells can be excavated and the height above ground level to which the waste can be disposed of. In turn, the cell depth is influenced by geotechnical conditions and the level of the groundwater, while the potential visual impact on surrounding I&APs, geological stability and air quality considerations will determine the maximum allowable height of the landfill.

3.4.2 Proposed Cell Development

The proposed cell layout will encompass the entire clay mining footprint and will be developed in a number of phases. The clay mining footprint starts approximately 9 m from the boundaries on the existing mining sections and will change to 20 m from the boundaries on future mining areas. A limited number of areas within the proposed development will not be mined (e.g. the northern part of Area E where the infrastructure will be located).

The landfill design will be developed to make optimum use of the available clay resources whilst creating maximum airspace. The future mining plan is based on a 20 m distance between the Area boundaries and the edge of the quarries, together with 1:3 side slopes towards the inside of the quarries.

The landfill design is based on a worst case scenario whereby the height of the final form cell is 25m. However, based on the results of the air quality study and the resultant buffer zones, actual final form cell height will be 1m above ground. For this reason, the estimated airspace available below surface after mining is taken as the expected final waste volume per development area (see **Table 3-2**).

Table 3-2 presents the areas proposed for development of the new WDF, area size, estimated airspace below surface (created by mining) and the remaining mining life span

based on current clay consumption as well as on 1:3 quarry slopes and a 20 m distance to the property boundaries.

Table 3-2: Estimated Areas and Life Span

Area	Volume available (m^3)	Volume of cover required (m^3) (1:6)	Volume of waste (m^3)	Lifetime (Years)
D	8 638 000	1 434 000	7 204 000	30.0
E	7 349 000	1 225 000	6 124 000	25.5
F (Builders rubble)	2 070 000	Not required	2 070 000	Dependent on BR generation
F (General waste)	1 035 000	172 500	862 500	3.6
Total	19 092 000	2 831 500	16 260 500	59.1

As Area E has the shortest remaining mining life, this area will be developed for the first waste disposal cells. Operations will begin in the northern part and progress in a southerly direction. Airspace will be recovered by using the rehabilitation material previously backfilled in Area E. This will be used for daily cover on the proposed waste disposal cells. Areas F and D will be developed, respectively, once all airspace within Area E has been utilised and as mining is completed in this area (i.e. within 6 years).

Landfilling is to commence in Area E, Cell 1, at the higher end of the cell to achieve the required cross falls for drainage (2%), and is to proceed downslope in a south easterly direction. Initially, a pioneering layer of waste, at least 1 m thick, is to be placed over the liner system by means of end tipping and spreading to protect the installed liner. Subsequent waste layers are then to be placed, compacted and covered in the conventional manner of sanitary landfilling. This procedure will apply to all cells when disposal commences.

The working surface of the landfill is to be sloped towards the contaminated runoff water collector drains at the lower end of each cell. Landfilling is to be taken up to maximum practicable height before moving downslope to the next cell.

Once the Phase 1 area has been developed up to maximum practicable height above the floor level, landfilling can commence in Phase 2, and progress down slope to the next cells. The same development principals will apply until the landfilling is completed. Landbuilding will then commence in 2,5 m lifts to a worst case maximum height of 25 m above NGL.

When a viable portion of any landfill area is completed i.e. the landbuilding is completed to the maximum height of worst case 25 m and the side slopes shaped, the outer slopes of the landfill are to be graded and final capping applied as part of a phased landfill rehabilitation programme. This will help to minimise leachate generation and will also make the landfill more aesthetically pleasing.

Figures 3-2, 3-3 and 3-4 show the planned cell development and drainage systems in each of Areas E, F and D respectively.

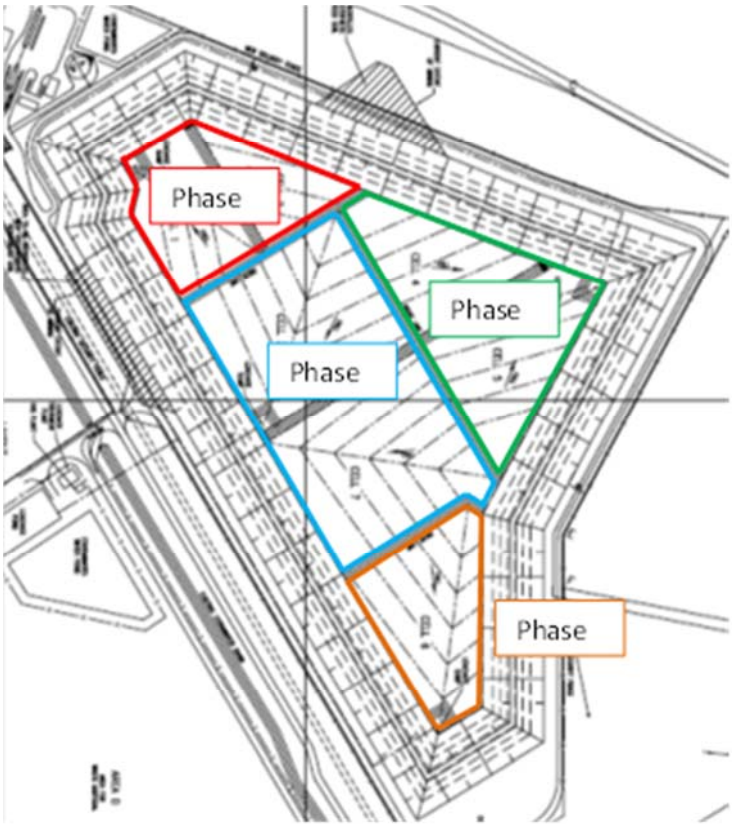

Figure 3-2: Phased Development of Area E

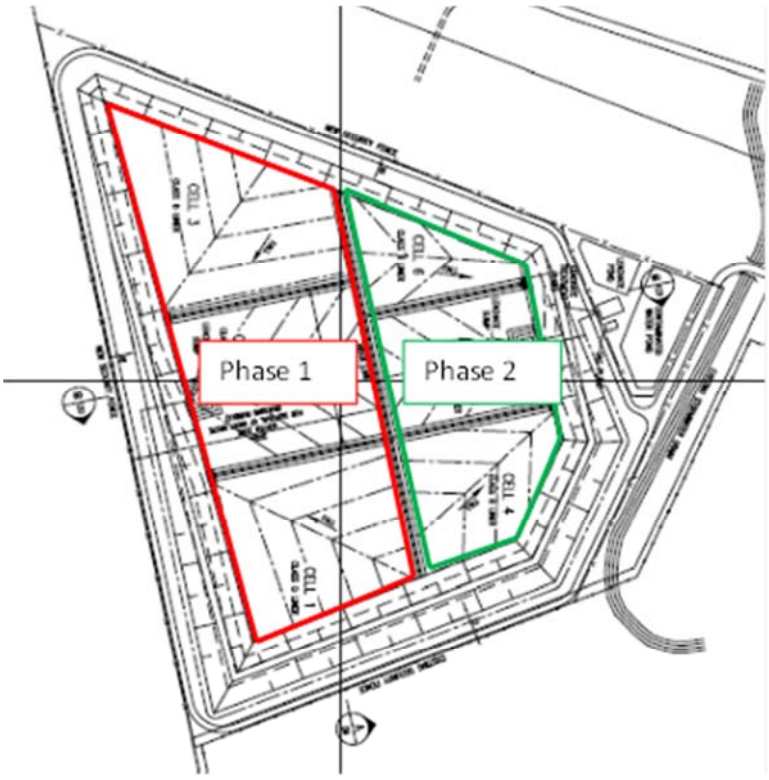

Figure 3-3: Phased Development of Area F

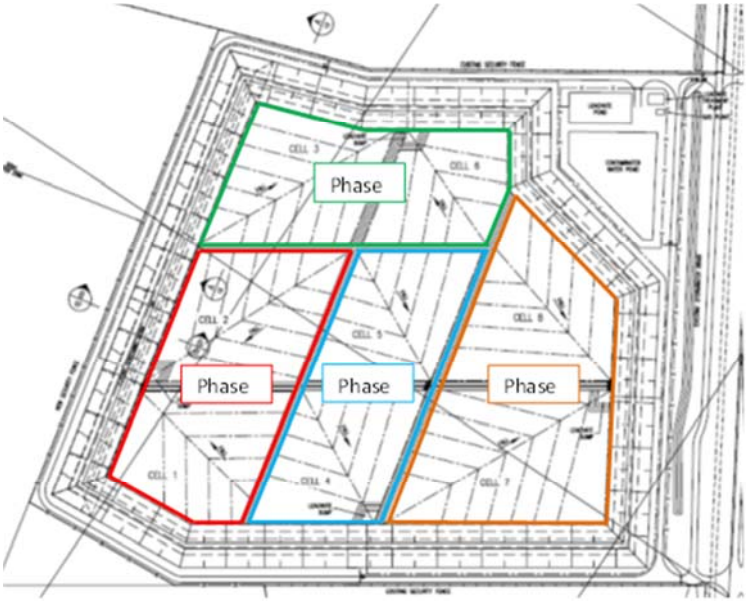

Figure 3-4: Phased Development of Area D

The exact processes for the development of the disposal cells include the footprint, depth below-ground level, slope and the final height of the cells, as well as the rehabilitation of the cells is presented in the Conceptual Design, Appendix 4.

3.4.3 Cell Lining and Design

Guidelines for the lining of disposal cells to prevent soil and groundwater contamination beneath the disposal cells are provided in the "*Minimum Requirements for Waste Disposal by Landfill*" (DWAF, 2009) as well as the draft Regulations and Standards currently developed by DEA. Cell liners typically comprise layers of geomembranes, geosynthetic clay liners, and/or compacted clay (refer to **Figures 3-2 and 3-3**). As part of the lining design, a leachate collection layer, typically comprising a graded underliner, is used. The leachate collection system is a system of drains, bunds or trenches covered by the leachate collection layer. The drains or collection pipes direct the gravity flow of leachate to collection points or ponds.

The liner designs for the landfill, the contaminated runoff water pond and the leachate pond have been developed in accordance with the Draft Standard for Disposal to Landfill.

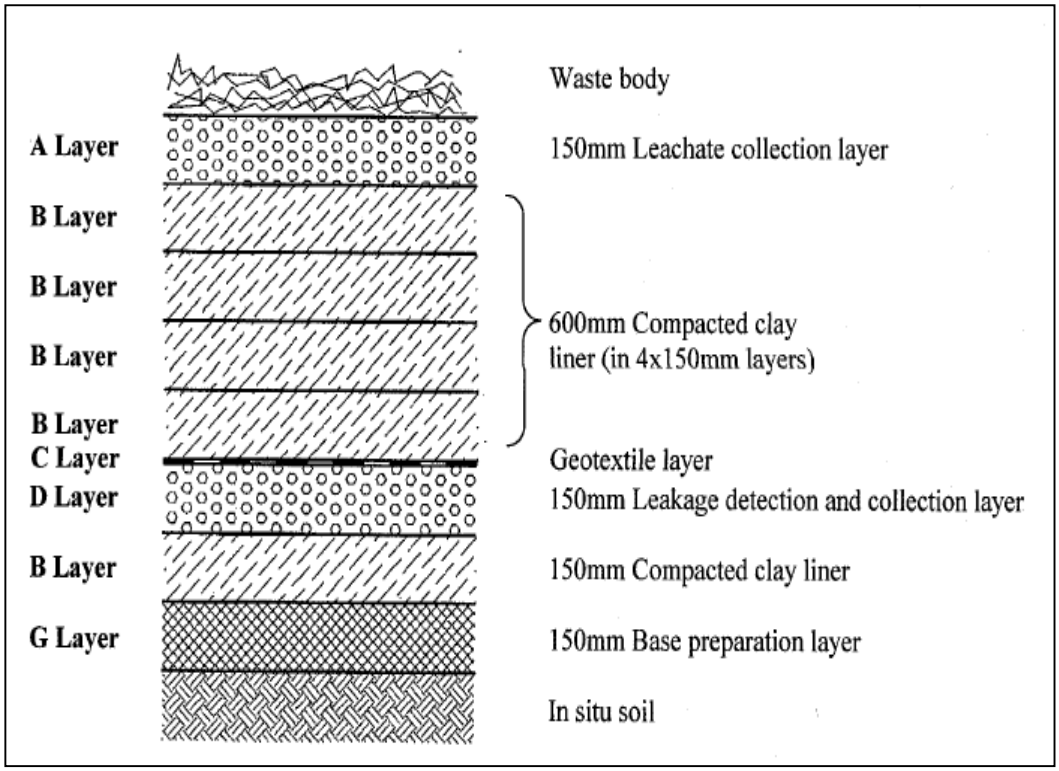

Figure 3-2: GLB+ Liner Design - Minimum Requirements for Waste Disposal by Landfill

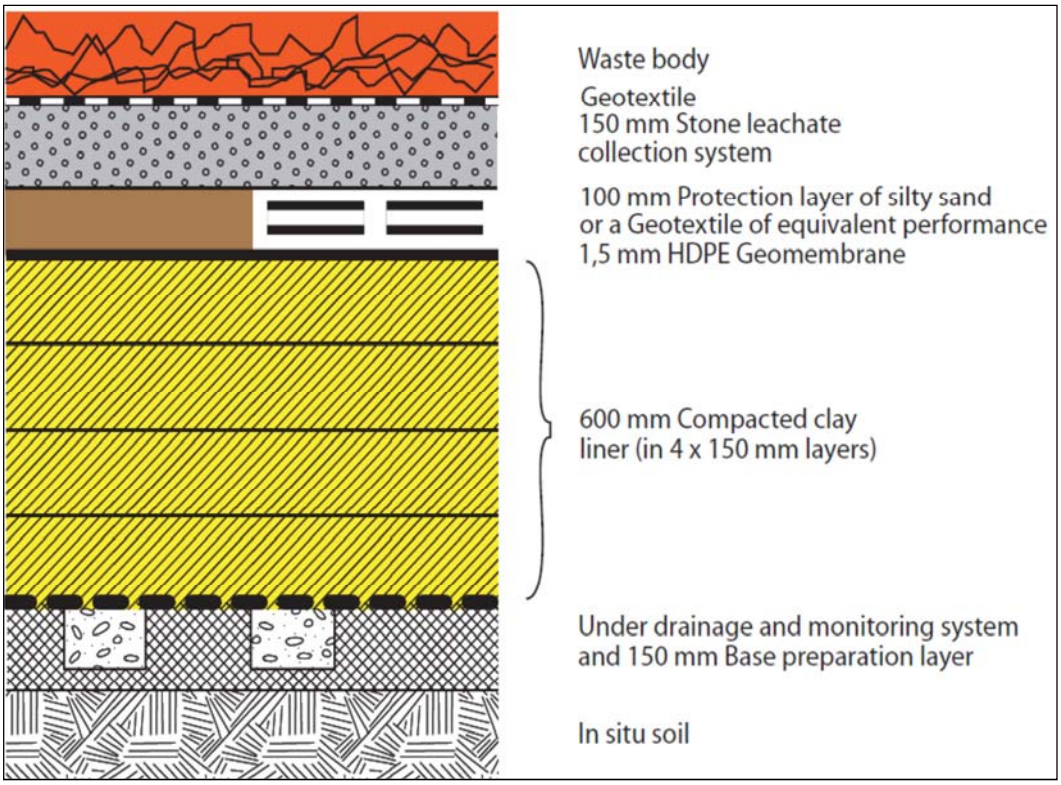

Figure 3-3: Class B Liner Design - Draft National Standard for Disposal of Waste to Landfill

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The *landfill base liner* for all the general waste cells would comprise of the following components, working from the top downwards:

- Leachate stone collection layer 200 mm thick with collection drains at 25 m centres, comprising of 110 mm dia perforated HDPE pipes, set in 1 m wide strips of 19 mm aggregate 300 mm deep;
- Liner protection Geotextile;
- 1.5 mm HDPE Geomembrane liner;
- Geosynthetic clay liner (GCL) or a 600 mm thick compacted clay liner;
- 150 mm base preparation layer (recompaction of in-situ clayey soil) with under-drainage and monitoring system comprising of 75 mm dia perforated HDPE pipes set directly below the leachate collection drains.

The proposed liner for the side slopes will comprise of the following components, working from the top downwards:

- Pozi drain protector geocomposite drain;
- 1.5 mm HDPE Geomembrane liner;
- Geosynthetic clay liner (GCL);
- Base preparation with Megaflo 150 subsurface drains at 25 m centres, installed diagonally down the slopes.

Builder's Rubble Landfill liner (Class D)

In terms of the Draft Standard for Disposal, a Class D landfill liner is required for landfill cells where building and demolition waste not containing hazardous substances is to be disposed. This would apply to the Builder's rubble cells of Area F. The landfill base liner for the builder's rubble cells would therefore comprise of a 150 mm deep base preparation layer of reworked and compacted in-situ clay soil.

Contaminated water pond liner (CLASS B)

The liner design for the contaminated water pond would be similar to the landfill liner, except that the leachate drainage layer would not be required. The liner layers on the base and walls of the pond would therefore comprise of the following components, working from the top downwards:

- 1.5 mm HDPE Geomembrane liner;
- Cuspated HDPE sheet leakage drainage layer (HiDrain 75 or similar);
- 1.5 mm HDPE Geomebrane liner;
- 600 mm thick compacted clay liner in 4 x 150 mm thick layers;

- 150 mm base preparation layer (recompaction of in-situ clayey soil) with under-drainage and monitoring system comprising of 75 mm dia perforated HDPE pipes.

The leakage drainage layer is to be provided with a collection sump fitted with an inclined 300 mm diameter HDPE pipe sleeve for leakage monitoring. Any leakage encountered in the sump is to be pumped back into the pond.

Leachate pond liner (CLASS A)

In view of the fact that the leachate ponds could contain highly contaminated leachate and that there will be a significant hydraulic head on the liner (>300 mm), it is necessary to install a Class A liner in all the leachate ponds and sumps. The liner layers on the base and walls of the pond would therefore comprise of the following components, working from the top downwards:

- 2.0 mm HDPE Geomembrane liner
- Cuspated HDPE sheet leakage drainage layer (HiDrain 75 or similar);
- 1.5 mm HDPE Geomembrane liner;
- Cuspated HDPE sheet leakage detection layer (HiDrain 75 or similar);
- 1.5 mm HDPE Geomebrane liner;
- 600 mm thick compacted clay liner in 4 x 150 mm thick layers;
- 150 mm base preparation layer (recompaction of in-situ clayey soil) with under-drainage and monitoring system comprising of 75 mm dia perforated HDPE pipes.

The leakage drainage layer is to be provided with a collection sump fitted with an inclined 300 mm diameter HDPE pipe sleeve for leakage monitoring. Any leakage encountered in the sump is to be pumped back into the pond. Similarly, the leakage detection layer must also be provided with a sump and monitoring/extraction pipe. Leakage must be monitored against the maximum allowable leakage in terms of the Minimum Requirements for a hazardous lagoon.

Construction Quality Assurance

The main risk to the performance of a geosynthetic liner system is mechanical/physical damage, during and after installation. For this reason, it is imperative that the liner is supplied and installed by a competent and reputable contractor, and in accordance with a strict quality assurance programme. In particular, extreme care must be taken when placing the leachate collection layer over the installed HDPE geomebrane so as not to damage the liner. Strict supervision is required.

The liner design for the Tonk Meter WDF is presented in the Design and Operational Management Plan, Appendix 4.

3.4.4 Cover and Compaction

Typically waste that is disposed of in a cell is compacted throughout the day before being covered at least once a day with approximately 150 mm of subsoil/overburden. Waste compaction ensures optimum use of available airspace as well as a stable surface for vehicle movement when the next 2 m layer of waste is to be deposited. This is undertaken in order to assist in lengthening the life of the WDF and to prevent:

a) waste from being blown off the cell by wind;
b) prevent the breeding of pests (e.g. vectors and rodents); and
c) nuisance odours (malodours) escaping from the cell.

The daily cover also directs contaminated rain water runoff into the contaminated stormwater management system. This assists in preventing rain water from infiltrating the waste body and generating leachate.

The cover and compaction process for the Tonk Meter WDF is presented in the Design and Operational Management Plan, Appendix 4.

3.4.5 Capping

Typically once a cell has reached capacity, it is domed and covered (capped) with layers of clay, geosynthetic clay liners and topsoil before being vegetated. This further prevents water from entering the waste body once it has been closed and rehabilitated. Rain water running off the capped and rehabilitated areas is considered clean (verified through water quality testing) and such runoff may be directed into the receiving environment. Refer to **Figure 3-4** for a typical cover or capping design as per the "*Minimum Requirements for Waste Disposal by Landfill*" (DWAF, 2009).

The capping process for the Tonk Meter WDF is presented in the Design and Operational Management Plan, Appendix 4.

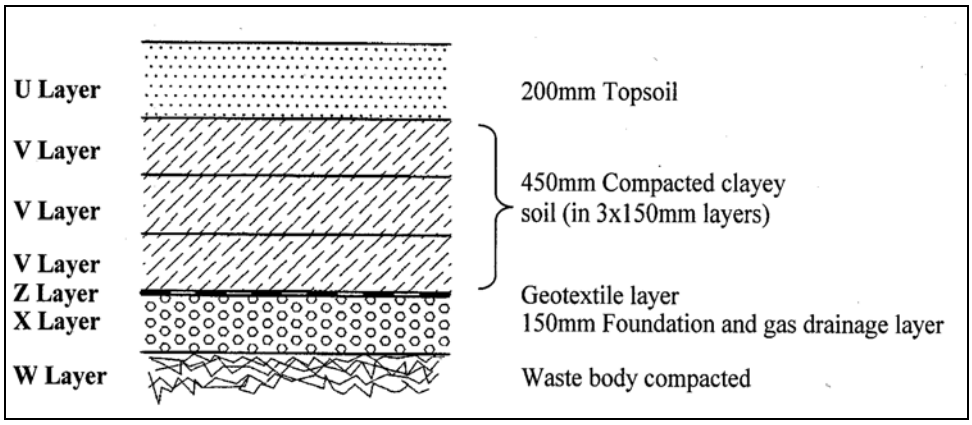

Figure 3-4: Cover or Capping Design - Minimum Requirements for Waste Disposal by Landfill

3.5 LEACHATE AND DRAINAGE MANAGEMENT

The drainage systems normally associated with a landfill address three components:

- Uncontaminated run-off from water that did not come in contact with waste;
- Contaminated run-off water from the operational and un-rehabilitated parts of the waste body where water came in contact with waste; and
- Highly contaminated leachate generated within the waste body of the landfill where water is allowed to seep through the waste.

Uncontaminated water drainage

The first objective is to develop a storm water diversion system around the various quarries and waste handling areas to prevent uncontaminated rain water falling on adjacent areas from entering such parts of the landfill development.

During the initial stages of development, when only a portion of the quarry floors are lined as part of cell development, uncontaminated water that falls within the quarry footprints will be directed to the lowest part of the quarry floors where sumps area will be created. The water will then be pumped out of the quarries into the existing storm water diversion drains. Once the entire quarry floor areas are lined as part of the landfill cell development, all rain water falling within the quarry footprint will be considered contaminated and diverted to the contaminated water system.

Rain water caught in lined cells not acting as contaminated water ponds and where waste was not yet disposed of will also be pumped into the storm water diversion system.

Uncontaminated upslope run-off is to be prevented from entering the landfill facility area by means of a diversion drain and berm along the higher side of each landfill Area.

Contaminated surface run-off

The initial diversion of contaminated water will be from the active cell to an adjacent cell that will act as a contaminated runoff water pond. Should the cells not have sufficient capacity to deal with contaminated water (during high rainfall events), water can be pumped to the cell lined as a contaminated water buffer pond. From there it will be pumped to a contaminated water pond at ground level. The cell serving as the contaminated water buffer pond will be used for waste disposal last at which stage a sump will be installed to deal with the contaminated runoff water.

Clean water from the lined cells not yet in operation will also be pumped into the storm water system.

Once the landfilling extends above ground level, a series of lined surface water drains will gravitate the contaminated water to the contaminated water ponds. Potentially

contaminated run-off from the outer surfaces of the waste body and site roads is to be directed towards an open V-drain along the outer toe of the starter berm. The working surface of the landfill is to slope towards the outer berms so that water drains away from the working face towards the toe drains. As portions of the landfill reach final height and capping has been applied as part of the phased rehabilitation process, run-off from these areas would be considered to be uncontaminated, and the toe drain would then be directed to link up with the clean storm water system.

The contaminated water ponds have been sized to contain the runoff from half of the exposed waste body for the 1 in 50 year recurrence interval 24 hour duration storm, plus a 500 mm freeboard. Each contaminated water pond will have a lined spillway to discharge overflow water during rainfall events exceeding the design requirements.

Leachate Management

The three main components of a leachate management system include the following:

- The liner beneath the landfill to prevent infiltration into the ground water;
- The collection system to transfer leachate to the treatment system; and
- The leachate treatment system to prevent surface and ground water pollution by leachate.

Any leachate emanating from the waste in the landfill would appear in the 200 mm thick granular soil layer overlying the composite liner and would flow downslope beneath the landfill towards the leachate collector drains. These drains would consist of 110 mm diameter perforated HDPE pipes placed within a zone of 19 mm aggregate approximately 1 m wide. These primary leachate collectors would discharge into a 160 mm diameter main leachate gravity drain running along the invert of the landfill cells towards the leachate sumps. Starter berms between cells will have an opening between them in the direction leachate would drain.

In any particular phase of the operation, landfilling with waste will commence in the cell furthest from the relevant leachate sump, and the adjacent lined cell downslope will be used for contaminated runoff water and leachate storage.

The system described above will be specific for each landfill Area and will be developed in detail during the final design. Leachate emanating from the landfill is to be contained in sumps located at the lowest points on the perimeter of the landfill base. Leachate will be pumped from the sump to the leachate pond situated on NGL.

3.6 DESCRIPTION OF TYPICAL MONITORING SYSTEM

Waste disposal facilities are dynamic structures that need continual monitoring to ensure environmental sustainability. Monitoring is undertaken throughout the development of the WDF. Quality assurance and control are forms of monitoring during construction. Monitoring during operation, rehabilitation and closure include gas and water quality monitoring.

Permit conditions for the two operational waste disposal facilities on Areas A and C require the bi-annual monitoring of groundwater quality around the existing operations. From the discussion above, it is likely that monitoring borehole Bh 1/119 has partly collapsed with the result that the water sampled lately from this borehole is not representative of the deeper groundwater sampled earlier. It is further suggested that surface water runoff is also allowed to infiltrate into the monitoring borehole. It is therefore recommended that all the active monitoring boreholes around the two EMM landfill sites in Areas A and C be thoroughly inspected to determine whether they still fulfill the original monitoring requirements. It is also recommended that the monitoring borehole Bh 1/119 be replaced with a new set of closely spaced shallow and deep monitoring boreholes. Consideration should also be given to (i) the replacement of the other old monitoring borehole Bh 1/098 at Area A with a set of shallow and deep boreholes, (ii) the establishment of additional pairs of monitoring boreholes along the western, northern and eastern sides of the Area A landfill site, and (iii) in view of the future establishment of waste disposal sites on Areas D, E and F, that the existing monitoring programme for Areas A and C be revised and in conjunction with the development of a proposed monitoring programme for the to be developed future landfill sites. This will ensure the early detection of any contamination originating for each existing and future site and that appropriate action can be taken to eliminate or contain further contamination.

The monitoring system for the Tonk Meter WDF is presented in the Design and Operational Management Plan, Appendix 4.

3.7 INFRASTRUCTURE FOR WASTE DISPOSAL FACILITY

The associated WDF buildings will be developed in the northern triangular section of Area E (i.e. the portion of land that is not viable for mining). The following presents a list of infrastructure for the proposed GLB+ / Class B WDF:

a) waste disposal cells;

b) site access and security facilities, including an access control building and perimeter fencing;

c) laboratory to test and verify the classification of incoming waste;

d) external access road (from Rietfontein Road) and internal access roads;

e) weighbridges with a weighbridge control room;

f) leachate collection system and leachate ponds to prevent surface and groundwater contamination;

g) pollution control ponds to collect contaminated stormwater runoff and prevent surface and groundwater contamination;

h) stormwater berms around the upstream side of the site to keep clean stormwater off site;

i) leachate treatment facility to treat leachate and contaminated stormwater runoff or disposal to sewer facilities (where approved by the DWA);

j) screening berms;

k) a public drop-off area (for future use);

l) administration and ablution buildings;

m) weather / meteorological station;

n) workshop and stores;

o) fuel storage facilities for the refuelling of plant and equipment; and

p) reticulation electricity, sewage and potable water infrastructure and connections.

3.8 TREATMENT, RE-USE AND RECOVERY OF WASTE

Additional waste management components relating to the treatment, re-use and recovery of waste have been considered within **Section 8** in terms of financial viability, feasibility, benefit and impact on the surrounding environment. These components include the extraction of landfill gas facilities, a Materials Recovery Facility (MRF) and storage facilities for recyclable materials. Refer to **Section 8** for the assessment.

Reclamation of waste directly from the workface will not be allowed.

A low technology composting facility is to be created in a non-active cell with a sufficiently deep bed of deposited waste capped with an interim cover of soil. In this way, any leachate or contaminated runoff from the composting operations will be captured within the landfill drainage systems. Shredded “greens” waste, such as garden clippings, grass cuttings, etc. will be composted. The greens will be placed in a series of long “windrows” and left for anaerobic composting. The compost produced will be used in final rehabilitation of the completed landfill surfaces.

3.9 SECURITY ASPECTS

The site will be fenced and there will be access or entrance control. Security will also be provided on-site 24 hours per day.

3.10 ACCESS

Access to the Tonk Meter Road WDF will be obtained via a new access (one-way stop) along Rietfontein Road, approximately 400m east of the existing EMM Rietfontein WDF access. The proposed entrance to the Tonk Meter Road WDF is located in the north eastern corner of Area E. Refer to Section 8.5 for alternative assessment for site access.

3.11 BUFFER ZONES

In terms of the "*Minimum Requirements for Waste Disposal by Landfill*" (DWAF, 2009), a buffer zone is defined as a zone to protect the public from any adverse effects of a waste disposal operation. In general, no development may take place within a proclaimed buffer zone, although certain light industries or agricultural developments may be allowed at the discretion of the EMM and relevant government departments. The width of the buffer zone is not prescribed by the "*Minimum Requirements for Waste Disposal by Landfill*" for large, general landfills and is instead flagged as an item that needs to be guided by specialist studies.

The defined buffer zone study undertaken for the Gauteng Province, outlines specific desired buffer zones for various activities within the province. In relation to general waste landfills, there are two sets of buffer zones (GDARD, 2003):

- Maximum: 400 m
- Minimum: 200 m

Based on the air quality impacts associated with the Tonk Meter Road WDF sites (i.e. Areas D, E and F) the buffers set by Gauteng Province will be met with a maximum extent of impact from the site noted to be 117.6m northward from Site E, 60m westward from site F and 176.47m south easterly from site D (Watson, 2013; **Appendix 11**).Since its initial development, the Kwa-Thema residential area has encroached closer to the existing EMM Rietfontein WDF resulting in the residences being approximately 30 m from the perimeter fence. An additional width of approximately 20 m covers the distance from the perimeter fence to the edge of the waste disposal site, inclusive of a screen berm.

Stockpiled material (i.e. that will be used as lining, daily cover and capping material during development, operation and closure of the final cell to be developed in approximately 60 years) will be placed in such a manner that it will form a screen berm on the western boundaries of Areas D (i.e. between the waste cells and Kwa-Thema). In the case of Area F, waste disposal cells within the buffer zone will be used for the disposal of inert material like building rubble.

Buffer zone widths will vary around the boundary of the proposed waste disposal areas, depending on the outcome of the studies., refer to Section 7 for the air quality study (Appendix 11). The buffer zone along the Kwa-Thema boundary require a wider area compared to the internal boundaries (e.g. adjacent to the existing EMM Rietfontein WDF). Wider buffer zones will result in a decrease in the available airspace. Refer to Section 8 for the buffer zones.

4. LEGAL FRAMEWORK

4.1 INTRODUCTION

The dominant legislation of reference to the project and the Draft EIA Report is by default that of the National Environmental Management [NEM] suite of acts. This is due to the fact that the aim of the Draft EIA Report is to provide sufficient relevant information to GDARD, such that they are able to reach an informed decision as to whether an Environmental Authorisation (EA) should be granted with an accompanying waste permit for the proposed Tonk Meter Road WDF.

4.2 GENERAL OVERVIEW OF RELEVANT LEGISLATION

The proposed Tonk Meter Road WDF and associated infrastructure will be controlled by the following list of legislation (**Table 4-1).** A number of the specific pieces of legislation are considered in greater detail in the sections to follow.

Table 4-1: Summary of Applicable Legislation

Legislation	Sections	Relates to
Constitution of South Africa (Act No. 108 of 1996)	Chapter 2	Bill of Rights
	Section 24	Environmental rights
	Section 25	Rights in property
	Section 32	Administrative justice
	Section 33	Access to information
National Environmental Management Act (No 107 of 1998) as amended	Section 2	The national environmental management principles is in Chapter 1 of the Act essentially guide the interpretation, administration and implementation of the Act and any other law concerned with the protection of the environment. An overarching emphasis of the principle that development must be environmentally, socially and economically sustainable. Applies throughout the Republic to the actions of all organs of state that may significantly affect the environment.
	Section 24	Chapter 5 of the Act deals with integrated environmental management, including environmental impact assessments. Section 24 requires the applicant of an environmental authorisation to consider, investigate, assess and report the consequences for or impacts on the environment of the listed activity or specified activity to the competent authority.
	Section 28	Section 28 imposes a duty of care on every person who causes, has caused, or may cause significant pollution or environmental degradation to take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring. The developer has a general duty to care for the environment and to institute such measures as may be needed to demonstrate such care. The duty of care has been amended to include significant pollution or degradation that occurred before the commencement of the NEMA that arises or is likely to arise at a different time from the actual activity that caused the contamination or that arises through an act or activity of a person that results in a change to pre-existing contamination.
	Section 30	Control of emergency incidents. Responsible person's duties relating to reporting and remediation actions regarding

Legislation	Sections	Relates to
		emergency incidents. A criminal sanction may be imposed on the responsible person for failure to comply with the reporting requirements and obligations to address any emergency incidents.
Environment Conservation Act (Act No. 73 of 1989) and related regulations	The Act has been substantially repealed by NEMA. However, there are certain regulations under the Act which are still in operation such as the National Noise regulations and the regulations on Medical Waste.	
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)	Sections 56 and 57	These sections deal with the listing of species that are threatened or in need of national protection and restricted activities involving listed threatened or protected species.
	Sections 65-69	These sections deal with restricted activities involving alien species; restricted activities involving certain alien species totally prohibited; and duty of care relating to alien species.
	Sections 71 and 73	These sections deal with restricted activities involving listed invasive species and duty of care relating to listed invasive species.
Conservation of Agricultural Resources Act (No 43 of 1983) and regulations	Section 5, 6	Implementation of control measures for alien and invasive plant species, especially in urban areas.
National Water Act (No 36 of 1998) and regulations	Section 19	Prevention and remedying the effects of pollution.
	Section 20	Control of emergency incidents.
	Section 21	Use of water and licensing.
National Heritage Resources Act (No 25 of 1999)	Section 35	No person may, without a permit issued by the responsible heritage resources authority destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or paleontological site.
	Section 36	No person may, without a permit issued by the South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority. "Grave" is widely defined in the Act to include the contents, headstone or other marker of such a place, and any other structure on or associated with such place.
	Section 38	This section provides for Heritage Impact Assessments (HIA), for the construction of any development footprint in excess of 5,000m^2.
National Environmental Management: Air Quality Act (No 39 of 2004)	Section 32	Control of dust
	Section 34	Control of noise
	Section 35	Control of offensive odours
	Chapter 5	Licensing of listed activities
	Schedule 2	Ambient air quality standards
National Environmental Management: Waste Act (No. 59 of 2008)	Section 2	Highlights the objectives and principles of the Act for protecting health, wellbeing and the environment by providing reasonable measures.
	Section 20	No person may commence, undertake or conduct a waste management activity, except in accordance with: • the requirements or standards prescribed by said Act and regulations; and • a waste management licence issued in respect of that activity, if a licence is required.
	Section 26	Prohibition of unauthorised disposal of waste.
	Section 27	Prevention of littering.
Occupational Health and Safety Act (No 85 of 1993) and regulations	General Administration Regulations GN R929 of June	Material Safety Data Sheets must be made available at the request of any interested or affected party.

Legislation	Sections	Relates to
	2003	
	Section 8	General duties of employers to their employees.
	Section 9	General duties of employers and self employed persons to persons other than their employees.
Fencing Act (No 31 of 1963)	Section 17	Any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to the protection of flora.
Hazardous Substances Act (No 15 of 1973) and regulations	Provides for the definition, classification, use, operation, modification, disposal or dumping of hazardous substances.	
Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (No 36 of 1947) and regulations	Sections 3 to 10	Control of the use of registered pesticides, herbicides (weed killers) and fertilisers. Special precautions must be taken to prevent workers from being exposed to chemical substances in this regard.
National Road Traffic Act (No 93 of 1996) and regulations	Section 54	Transportation of dangerous goods by road, loading and offloading.
National Veld and Forest Fire Act (No 101 of 1998)	Chapter 2	Promotes and regulates the formation of fire protection associations which aim to manage and coordinate fire protection and fire services in an area.
	Chapter 4, 5	Organizations are required to make and maintain firebreaks and fire fighting equipment and personnel should a risk exist that a fire may start or spread from the premises.
National Forest Act (No 84 of 1998)	Section 7	No person may cut, disturb, damage or destroy any protected tree except if a permit has issued.
Water Services Act (No 108 of 1997) and regulations	Section 7	Effluent acceptance from Local Authority.
National Building Regulations and Building Standards Act (No 103 of 1977)	Section 4	Local Authority approval of plans to erect buildings.
Minerals and Petroleum Resources Development Act and regulations (Mo 28 of 2002)	Section 38, 43	Provisions for approved EMPR, closure objectives and closure plans for a mining area.
Gauteng Provincial Notice No. 5479 of 1999: Gauteng Noise Control Regulations	Provisions for a minimum standard regarding noise regulation within Gauteng. Noise pollution management.	
By-Laws	EMM Public Health By-laws, 2009 EMM Waste Water By-laws, 2001 EMM Solid Waste By-laws, 2001 EMM Electricity By-laws, 2002 EMM Water Supply By-laws, 2001	

4.3 NATIONAL ENVIRONMENTAL MANAGEMENT ACT

4.3.1 Overview

The National Environmental Management Act (No. 107 of 1998) (NEMA), provides a framework for cooperative environmental governance between the various spheres of government, by establishing principles for decision-making on matters relating to the environment. Furthermore, NEMA promotes integrated management to ensure sustainable resource utilisation and development and requires that the DEA be the lead agent in ensuring effective custodianship of the environment. It also provides that sensitive,

vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where subjected to significant human resource usage and development pressure. The NEMA principles, contained in Section 2, clearly emphasize the need to protect threatened ecosystems and are binding on all organs of state including the local authorities. Furthermore, the principles essentially guide the interpretation, administration and implementation of the Act and any other law concerned with the protection of the environment. An overarching emphasis is the principle that development must be environmentally, socially and economically sustainable.

Section 23 of NEMA further determines that Integrated Environmental Management should be employed when any policies, programmes, plans or projects are drawn up to minimise the impact on the environment. The duty of officials to prevent pollution and ecological degradation, to promote conservation and secure ecologically sustainable development and use of natural resources, originates from the Constitution and NEMA.

For a range of listed activities and depending on the scope of the activity, the responsibility to ensure compliance with NEMA and its suite of linked Acts has been devolved to the nine provincial departments. In this case, the devolved responsibility is to the GDARD.

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an environmental authorisation, the result being that NEMA began governing the EIA process with the promulgation of the EIA Regulations in April 2006 (Government Gazette No. 28753 of 21 April 2006). These regulations have subsequently been replaced by the NEMA EIA 2010 Regulations listed in Government Gazette No. 33306 of 18 June 2010 (GN543, 544, 545 and 546 of 18 June 2010, as amended). The NEMA EIA 2010 Regulations are contained in four Government Notices and came into effect on 2 August 2010, as amended. All applications listed in the abovementioned regulations shall be subject to an environmental impact assessment process (i.e. Basic Assessment, or, Scoping and Environmental Impact Assessment Reports) and will require Environmental Authorisation from the relevant competent authority. Section 24F of the NEMA prohibits the undertaking of identified listed activities except by virtue of being undertaken under the control of an environmental authorisation from the relevant competent authority.

On submission of an application the competent authority must consider all the relevant information contained in the Scoping Report and the EIA Report (including any pollution, environmental impacts or environmental degradation likely to be caused if the application is approved or refused) and thereafter make a decision of whether or not to grant an environmental authorisation to the proposed Tonk Meter Road WDF. Note that an EA may be positive or negative and may grant approval for the entire requested proposal, or a part thereof.

Certain minimum conditions are attached to environmental authorisations, as required by section 24E of NEMA, however it is at the competent authorities discretion to include additional project specific conditions. In terms of section 24F of NEMA it is an offence not to comply with any condition applicable to an environmental authorisation issued for a listed activity.

Typical conditions that may be applied by the competent authority include but are not limited to:

- Measures to prevent, manage and mitigate environmental impacts to acceptable levels;
- Prevention of pollution of water bodies and groundwater;
- A rehabilitation programme for disturbed natural and/or heritage areas;
- Appointment of an independent Environmental Control Officer (ECO) to oversee the construction phase and to ensure that the development phase is conducted in an environmentally responsible manner;
- Conservation management and visitor management plans; and
- Requirements of other authorities, such as the Department of Water Affairs (DWA), the Department of Mineral Resources (DMR), the South African Heritage Resources Agency (SAHRA), and/or relevant provincial authorities.

4.3.2 Activities Applicable to NEMA: General EIA Regulations (2010)

The proposed WDF includes activities that may have a detrimental effect on the environment as listed in GNR 544, GNR 545 and GNR 546 (of 18 June 2010). All applications listed in these regulations require an Environmental Authorisation.

The relevant general EIA activities are listed in **Table 4-2**, as per the application submitted to GDARD in November 2011.

Table 4-2: Listed Activities in terms of NEMA – EIA Regulations, 2010

Number and Date of Relevant Notice	Activity Number	Description of Activity
GNR 544, 18 June 2010 (Listing Notice 1, Basic Assessment)	13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres. *The construction of fuel storage facilities for the refueling of plant and equipment.*
GNR 545, 18 June 2010 (Listing Notice 2, Scoping & EIA)	5	The construction of facilities or infrastructure for any process or activity which requires a permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent and which is not identified in Notice No. 544 of 2010 or included in the list of waste management activities published in terms of Section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in

Number and Date of Relevant Notice	Activity Number	Description of Activity
		which case that Act will apply. *The construction of pollution control ponds, leachate collection system and treatment facilities which may require a Water Use License from the Department of Water Affairs. Please refer to **Section 4.6** which considers the need for a Water Use Licence and **Section 4.5** regarding the requirements for an Air Quality Permit.*
	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more; except where such physical alteration takes place for: (i) linear development activities; or (ii) agriculture or afforestation where activity 16 in this Schedule will apply. *The physical alteration of undeveloped land for a waste disposal facility (commercial or institutional use) where the total area to be transformed is 20 hectares or more. The combined area for the proposed site is 95.2 ha in size and constitutes surface mined areas, future proposed mining areas (86.6 ha), and undeveloped areas (8.6 ha) for the WDF infrastructure.*
GNR 546, 18 June 2010 (Listing Notice 3, Basic Assessment – Geographical Areas)	4	The construction of a road wider than 4 metres with a reserve less than 13,5 metres. (b) In Gauteng: … (iii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; … (v) sites identified as irreplaceable or important in the Gauteng Conservation Plan. *The construction of access roads wider than 4 metres with a road reserve less than 13,5 metres within sensitive areas as identified in the Ekurhuleni Metropolitan Municipality's EMF and sites identified as important in the Gauteng Conservation Plan.*

4.4 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT

4.4.1 Overview

The National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA) regulates waste management in order to protect human health and the environment, by providing reasonable measures for the prevention of pollution and ecological degradation, and for securing ecologically sustainable development. It also provides for national norms and standards for regulating the management of waste by all spheres of government, providing for specific waste management measures for licensing and the control of waste management and remediation activities associated with contaminated land. This legislation provides for compliance and enforcement of the above requirements.

4.4.2 Draft National Standards for Disposal of Waste to Landfill

The DEA is in the process of establishing Regulations and Standards to regulate various aspects of waste management, including the design and classification of landfills. In addition to the existing Minimum Requirements, the following draft documents will be applicable once promulgated:

g) Draft National Standard for Disposal of Waste to Landfill (GN 432 of 2011).
h) Draft Standard for Assessment of Waste for Landfill (GN 433 of 2011).
i) Draft Waste Classification and Management Regulations (GN 435 of 2011).
j) Draft Standard for Assessment of Waste for Landfill Disposal (GNR 613 of 2012).
k) Draft Waste classification and Management Regulations (GNR 614 of 2012).
l) Draft Standard for Disposal of Waste to Landfill (GNR 615 of 2012).

As a result of the above, the design and classification of the proposed new WDF will take the existing Minimum Requirements as well as the new Regulations and Standards (future) into account. Until the new standards and regulations are legislated, the exact requirements can only be approximated. However, the design of the landfill as proposed complies with the latest revision of the draft regulations as well as recommendations from the authorities based on those proposed regulations, and will be amended during final design of the WDF to meet the required standards once legislated.

4.4.3 Activities Applicable to NEM:WA

The proposed WDF includes activities listed in Category A and B of Government Notice (GN) 718 of 3 July 2009, published in terms of Section 19(1) of the NEM:WA. These activities relate to waste management activities that may have a detrimental effect on the environment and for which authorisation is required in the form of a Waste Management Licence.

The relevant waste management activities are listed in **Table 4-3**, as per the application submitted to GDARD in November 2011.

Table 4-3: Listed Activities in terms of NEM:WA

Number and Date of Relevant Notice	Activity Number	Description of Activity
Category A **GN 718, 3 July 2009**	1	The storage, including the temporary storage, of general waste at a facility that has the capacity to store in excess of 100m^3 of general waste at any one time, excluding the storage of waste in lagoons.
	5	The sorting, shredding, grinding or bailing of general waste at a facility that has the capacity to process in excess of one ton of general waste per day.
	7	The recycling or re-use of general waste of more than 10 tons per month.
	8	The recovery of waste including the refining, utilisation or co-processing of the waste at a facility that has the capacity to process in excess of three tons of general waste or less

Number and Date of Relevant Notice	Activity Number	Description of Activity
		than 500kg of hazardous waste per day, excluding recovery that takes place as an integral part of an internal manufacturing process within the same premises.
	9	The biological, physical or physio-chemical treatment of general waste at a facility that has the capacity to process in excess of 10 tons of general waste per day.
	10	The processing of waste at biogas installations with a capacity to process in excess of five tons per day of bio-degradable waste.
	11	The treatment of effluent, wastewater or sewage with an annual throughput capacity of more than 2000 cubic metres but less than 15000 cubic metres.
	13	The extraction, recovery or flaring of landfill gas.
	18	The construction of facilities for activities listed in Category A of this Schedule (not in isolation to associated activity).
Category B GN 718, 3 July 2009	10	The disposal of general waste to land covering an area in excess of 200m^2.
	11	The construction of facilities for activities listed in Category B of this Schedule (not in isolation to associated activity).

Note that the process within which the new waste specific legislation is being generated is controlled in terms of the National Waste Management Strategy (NWMS). The NWMS forms a framework within which the various pieces of legislation are being rolled out.

4.5 NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT

The National Environmental Management: Air Quality Act, 2004 (Act No 39 of 2004) (NEM:AQA) regulates air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development. The NEM:AQA requires the development of national norms and standards in order to regulate air quality monitoring, management and control by all spheres of government as well as for specific air quality measures.

4.5.1 Activities Applicable to NEM:AQA

The proposed landfill and associated infrastructure, as per the application submitted to GDARD in November 2011, are believed to trigger the following listed air quality specific scheduled activities (**Table 4-4**).

Table 4-4: Summary of air quality specific scheduled activities triggered

Number and Date of Relevant Notice	Activity Number	Description of Activity
GNR 248 of 31 March 2010 (i.t.o. Section 21(3)(c) of NEM:AQA)	(4) Cat. 1: Combustion Installations: Subcat. 1.4	**Gas combustion installations:** Gas combustion (including gas turbines burning natural gas) used primarily for steam raising or electricity generation, except reciprocating engines ~ all installations with design capacity equal to or greater than 50MW heat input per

Number and Date of Relevant Notice	Activity Number	Description of Activity
		unit, based on the lower calorific value of the fuel used.
	Note that the above category is only relevant should the amount of landfill gas being flared from the landfill reach a sufficient quantity to allow for the use of a gas turbine to generate electricity from the site for the brickmaking works. It is noted that a general rule of thumb is that a minimum of one million tonnes of waste is required within a site before generation of electricity from the site becomes a viable alternative. This is of course related to the balance of gases within the landfill gas, especially the percentage of methane generated. The intention is to thus monitor the gas generation levels from the site over the first few years of operation and at the same time to continue investigating the alternatives for use of landfill gas, before requesting the best-practice alternative at that point as an amendment to the overall EA for the landfill site.	

4.6 NATIONAL WATER ACT

4.6.1 Overview

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) provides a framework to protect, develop, conserve and manage the nation's water resources and aims to regulate the use of water and activities, which may impact on water resources through the categorisation of 'listed water uses' encompassing water abstraction, flow attenuation within catchments, construction within the floodlines of a river as well as the potential contamination of water resources.

The NWA provides for tiered regulatory control over 11 water uses, as identified in Section 21 of the NWA. A person who wishes to use or who uses water in a manner that is not covered under Schedule 1, General Authorisations, or in a manner that is not regarded or declared as an existing lawful use, may only use that water under the authority of a Water Use Licence. This list was amended from that originally gazetted to be less inclusive, with four (4) of the general authorisations lapsing on the 1 April 2011. The list in Table 4-5 thus considers only the remaining seven (7) general authorisations currently allowed to be considered.

Table 4-5: Potentially Relevant Listed Water Uses in terms of NWA

Activity Number	Description of Activity
Section 21: b	Storing water (stormwater runoff, pollution control dams).
Section 21: g	Disposing of waste in a manner which may detrimentally impact on a water resource.
Section 21: 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.

The NWA also provides for pollution prevention measures, with particular emphasis on water resource pollution. In accordance, the licensee shall ensure that activities impacting upon water resources and effluent releases are monitored for compliance with the applicable regulations. Emergency incidents involving water resources are included in the Act, requiring the polluter to remediate and mitigate the impacts of such an emergency incident.

4.6.2 Water Use Licence (WUL) for the Landfill

As part of the review process of the Draft EIA Report and associated documents, the documentation will be submitted to the DWA for review. As per an internal agreement and process in place, the DWA will provide information to the environmental competent authority, i.e. GDARD, for inclusion into the environmental authorisation that will lead to a landfill-specific WUL forming and integrated part of the EA. As such a separate formal WUL application process for the landfill is not deemed a legal requirement, so long as all required information is supplied in the EIA documentation to the DWA for their review.

4.7 NATIONAL HERITAGE RESOURCES ACT

The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) is the primary statute regulating the protection and management of South Africa's heritage resources.. The NHRA aims to promote good management of the national estate, and ensures community participation in the protection of national heritage resources and involves all three levels of government (national, provincial and local) in the management of the country's national heritage. The South African Heritage Resources Agency (SAHRA) is the enforcing authority for the NHRA. A variety of formal protection measures are provided for in the NHRA, ranging from protection of national and provincial heritage sites, protected areas, provisional protection, inclusion on the heritage register of a province, heritage areas and heritage objects, the legal protection of paleontological and archaeological sites (including rock art) and meteorites, burial grounds and graves, and the protection of structures older than 60 years and public monuments and memorials.

Section 38 of the NHRA refers to the activities that require correspondence with the SAHRA and a Heritage Impact Assessment (HIA). The following activities listed in **Table 4-6** apply to the proposed Tonk Meter Road WDF. The results of the HIA are presented in **Section 7.5** of the document.

Table 4-6: Listed Activities in terms of NHRA

Activity Number	Description of Activity
Section 38: a	The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length.
Section 38: c	Any development or other activity which will change the character of a site (i) exceeding 5,000m^2 in extent.
Section 38: d	The re-zoning of a site exceeding 10 000 m^2 in extent.

Activity Number	Description of Activity
Section 38: e	Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.

4.8 MINERALS AND PETROLEUM RESOURCES DEVELOPMENT ACT

The Mineral and Petroleum Resources Development Act (Act 28 of 2002) (M&PRDA), as amended, provides for the ecologically sustainable development of mineral resources by integrating social, economic and environmental factors into the planning and implementation of mining projects. Section 38 provides for environmental authorisations and approved EMPRs for mining operations.

The M&PRDA Regulations (GNR 527 of 23 April 2004) describe the requirements for EMPRs, including environmental objectives and goals for mining operations and closure. Closure objectives relate to a broad future land use objective for the site. As a result, the rehabilitation and closure requirements for the related quarry EMPRs will be amended in order to incorporate waste disposal facilities as an end land use.

4.9 HAZARDOUS SUBSTANCES ACT

The Hazardous Substances Act (Act No 15 of 1973) provides for the control of substances which may cause injury, ill-health or death to humans by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature or the generation of pressure, thereby, in certain circumstances, and for the control of certain electronic products.

The Act divides such substances or products into groups in relation to the degree of danger and also to prohibit and control the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of the substances and products indicated in this Act. The Act acknowledges that these substances will lose their economic value after use, and would therefore require disposal. Section 29 of this Act therefore makes provision for the promulgation of regulations "authorising, regulating, controlling, restricting or prohibiting the storage, transportation, or dumping and other disposal" of any grouped hazardous substances or class of grouped hazardous substances.

Note that although hazardous substances will not be landfilled at the proposed Tonk Meter Road WDF, the potential for various hazardous substances (e.g. vehicle fuel) will be present and thus the controls of the Hazardous Substances Act must be complied with.

4.10 MAJOR HAZARD INSTALLATION I.T.O. OCCUPATIONAL HEALTH AND SAFETY (OHS) ACT

The nature of the proposed development is such that the Major Hazard Installation Regulations [MHI] (GNR No. 692 of 2001, **Table 4-7**), in terms of the OHS (Act No. 85 of 1993), may be triggered. All requirements in terms of the OHS will be adhered to and integrated into the final detailed design process of the landfill once the environmental authorisation is granted and the detailed design developed in consultation with the DWA.

Table 4-7: Major Hazard Installation regulations (GNR 692 of 2001)

Legislation	Activity Number	Description of Activity
GNR 692 of 2001 i.t.o. Occupational Health & Safety Act (Act No 85 of 1993)	2(1)	Subject to the provisions of sub-regulation (3) these regulations shall apply to employers, self-employed persons and users, who have on their premises, either permanently or temporarily, a major hazard installation or a quantity of a substance which may pose a risk that could affect the health and safety of employees and the public.

4.11 GUIDELINE DOCUMENTS

The following guideline documents have been considered during the process:

a) Companion to the National Environmental Management Act Environmental Impact Assessment Regulations of 2010, Integrated Environmental Management Guideline Series 5, 2010, Department of Environmental Affairs, Pretoria.

b) Public Participation in the EIA Process, Integrated Environmental Management Guideline Series 7, 2010, Department of Environmental Affairs, Pretoria.

c) Guideline 5: Assessment of Alternatives and Impacts in support of the Environmental Impact Assessment Regulations 2006, Integrated Environmental Management Guideline Series, 2006, Department of Environmental Affairs and Tourism, Pretoria.

d) Guideline 12: Environmental Management Plans, Integrated Environmental Management Guideline Series, 2004, Department of Environmental Affairs and Tourism, Pretoria.

e) Minimum Requirements for Waste Disposal by Landfill, Second Edition, 1998, Department of Water Affairs, Pretoria.

f) Draft National Standard for Disposal of Waste to Landfill (GN 432), 2011, Department of Environmental Affairs, Pretoria.

g) Draft Standard for Assessment of Waste for Landfill (GN 433), 2011, Department of Environmental Affairs, Pretoria.

h) Draft Waste Classification and Management Regulations (GN 435), 2011, Department of Environmental Affairs, Pretoria.

i) Appropriate Development of Infrastructure on Dolomite, 2004, Department of Public Works, Pretoria.

j) Environmental Management Framework for Ekurhuleni, 2007. Ekurhuleni Metropolitan Municipality.

k) Gauteng Conservation Plan, 2011. Johannesburg: Gauteng Department of Agriculture and Rural Development.

l) SANS 1929: Ambient air quality – limits for common pollutants.

m) SANS 10103: The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication.

n) SANS 10128: Bunding of fuel storage tanks.

o) SANS 10228: The identification and classification of dangerous goods.

5. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

5.1 STUDY APPROACH

The EIA process is a planning and decision making tool that identifies the potential negative and positive impacts of a proposed development. It also recommends ways to enhance the positive impacts and to minimize the negative ones. The environmental studies that will be undertaken will address the impacts associated with the proposed development, and provide an assessment in terms of the biophysical, social, cultural-historic and economic environments. This will assist both GDARD and Verref in making decisions regarding potential environmental authorisation and implementation of the proposed Tonk Meter Road WDF, respectively.

The EIA has been undertaken in compliance with the NEMA, specifically Government Regulations Notice (GNR) 543, 544, 545 and 546 of 18 June 2010 (as amended), and the NEM:WA. Cognisance will also be taken of related guideline documents and other relevant legislation.

5.2 SCOPING PHASE

The aim of the Scoping Phase of the project was to identify and define the issues that needed to be addressed in the EIA Phase. An environmental scoping site visit was undertaken on 15 November 20112012 by the BKS project team.

During the PPP, I&APs were identified and given the opportunity to list issues and concerns relating to the proposed Tonk Meter Road WDF and study area. A first round of public participation was undertaken to identify I&APs, notify them of the proposed development and to afford them the opportunity to identify issues and concerns that should be addressed in the EIA study.

Input from the technical team, the authorities, specialists and I&APs were considered and integrated into the Scoping Report. The Draft Scoping Report (DSR) was made available for public comment over a period of 60 days, from 2 April 2012 – 5 June 2012. The objective of the public comment period was for I&APs to raise issues about the information presented in the DSR and for them to raise any other issues related to the proposed Tonk Meter Road WDF. Refer to **Appendix 2** for the PPP Report which includes the issues and response register as well as proof of all interactions with the I&APs.

The Final Scoping Report (FSR) incorporated all comments that were received during the public review period and submitted to GDARD on 14 June 2012 for review and acceptance/rejection. The FSR including the Plan of Study for the EIA was approved by GDARD on 10 August 2012.

5.3 ENVIRONMENTAL IMPACT ASSESSMENT PHASE

The EIA for the proposed Tonk Meter Road WDF was conducted in accordance with the process as described in Section 26 to 35 of the EIA Regulations (2010) as promulgated in terms of section 24(5) of the NEMA. BKS is responsible for the process and collation of information from the specialists reports including the issues raised from the PPP.

From the various sources (i.e. site visits, PP, and the expertise of the EAP and the technical team) a range of issues (i.e. biophysical, social and cultural) were identified and assessed during the EIA phase (refer to **Section 10**). Included in the EIA process was the identification of mitigation measures. How these mitigation measures are implemented is included in the draft Site-Specific EMPr (**Appendix 3**), compiled specifically for the design, construction, operation and maintenance, and eventual decommissioning of the proposed Tonk Meter Road WDF. The EMPr is supported by the Operational Management Plan for the landfill site (**Appendix 4**).

The objective of the PPP in the EIA phase of the project is to present the findings of the investigations to the stakeholders and to provide them with an opportunity to comment on these. In order to achieve this, the Draft EIA Report will be available for review by registered I&APs for a period of 60 days, from 9 April – 10 June 2013. Refer to the PPP Report, **Appendix 2,** for additional information on the PPP.

On closure of the public review period, comments and issues raised will be noted and the EIA Report and EMPr will be updated, finalised and submitted to the GDARD for review and issuing of the EA (whether positive or negative).

5.4 DECISION MAKING PHASE

On conclusion of the public review period, the EIA Report and EMPr will be finalised and submitted to GDARD, the competent authority.

The report will be reviewed by officials from the competent authority and an EA will be drafted with possible specific conditions that must be adhered to by the Applicant during the design, construction, operation and maintenance and eventual decommissioning. As part of the review process of the EIA Report and associated documents, the documentation will be submitted to the DWA for review in evaluating the risk to water pollution and technical review of the designs. The DWA will provide information to the environmental competent authority, i.e. GDARD, for inclusion into the EA that will lead to a landfill-specific WUL forming and integrated part of the EA.

Note that the EA may grant the entire proposal as submitted (i.e. positive EA), or only part thereof (i.e. positive EA for only some of the listed activities specified, part of the site, etc.) with specific conditions imposed thereon, or may decide that the risk is too high and reject

the proposal (i.e. negative EA). Note that if additional information is required, which will be requested, an EA would not be granted under that situation at that time.

Once the draft authorisation is approved at the various required levels within the GDARD, a decision in the form of an EA is sent to the Applicant.

5.5 POST-AUTHORISATION PHASE

Once an EA is granted, the EAP must notify all I&APs of the contents of that EA, and notify the I&APs of the fact that an appeal may be lodged – that is, should I&APs or the Applicant disagree on the grounds of the decision taken they may enter into an appeal process.

If no appeal(s) are lodged, proof of compliance with post-authorisation conditions (as relevant) would then be submitted to the GDARD along with a request to commence construction (within the validity periods included in the EA). Once the GDARD has approved such submissions, final detailed planning and then construction (i.e. from pegging-out of the first cell and infrastructure on the site) would then be allowed to proceed. Detailed designs will also be submitted to the DWA for approval of each phase of development over the life of the Tonk Meter Road WDF. The DWA will then be able to ensure that all future cell developments comply with the latest standards set for landfill cell development.

If an appeal is lodged, a separate appeal process to the EIA process currently being carried out would be initiated.

5.6 PUBLIC PARTICIPATION PROCESS

The Public Participation Process (PPP) is an integral part of the environmental investigations that were undertaken for the proposed landfill.

The PPP runs both during and after the EIA process – with only the focus shifting over the lifespan of the project. That is, the relationships between the Applicant and the I&APs continue once the EA has been granted during the implementation phase of the project, and then extending into the operational phase. This typically takes the form of a Monitoring Committee comprising of representatives of GDARD, DWA, the owner, the operator and representatives of those affected by the Tonk Meter Road WDF. On-going engagement is an important tool in best practice landfill management.

The PPP is presented in a detailed stand-alone document in **Appendix 2**, and includes the Issues and Response Report, as well as proof of all interactions with the I&APs. Please refer thereto for more information.

It should be noted that the PPP is in compliance with the relevant EIA Regulations, 2010, and the related guideline documents.

5.7 RELATED AUTHORISATIONS

Once an EA is granted associated processes and permits such as the rezoning process may be completed. The zoning for site, i.e. Remainder Portion of 81, is "Undetermined with an Annexure 1" and this allows for waste disposal. Although separate and under different legislation such processes are linked to obtaining a positive EA.

The separate mining-related amendment application process will be completed and all planning related thereto will be based on information generated in the EIA process at hand, plus additional information as required by that process.

Refer to **Section 4.5** regarding the air quality permit and **Section 4.6** regarding the water use licence.

5.8 ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

The following assumptions, uncertainties and gaps in knowledge were identified for this process:

5.8.1 EIA Process

The EIA process is multi-disciplinary, which was informed by the project team (**Section 2**). It is thus necessary to presume that the information as provided to the project team to date by external sources is accurate, appropriate and correct.

Data shown in the maps was supplied by various sources and was used after it was reviewed and verified where considered necessary. Verification was, however, restricted to available sources of information only.

5.8.2 Public Participation Process

Every effort was made to contact all stakeholders and adjacent landowners within the study area. Written notification was provided to the landowner, occupiers of the land, adjacent landowners, the ward councillors and the EMM. Information presented by the stakeholders is presumed to be accurate and presented timeously with respect to the process at hand.

5.8.3 Air Quality

The following assumptions were made as part of the assessment:

- Silt loading and particle size distribution were not provided therefore use was made of the typical particle size distribution observed from previous studies undertaken in the area.
- It is important to note that the GasSim Model makes provision for the input of site-specific gaseous concentrations within the waste (i.e. subsurface concentrations) despite comprising default values based on information from UK landfills. However,

due to the absence of site specific data, the default values were used during the assessment.

- If the waste stream composition used at the landfill are drastically different to those proposed this may result in an over or under estimation of impacts for certain pollutants.
- Routine emissions were estimated and modelled. Atmospheric releases due to upset or abnormal conditions were not accounted for.
- The impact of vehicle emissions on site and due to releases from Tonk Meter Road were not included in the assessment as not enough site specific information was available to enable quantification.
- Ambient air quality monitoring data was not available to assess background pollutant concentrations in the area.
- As there are no South African Standards available for the assessment of commonly emitted pollutants associated with landfills, internationally recognised guidelines and limits were used in this assessment to assess risk.

5.8.4 Geological, Geotechnical and Geohydrological Investigations

The extent of the boreholes drilled and test pits excavated was chosen so as to obtain an overall understanding of the nature of the site (i.e. geology, soils, and groundwater) and the potential constraints that may be encountered across the site. Irregularities may however be encountered on the site when the various landfill cells are constructed, due to variances in soil and rock formations.

The dyke and sills may have resulted from different intrusions at different times but for the purpose of this study the intrusive materials are referred to as dolerite.

Several of the boreholes drilled during earlier surveys have been destroyed or have collapsed or been vandalized and no recent water level information is available from these sites. In such cases the water level information recorded after completion of drilling or as part of monitoring programmes of EMM were used to provide an indication of the water levels that can be expected in the area and also used as a guideline in the construction of water level contour maps.

The position of the linear approximately north-south directed dolerite intrusion is indicated on the water contour map, but was not considered to act as a barrier to groundwater movement during the construction of the water level contours as no clear indication to that effect is displayed by the individual water level measurements.

5.8.5 Designs

Taking into consideration the expected waste disposal operations, the physical conditions of the site, and discussions with various members of the project team, there are several factors that affect the design philosophy adopted. These are as follows:

- The preliminary design needs to comply with the Minimum Requirements for a G:L:B+ or Class B landfill as per the Draft Standard for Disposal to Landfill (Notice 615 of 2012).
- The preliminary design of the landfill needs to cater for a total waste stream of 27 731000 tonnes over the 115 year site life. The total available airspace is 37 243 000 m^3 and allowance is made for 20% cover or a 1:4 cover to waste ratio.
- The development of the site is determined by the extent of the clay mining taking place on site and development of the various areas had to be aligned to the planned mining activities. Future detailed design of new landfill cells should therefore be integrated with the mining activities on site.
- Steep existing quarry walls with an average slope of 1:2 as well as limited space between the edge of quarries and property boundaries poses a challenge in terms of lining of each area. Future clay mining will be undertaken in a manner that will facilitate landfill cell development.
- The maximum worst case design height of each landfill area is 25 m above natural ground level. However, the actual height of the cells is dictated by the air quality impacts and associated buffers, and is reality will be 1m above surface.
- The separation of clean storm water, contaminated runoff water and leachate is critical in the design of a facility of this nature, especially with the cells that will be below ground level.
- Allowance has to be made for future development of a public drop-off facility close to the entrance to the site with some associated infrastructure such as a Materials Recovery Facility (MRF), despite such facilities not necessarily being constructed during the first phase of the development.
- Three separate disposal areas have to be designed with one entrance facility and suitable access roads to serve all three areas.

5.8.6 Biodiversity Assessment

The faunal assessment was undertaken largely as a desktop study. The often secretive and nocturnal nature of many species also makes them difficult and unlikely to find during a diurnal field assessment. During the field assessment, the presence of any faunal species observed either directly (visual observation) or indirectly (scats, tracks, burrows, etc) was noted.

The topography of the site is altered by numerous excavations and dumping of material. The identification of wetlands on the proposed development site was complicated by mining activities, which disturbed the soil profile through excavations and material dumping (including reclaimed tailings dams). Under these conditions it is not possible to determine the original extent of natural wetlands that may have historically occurred on the site.

The site for the proposed landfill is highly impacted on by intensive mining activities and of the original vegetation, very little remains on the site.

5.8.7 Heritage

Most of the study area has been subjected to mining and quarrying activities, which would have destroyed potential sites, features or objects that might have occurred there previously.

5.8.8 Traffic

No recognised trip generation rates are available for landfill sites. It is, however, expected that the trip generation of the proposed Tonk Meter Road WDF will be similar to that of the adjacent landfill site, i.e. the existing EMM Rietfontein WDF. The expected peak hour trip generation was calculated by evaluating the traffic volumes accessing the EMM Rietfontein WDF.

The traffic survey by default considers the most critical periods for traffic generation across a limited period of time.

5.8.9 Visual

The assessment does not consider the ancillary project infrastructure and components such as borrow pits (progressively filled with waste), spoil dumps (progressively used as daily cover), etc., but is limited to the overall assumed shape of the landfill once at maximum height and capped.

The assessment is based on assumed demographic data. A detailed study was not done to determine accurate data on potential viewers of the project components.

The location and extent of the construction camp site, which due to the infrastructure required at inception and construction of each cell is likely to be small, as well as material lay-down areas will only be determined during the design and construction phases. These, however, have a relatively temporary nature and can effectively be controlled through the draft Site-Specific EMPr.

6. DESCRIPTION OF THE AFFECTED ENVIRONMENT

6.1 STUDY AREA CONTEXT

6.1.1 Regional Context

The study area falls within the EMM, one of six metropolitan municipalities in South Africa, which is located in the Gauteng Province. The EMM is bordered by the City of Tshwane to the north, City of Johannesburg to the west and the Sedibeng District Municipality to the south and part of the east (refer to insert in **Figure 6-1**). Mpumalanga province forms the remainder of the eastern border.

The EMM covers an area of approximately 2,000 km^2 and extends from Germiston in the west, to Springs and Nigel in the east. The EMM is divided into three service delivery regions namely northern, southern and eastern. The EMM comprises Local Municipalities in the East Rand, including Germiston, Kempton Park/Tembisa, Boksburg, Benoni, Brakpan, Springs, Nigel, Alberton and Edenvale/Lethabong (EMM, 2010).

6.1.2 Local Context

The proposed new Tonk Meter Road WDF will be located on the Remaining Extent of Portion 81 of the Farm Rietfontein 128 IR, and is considered to be the study area for the purposes of this report. The site is located adjacent to the existing EMM Rietfontein WDF, south of Rietfontein Road, west of Tonk Meter Road and east of Kwa-Thema in the southern part of Springs (Eastern Service Delivery Region of the EMM) (refer to **Figure 6-1**).

6.2 CLIMATE AND ATMOSPHERIC CONDITIONS

Within the study area, daily average summer temperatures ranged between ~ 20 °C and ~ 18 °C, while winter temperatures range between ~13°C and ~ 15°C. The relative humidity is lowest during the winter and highest in summer and spring. Average monthly temperature and humidity for the period Jan 2008 – Dec 2011 is presented in **Figure 6-2** (Watson, 2013). Frost can occur from middle April to early October (AGIS, 2007).

The predominant wind direction within the study area is mainly from the north and north western region. Secondary winds are noted from the south western and north eastern region (refer to **Figure 6-3**). During the summer months (Dec, Jan and Feb) the winds originate predominantly from the north-north–west and north-east. During the spring months (Sep, Oct and Nov), the winds originate from the north-north-west. A similar pattern in wind field occurs during the autumn (Mar, Apr and May) and winters months (Jun, Jul and Aug), with winds originating predominantly from the north-west, south-west and south-easterly sectors (Watson, 2013).

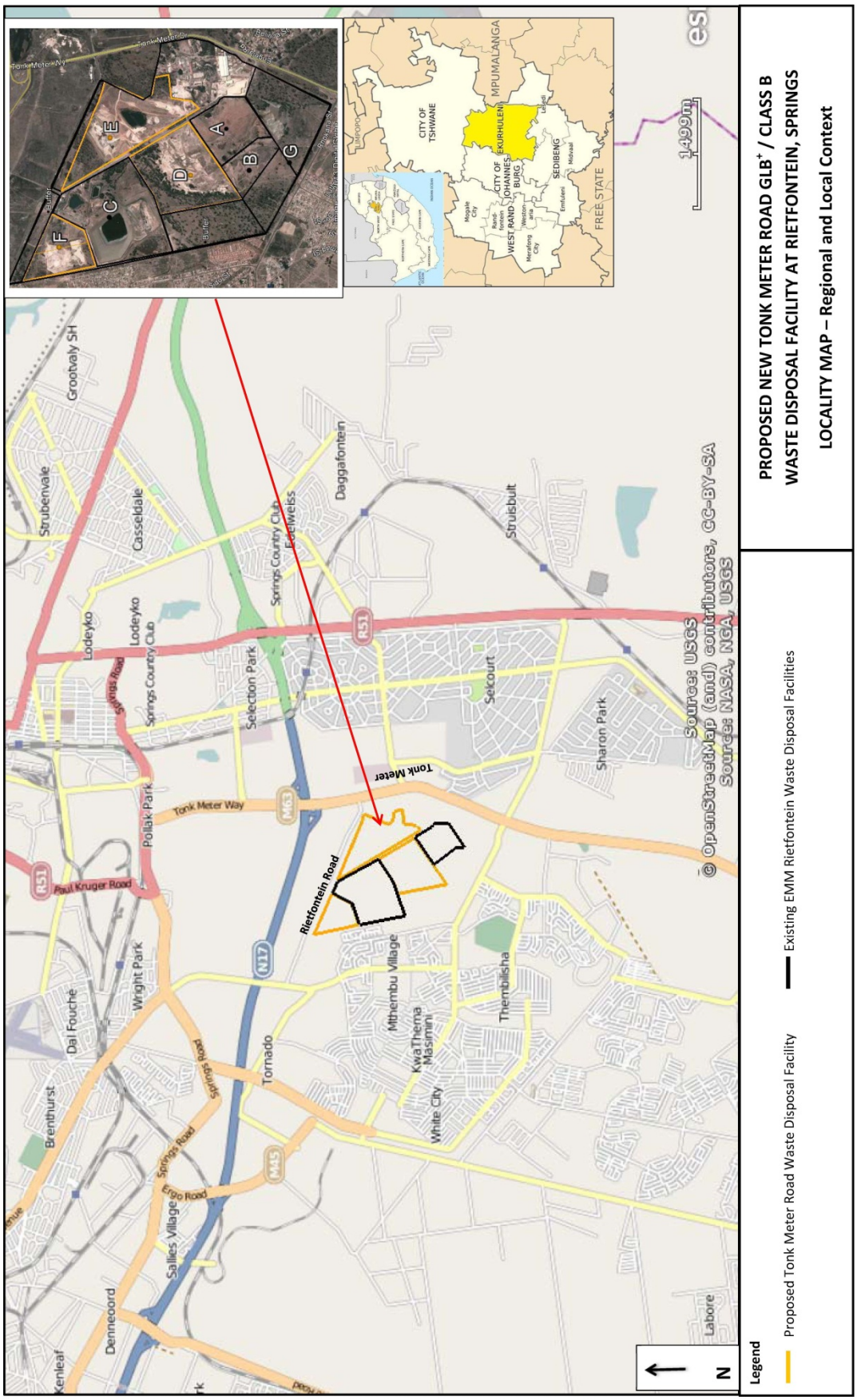

Figure 6-1: Locality Map

In the study area, 1.2 % of the time, calm conditions existed over the area. The highest frequency of wind speeds lie between 2.1 – 3.6 m/s and 3.6 - 5.7 m/s which occurred for 33 % of the time respectively. The study area experiences very stable conditions which are characteristic of low winds, clear skies and cold night-time conditions (Watson, 2013).

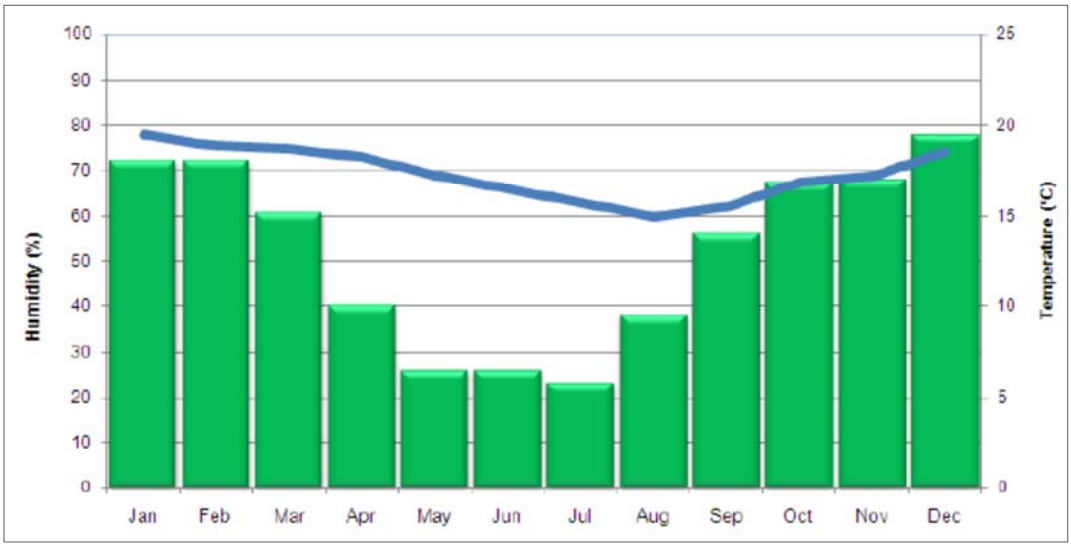

Figure 6-2: Average monthly temperature and humidity in Springs, Jan 2008 – Dec 2011

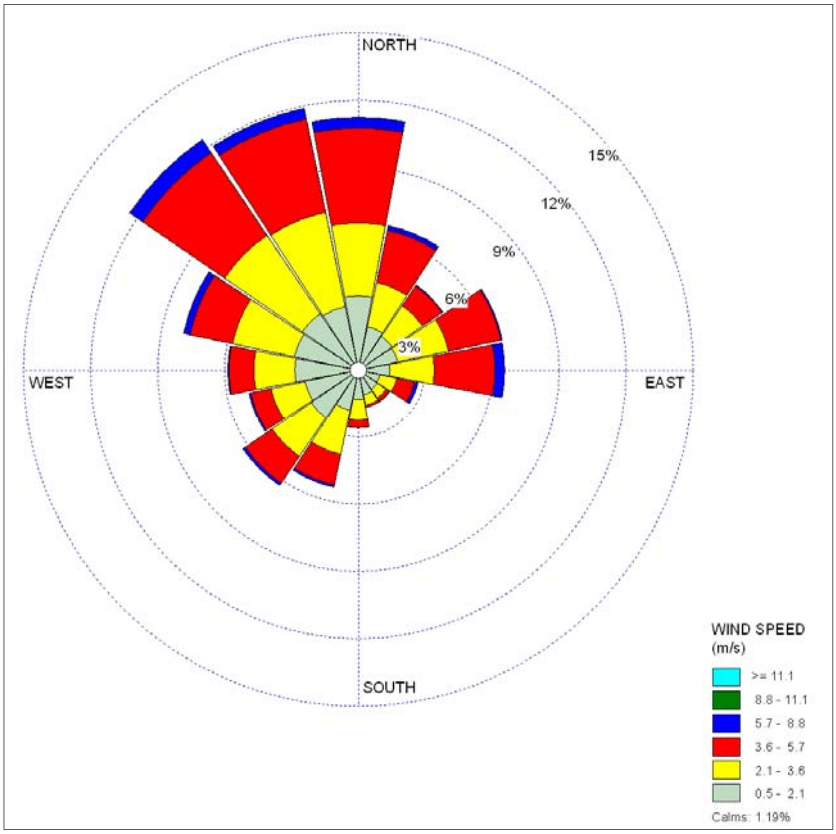

Figure 6-3: Period wind rose for Springs, Jan 2008 – Dec 2011

Total monthly rainfall figures for the area are depicted in **Figure 6-4**. The highest average of rainfall (mm) was recorded during the summer and spring months, while the lowest rainfall average occurred during the winter and autumn months (Watson, 2013). Intense thunderstorms can be experienced in the late afternoons, periodically with hail (EMM, 2007). Frequent lightning strikes (6 – 8 lightning flashes per square kilometre per year (Botha, 2012) occur within the EMM, refer to **Figure 6-5**.

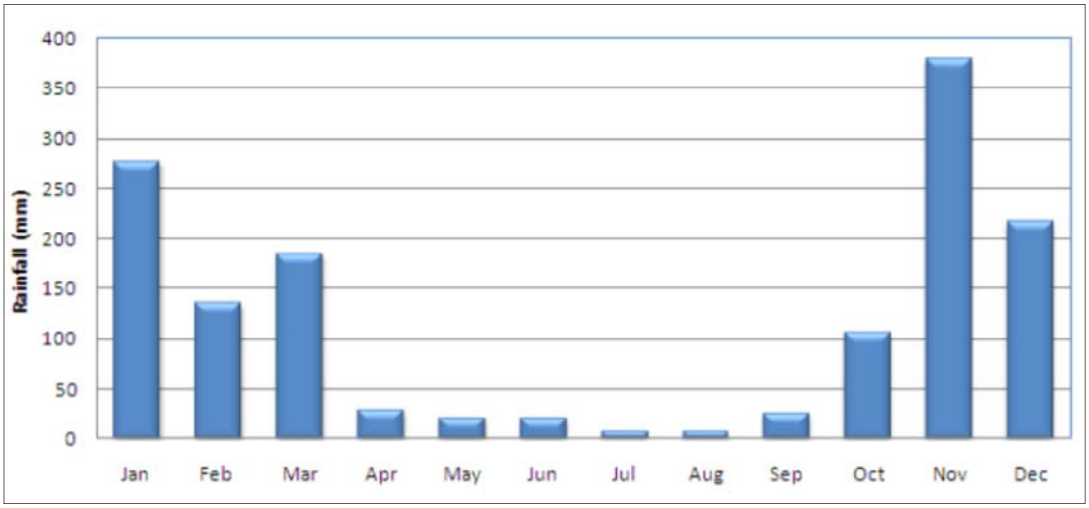

Figure 6-4: Precipitation recorded in Springs, Jan 2008 – Dec 2011

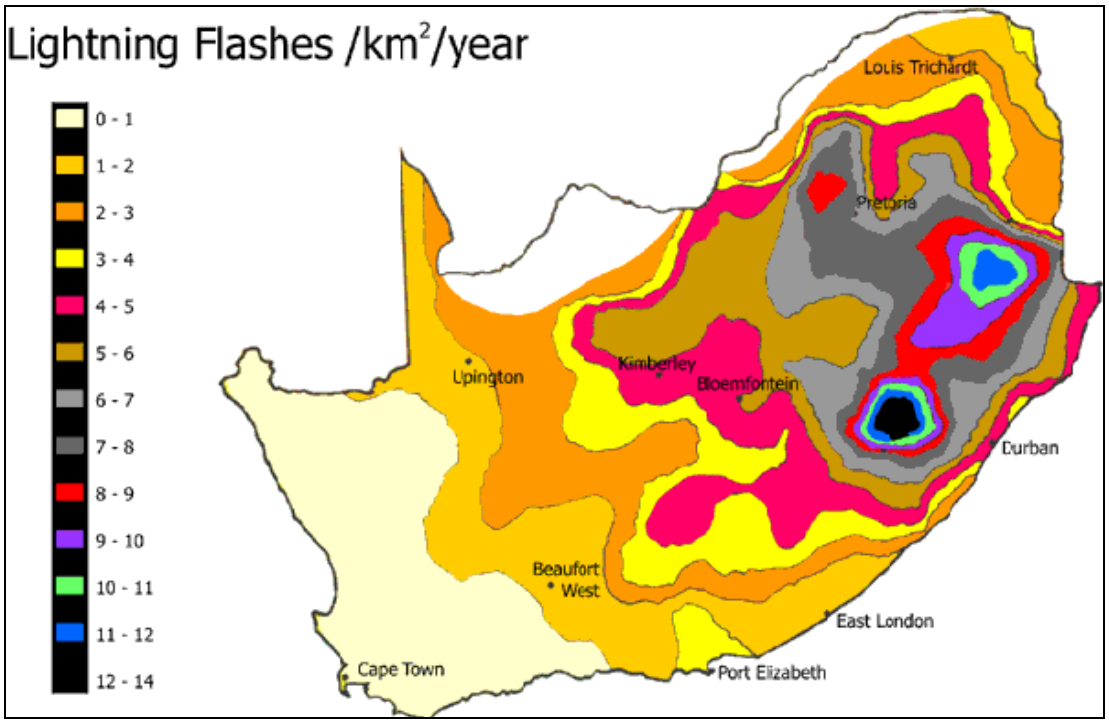

Figure 6-5: Lightning Flashes per km^2 per year

6.3 GEOLOGY

Geologically the area is underlain by rocks of the Vryheid Formation and Dwyka Group of the Karoo Supergroup. These rocks overlie dolomite of the Chuniespoort Group and the Black Reef Formation of the Transvaal Supergroup. Rocks of the Witwatersrand Supergroup are present at depth. In some areas dolerite/syenite intruded into the Karoo rocks and the dolomite and these intrusive rocks are present as irregularly shaped "sills". Refer to **Figure 6-6** for the geological formations (Venter, 2012).

Area D is overlain by Karoo sediments and the depth to sedimentary rocks, described as Dwyka sediments, range from 8 to 52 m. The deep Dwyka sediments occur mainly in the north western and western part of Area D. The depths to the dolomite rock on which the Dwyka sediments were deposited vary from 15 to 63 m (Venter, 2012).

Area E is overlain by Karoo mudrocks and the southern section has been excavated for clays. The upper part of the soil and rock profile of the Karoo Supergroup rocks can be seen in the northern quarry face. Most of the area has been rehabilitated with so called overburden material i.e. the ferrugenised overlying sands, ferrugenised mudrock and plastic mudrocks overlying the yellow shale ("clay") (Venter, 2012).

The geology of Area F is similar to the area to the south (i.e. Area D) but with the Vryheid Formation mudrocks wedging out towards the north. The eastern part of Area F is close to or on a dolerite dyke. The depths to Dwyka rocks range from 3 to 7 m in the north to 15 to 20 m in the south, with thicknesses varying from 4 to 13 m. A large part of the Area F has been excavated down to a depth of about 7 m and two quarries (one backfilled) have been excavated to obtain plastic and fire clays. The "open" quarry in the south shows mainly very soft to soft rock Karoo mudrock overlying a more purplish mudrock (probably plastic clay) lower down. Dolomite was encountered at depths from 11 to 29 m (Venter, 2012).

Dolomite investigations have been undertaken on Areas E, F and Area D. In terms of the hazard for the development of sinkholes and subsidence, the site (Areas D, E and F) is classified as Inherent Hazard Class (IHC) 1 and suitable for the development of waste disposal facilities. The Council for Geoscience have accepted the development of a GLB+ landfill on Areas E, F and Area D. Although further geological studies have been undertaken on the far western side of Area D (outside of the proposed WDF area), the findings as presented in the Geology Report (Appendix 9) is representative of the conditions encountered across the proposed Area D for the WDF (Venter, 2012).

Table 6-1 represents the typical material sequence encountered in the geological profile to the Dwyka Group.

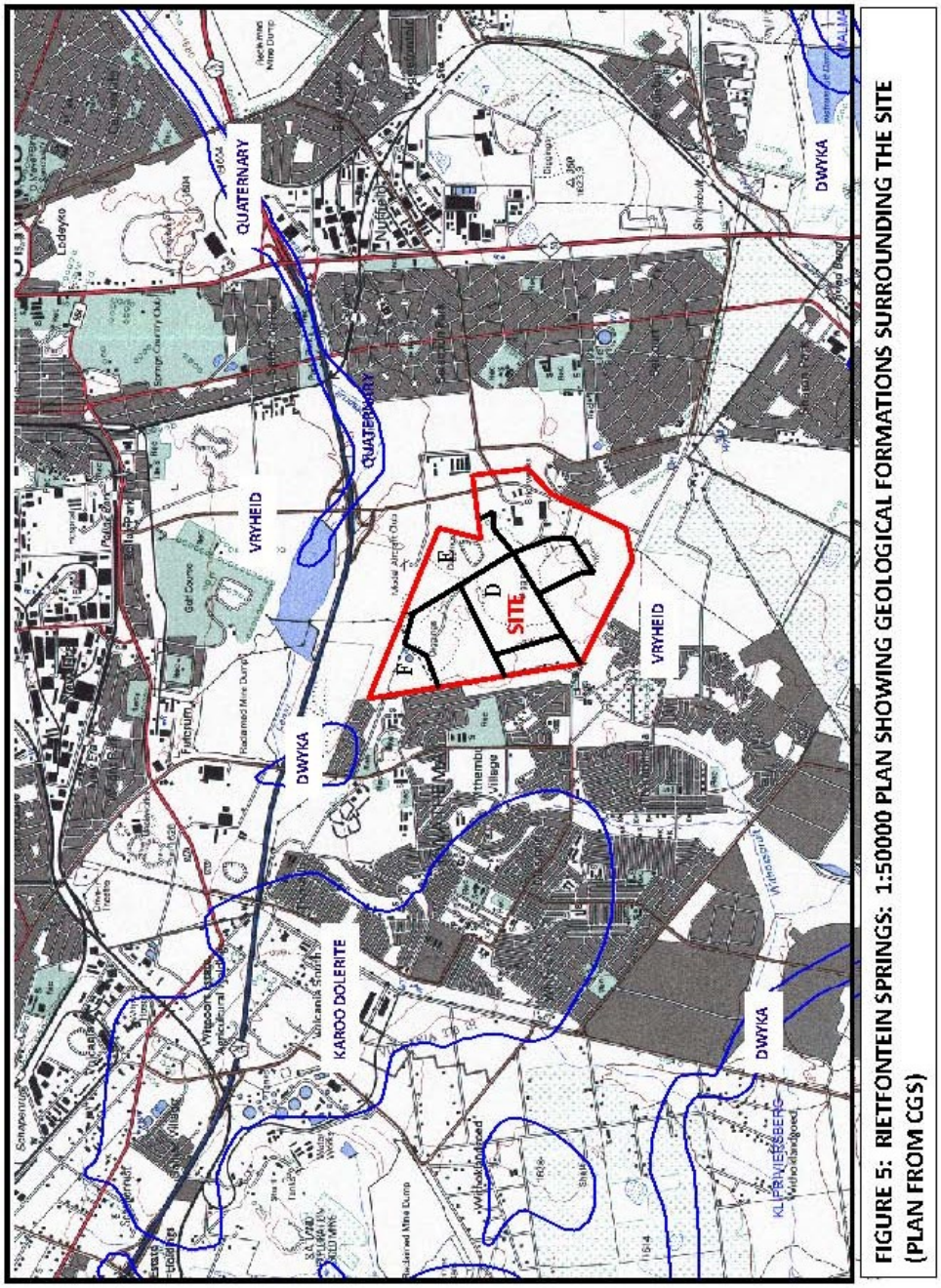

Figure 6-6: Geological Formations (per Report)

Table 6-1: Typical Material Sequence Encountered in the Geological Profile

Material	Description
Topsoil	Thin sandy layer
Aeolian sand	Windblown silty sand/sandy silt material
Ferrugenised sand	The lower part of the aeolian sand which is genised to different levels i.e. from soft nodular ferrusandy material to hardpan ferricrete
Ferrugenised mudrock	The top of the residual mudrock is usually highly ferrugenised. The thickness of this highly ferrugenised material is usually not extensive
Residual yellow mudrock	Almost structureless slightly ferrugenised highly plastic stiff silty clay / clayey silt
Mudrock	Highly weathered very soft rock shale or siltstone, i.e the "yellow shale"
Residual purplish mudrock	Highly to completely weathered very soft rock claystone or very stiff silty clay i.e. the "plastic clay" (usually thin 1 m to 1,5 m layer(s))
Residual light grey mudrock	Almost structureless medium weathered very soft to soft rock mudrock i.e. the "fire clay" (also "thin" layer(s))
Dwyka	Hard rock sandstone type material but the material type will vary
Carbonaceous materials and coal are also present in areas above the Dwyka sediments	

Additional geological information and implications thereof is presented in **Section 7.6.**

6.4 TOPOGRAPHY

The study area is relatively flat and higher-lying areas occur to the south of the area (refer to **Figure 6-7).** The lowest point is 1,612 m amsl (northern portion) and the highest point is 1,629 m amsl (southern portion).

The natural topography of the study area has been changed due to past and current activities (i.e. clay mining and deposition followed by subsequent reclamation of old gold tailings). The topography will be further changed will future planned clay mining.

6.5 WATER RESOURCES

6.5.1 Surface Water

Two rivers are located in close proximately to the study site, namely the Klein Blesbokspruit to the northeast and the Withokspruit to the southwest (refer to **Figure 6-8**). The study area is situated south of where the Klein Blesbokspruit and north of where the Withokspruit Rivers originate. The study area is located on the edge of the catchment draining into the Klein Blesbokspruit.

No natural wetland areas are located within the study site. Surface water accumulates in excavations within the site, and as a result wetland plant species are supported therein, however these are not classified as natural wetland areas (refer to specialist findings **Section 7.2**, **Appendix 5**).

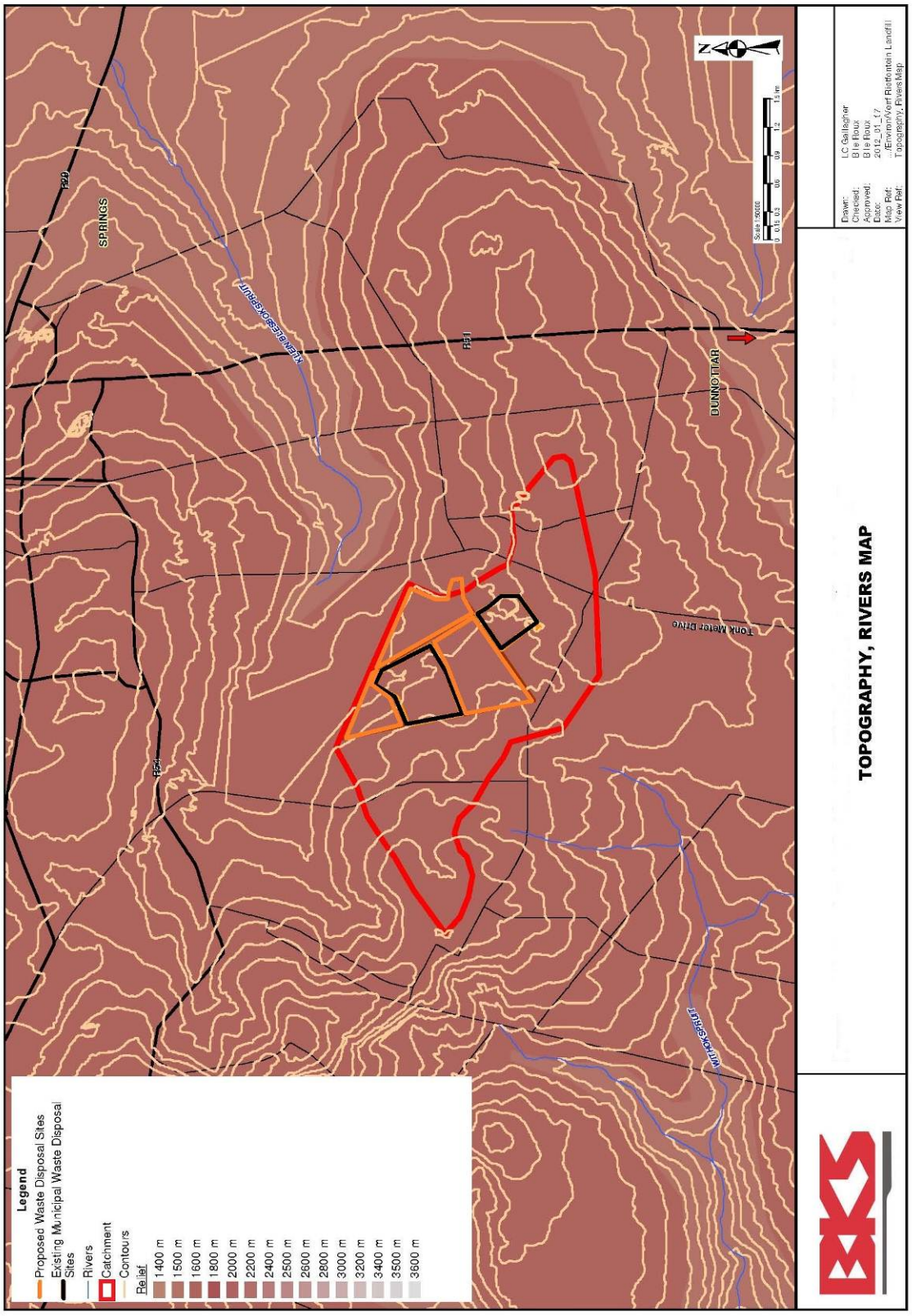

Figure 6-7: Topography and Rivers

6.5.2 Groundwater

The area investigated in underlain by rock formations representing the Ecca, Dwyka and Chuniespoort Groups. Information from more than 80 boreholes drilled during the various investigations of the larger area, confirmed the presence of a geological sequence consisting of mainly shale and mudstone, including some minor coal seams, of the Vryheid Formation, Karoo Supergroup that outcrop over the entire area. These sedimentary sequences are in turn underlain by a glacial tillite deposit of the Dwyka Group, deposited in glacial valleys scoured into the underlying dolomitic basement rocks. The Dwyka Group is in turn underlain by several hundred metres of alternating formations of dolomite and chert rich dolomite of the Chuniespoort Group that is considered for the purposes of this investigation as the geological basement to the area. Weathering of the mudrocks formed high quality clay which has been, and still is, extensively quarried for brick-making purposes. The positions of all boreholes from which geological and geohydrological information was sourced, is indicated on Figure 6-8.

An important linear and approximately NNW-SSE directed geological structural feature occurs roughly in the centre of the area investigated. This feature is indicated on the official 1:250 000 geological map of the area (Sheet 2628 East Rand) as an aeromagnetically derived lineament, possibly a dyke, while on the 1:50 000 geological map sheet (2628AD Springs) describing the engineering geological conditions in the area, it is shown as a fault (Zawada, 2004). This structure has been traced geophysically with ground magnetic surveys in 1994, 1997 and 2011 as well as with resistivity depth profiling surveys in 2011 and forming part of the current investigation programme described in this report. This approximately ~150º trending lineament represents a near vertical dolerite or diabase dyke and could be seen in the clay quarry on Area A where it was exposed by the quarrying process. The dyke intrusion is perceived to have intruded along the fault indicated on the 1:50 000 scale geological map (Zawada, 2004). The magnetic anomaly pattern suggests an intrusion of variable width dipping slightly to the southwest. Drilling results also indicate the presence of diabase in several boreholes especially west of the diabase dyke. These occurrences are interpreted as being isolated sills possibly related to the dyke intrusion. The position of the dyke is also shown on Figure 6-8.

The thickness of the Vryheid Formation varies considerably across the area investigated but a general increase in thickness of the mudstone occurs towards the west and southwest where thicknesses in excess of 50m are present.

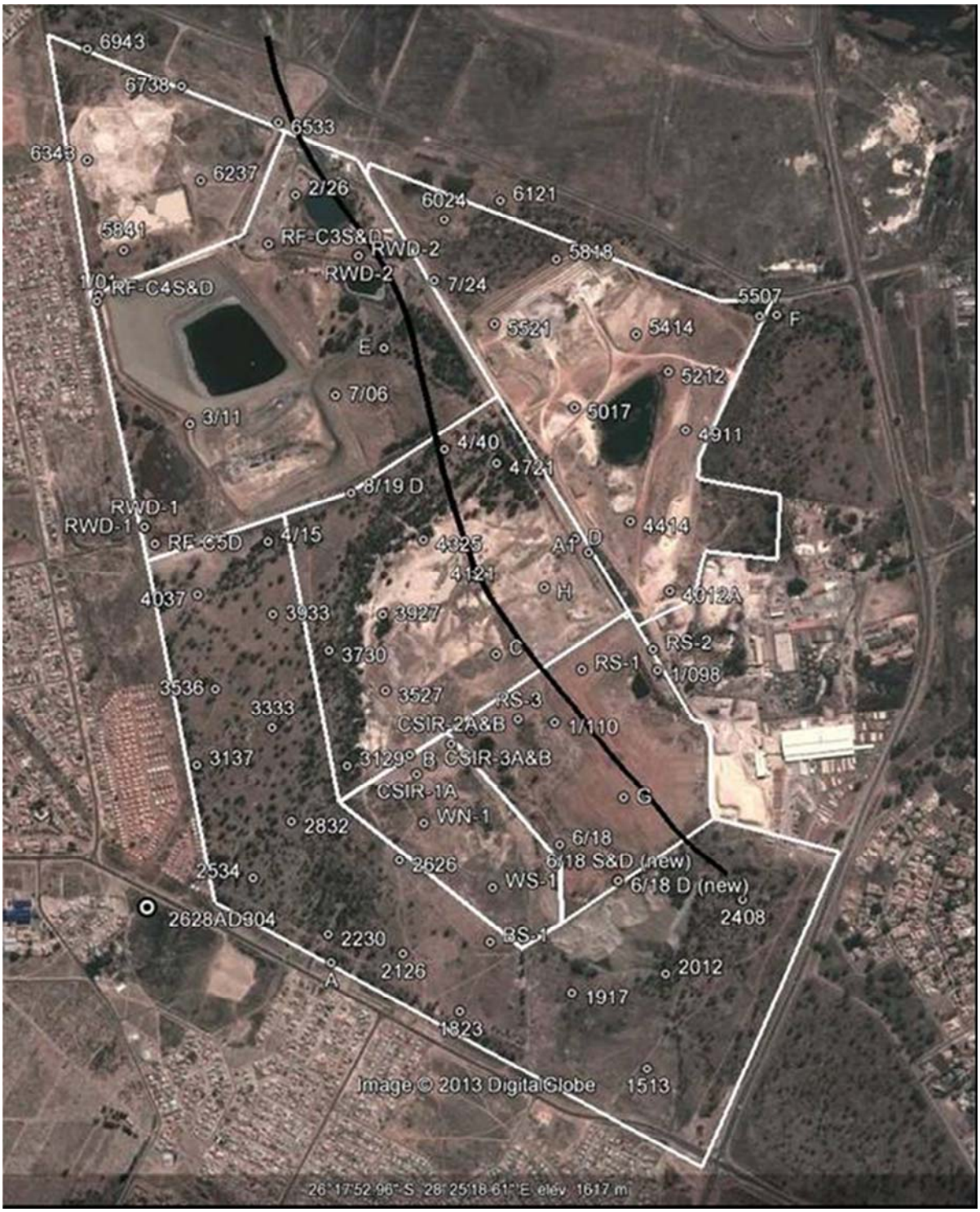

Figure 6-8: Locality map showing the positions of all boreholes drilled across the area investigated and also the position of the diabase dyke (black line) intruded into the formations. .

A hydrocensus of the entire site and the surrounding area was done during which more than 100 boreholes were located and all available geohydrological information of these boreholes was compiled. Information from the National Groundwater Archive (NGA) of the Department of Water Affairs was included in this compilation. The analysis indicated that in more than 50% of the boreholes drilled, no water strikes were reported. In several of the

deep boreholes (>50m deep), no water was encountered during drilling and the boreholes were completely dry at completion of drilling.

The majority of reported water strikes occurred in mudstone of the Vryheid Formation and diamictite (tillite) of the Dwyka Group (14 and 16 respectively). Several water strikes were reported at the contacts between different formations or with intrusive dolerite. Only six water strikes in the dolomite were reported. This was to be expected as the main source of groundwater in dolomite is associated with karstification. Except for some slight dolomite weathering, no indications or evidence of karstification of the dolomite was observed in any of the 60 boreholes that intersected dolomite.

From a geohydrological perspective it is important to note that by far the majority of boreholes (more than 90%) had a blow or tested yield of <0.5 l/s. The highest reported blow yield (0.9 l/s) occurred at the intersection with a coal seam in the Vryheid Formation. The low reported groundwater yield observed in all the boreholes drilled during all the investigations is in agreement with the observations reported by Barnard (2000) and on the DWA Hydrogeological map Sheet 2526 Johannesburg.

Inspections of the clay quarry on Area E and F revealed that the side walls are dry for most of the year supporting the conclusion that the mudstone of the Vryheid Formation has a low permeability and does not host large amounts of groundwater to support sustainable high yielding boreholes. The water accumulating in the lower sections of the quarry at times is mainly attributed to rainfall and inflow of storm water during summer months.

No groundwater from any of the boreholes present on Areas A to G is used for any domestic or industrial purpose. The only known groundwater used for domestic purposes is from the privately owned boreholes in Selcourt to the east of the proposed site.

The water level measurements collected during the 2011/2012 drilling programmes as well as those from earlier surveys, indicate the presence of two distinctly different ground water level situations: (i) a shallow, perhaps perched water level associated with the mudstone and carbonaceous shale of the Vryheid Formation and dolerite/diabase intrusions, and (ii) a deeper water level associated with the tillite and dolomite of the Dwyka and Malmani Groups respectively. This situation is illustrated by the water level contour maps in Figures 6-9 and 6-10.

The contours of the shallow water level with elevations varying between approximately 1590 and 1610 mamsl are mainly associated with the Vryheid Formation. These indicate a groundwater flow direction towards the central and western side from the north, east and south, with outflow towards the west.

Figure 6-10: Water level contour map for those boreholes displaying Vryheid Formation water levels.

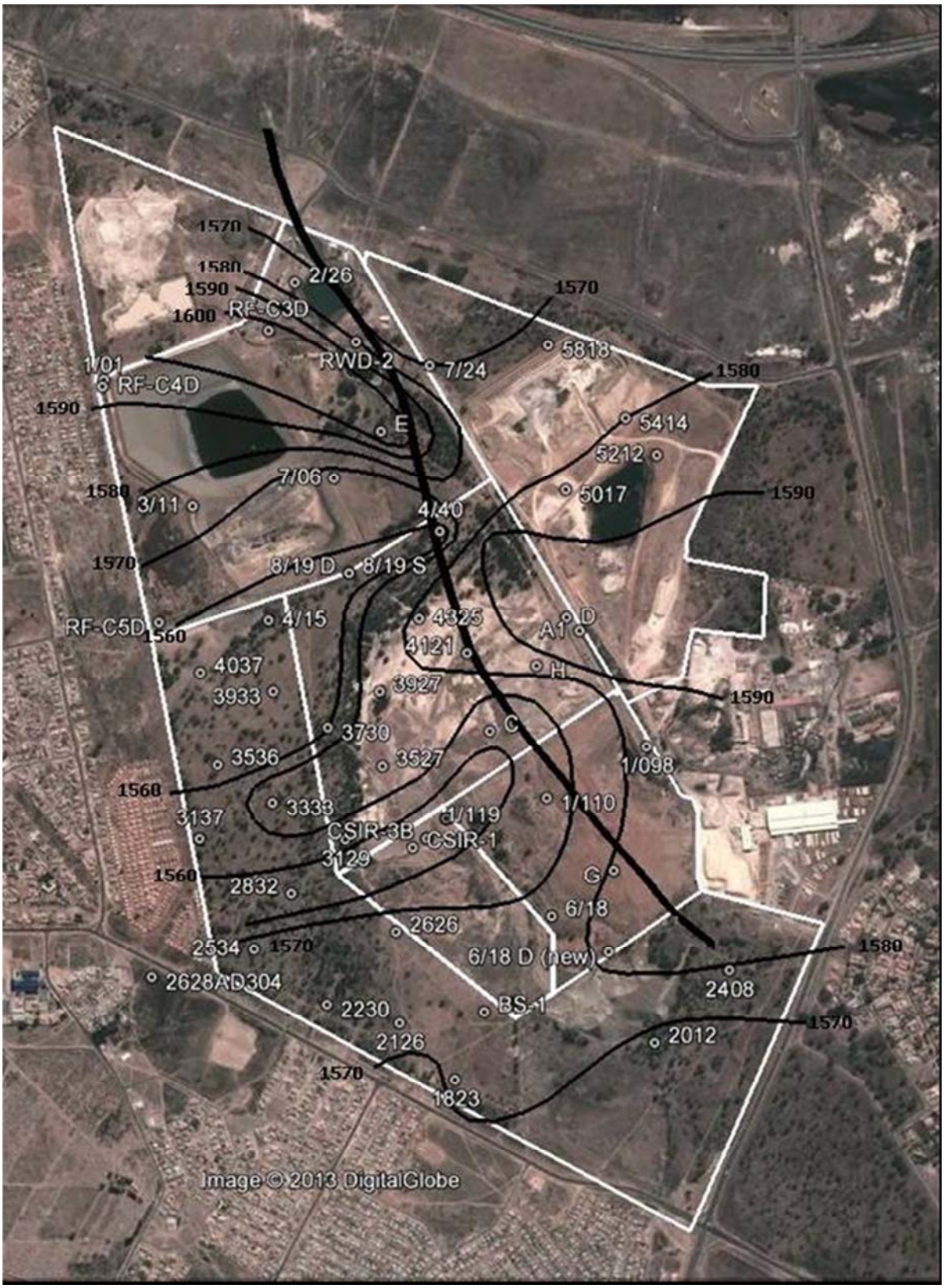

Figure 6-10: Water level elevation contour map for those boreholes displaying Dwyka Group and Malmani Subgroup related water levels.

Water level depths in the Dwyka and Malmani Group rocks range between approximately 10 m and 67 m below ground surface or in terms of elevation above mean sea level the range is between approximately 1550 and 1606 mamsl.

Similar to the water level distribution for the Vryheid Formation, the Dwyka/dolomite water levels indicate a groundwater movement towards the central and western part of the area investigated, with eventual outflow towards the west. The position of the linear, approximately north-south directed, dolerite intrusion does not appear to act as a barrier to groundwater movement.

Water samples collected from a selection of the newly drilled boreholes, as well as the results from earlier surveys, indicate that the water quality of both the shallow and deeper groundwater is of a good quality. However, boreholes on an close to the areas previously used for gold mining tailing dams have a high electrical conductivity and low pH, higher concentrations of for example sulphate (SO4), chloride (Cl) and iron (Fe), that was leached from the large tailings dams and the remnants still present in certain areas.

The groundwater quality monitoring around Areas A and C where waste disposal is practised, has not shown any significant deterioration in groundwater quality over the past approximately 15 years since monitoring was initiated. However, at one monitoring borehole on the western side of Area A, the water quality has deteriorated significantly since 2010 due to the partial collapse of the borehole and apparently also as a result of surface water runoff, of which the quality has been negatively impacted by gold mine tailings, that can infiltrate the borehole. The water sampled form this borehole has therefore not been representative of the original groundwater, which creates the impression that the groundwater is contaminated by the waste disposal site. This monitoring borehole needs to be replaced with a set of one shallow and one new borehole in the same area. Other monitoring boreholes at Areas A and C should also be inspected for possible collapse, and if present, consideration should also be given to replace these with similar sets of shallow and deep boreholes in order to monitor both the shallow and deeper groundwater quality at each location.

Consideration should furthermore be given to the establishment of additional pairs of monitoring boreholes along the western, northern and eastern sides of the Area A landfill site, and in view of the future establishment of waste disposal sites on Areas D, E and F, that the existing monitoring programme for Areas A and C be revised and taking into account the proposed monitoring programmes for the new disposal sites. This will ensure the early detection of any contamination originating for each existing and future landfill sites and that appropriate action can be taken to eliminate or contain possible further contamination.

The three criteria recommended by DWAF for the classification of aquifers, (i) potential sustained yield, (ii) water quality, and (iii) significance of the aquifer, were used to classify the aquifers in the study area. In terms of groundwater significance, and based on the

borehole yield and water quality information, the aquifers associated with the Vryheid Formation, and Dwyka and Malmani Groups are considered to be "non-aquifers" and were classified as of low potential sustained yield.

Based on the results obtained during this investigation and described in detail in the main report, it is concluded that from a geological and geohydrological perspective, the Areas D, E and F are considered suitable for the development of waste disposal facilities. Refer to **Section 7.7** and **Appendix 10** for additional information.

6.6 ECOLOGY

6.6.1 Gauteng Conservation Plan

According to the Gauteng Conservation Plan (C-Plan, v3), the majority of the study area is built-up land. Areas indicated as Important Areas are located within the north-western section of Area E and along the northern and western sections of Area D (refer to **Figure 6-11**). It needs to be noted that these areas will be disturbed due to future clay mining activities.

The study area is highly disturbed and degraded due to past and current activities (including the reclamation of gold tailings, clay mining and borrowing of road construction material). No important sensitivities or areas were identified in Areas D, E and F (Le Roux, 2012) (refer to specialist findings **Section 7.2, Appendix 5**).

6.6.2 Terrestrial Vegetation

The study area and the surrounds fall within the Tsakane Clay Grassland veld type, as indicated in **Figure 6-12**. The Tsakane Clay Grassland occurs on flat to gently undulating plains with low hills. Where not removed by previous storage of gold tailings, clay mining or borrowing of road construction material, the vegetation is short and dense grasslands (refer to **Figure 6-13)**. The presence of *Hyparrhenia hirta* and *Eragrostis chloromelas* indicates past disturbances in this veld type. The veld type is considered *Endangered* and only 1.5% of the 24% target is currently under conservation (Mucina & Rutherford, 2006). However little remains of natural vegetation.

An abundance of alien plant species are located in Areas E, F and the eastern portion of D. This indicates poor ecological conditions and significant disturbances to the soil from past and present mining operations. Indigenous forbs remain in the grassland of the western side of Area D (now forming part of the buffer area), but the vegetation is impacted by heavy grazing and trampling (le Roux, 2012) (refer to specialist findings **Section 7.2, Appendix 5**).

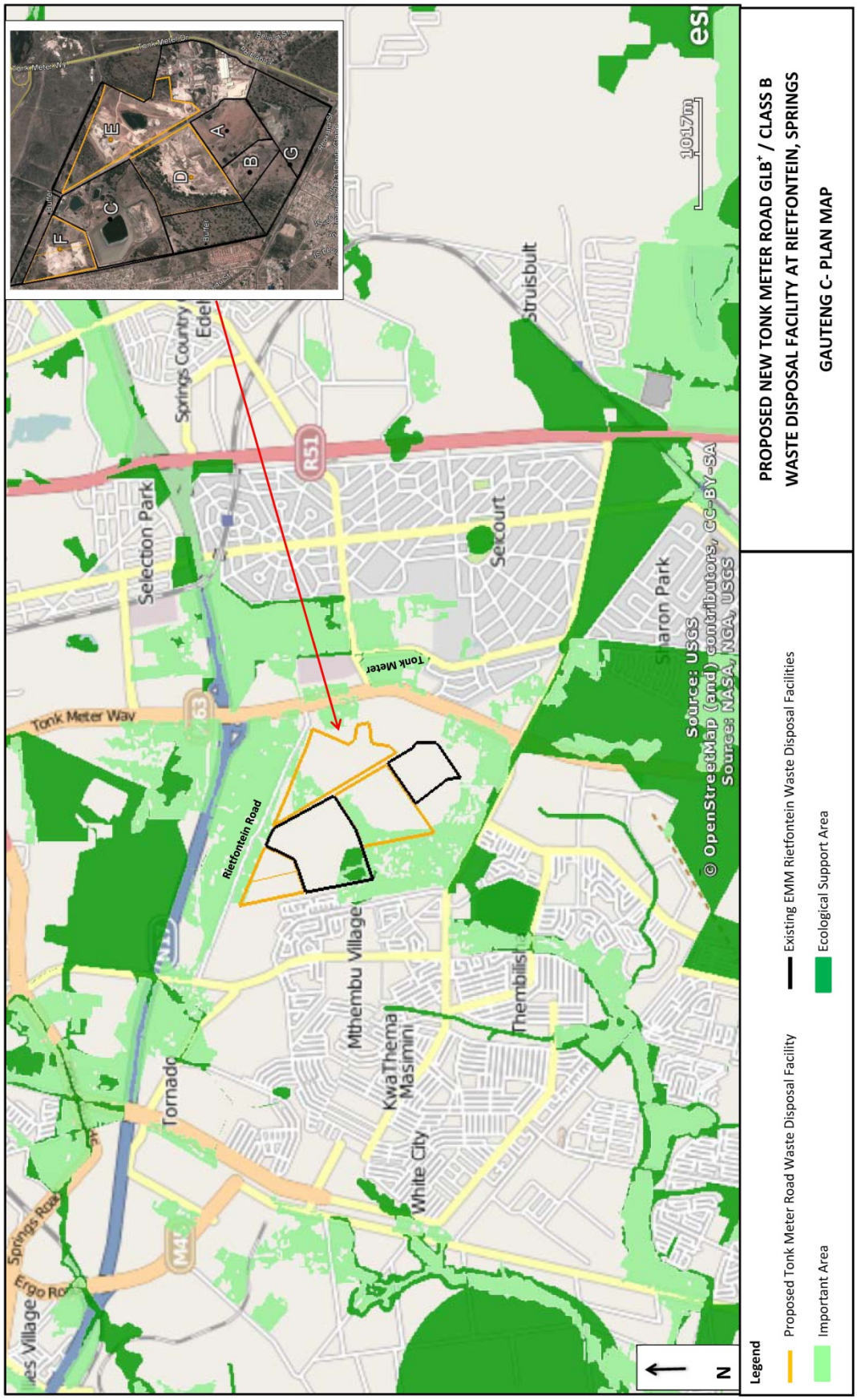

Figure 6-11: Gauteng C-Plan

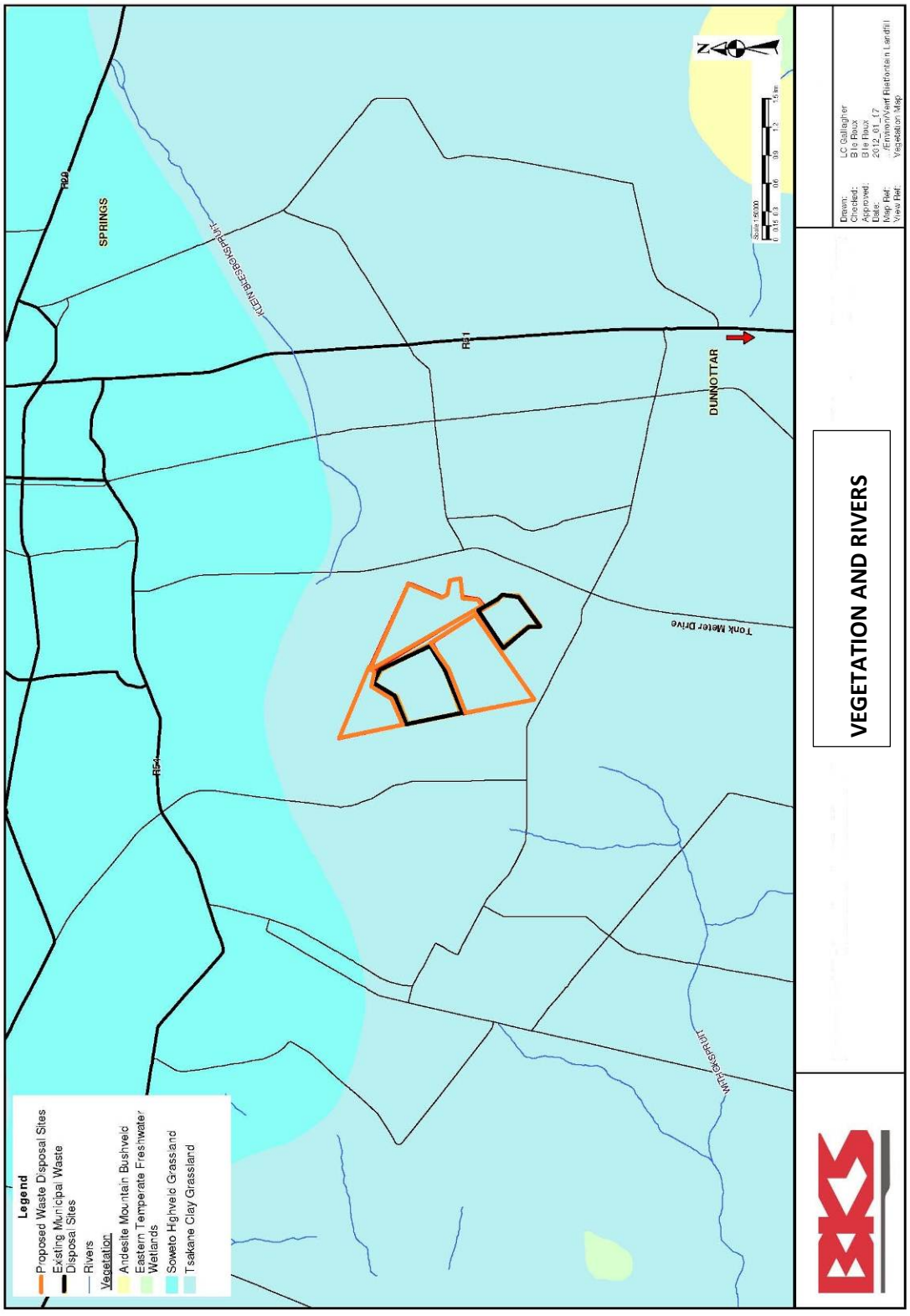

Figure 6-12: Vegetation

Figure 6-13: Remaining Vegetation within Study Area

6.6.3 Red Data Listed Species

The Red Data Listed (RDL) species relevant to the study area, as obtained from GDARD (2012), are presented in **Table 6-1** together with the habitat requirements, conservation status and the flowering season of plants.

No red data listed species were observed on the proposed development site and due to the degree of overutilization, disturbance and pollution sensitive species are not expected (le Roux, 2012) (refer to specialist findings **Section 7.2 Appendix 5**).

Table 6-2: Red Data Listed Species

SPECIES	FLOWERING SEASON	SUITABLE HABITAT	CONSERVATION STATUS
PLANT RECORDED WITHIN 5 KM OF PROPOSED DEVELOPMENT SITE			
Trachyandra erythrorrhiza	September-November	Marshy areas, grassland, usually in black turf marshes.	Near Threatened
PLANTS RECORDED IN QUARTER DEGREE SQUARE 2628AD			
Adromischus umbraticola* subsp. *umbraticola	September-January	Rock crevices on rocky ridges, usually south-facing, or in shallow gravel on top of rocks, but often in shade of other vegetation.	Near Threatened
Boweia volubilis* subsp. *volubilis	September-April	Shady places, steep rocky slopes and in open woodland, under large boulders in bush or low forest.	Vulnerable
Cineraria longipes	March-May	Grassland, on koppies, amongst rocks and along seepage lines, exclusively on basalt on south-facing slopes.	Vulnerable
Delosperma leendertziae	October-April	Rocky ridges; on rather steep south facing slopes of quartzite in mountain grassveld.	Near Threatened
Dioscorea sylvatica	October-January	Wooded places with fair to reasonably good rainfall, such as the moister bushveld areas, coastal bush and wooded mountain kloofs.	Vulnerable

SPECIES	FLOWERING SEASON	SUITABLE HABITAT	CONSERVATION STATUS
Eucomis autumnalis	November-April	Damp, open grassland and sheltered places.	Declining
Eulophia coddii	Early December	Steep hillsides on soil derived from sandstone, grassland or mixed bush.	Vulnerable
Gnaphalium nelsonii	October-December	Seasonally wet grasslands.	Rare / sparse
Gunnera perpensa	October-March	In cold or cool, continually moist localities, mainly along upland streambanks.	Declining
Habenaria barbertoni	February-March	In grassland on rocky hillsides.	Near Threatened
Habenaria bicolor	January-April	Well-drained grasslands at around 1600m.	Near Threatened
Holothrix micrantha	October	Terrestrial on grassy cliffs, recorded from 1500 to 1800m.	Endangered
Hypoxis hemerocallidea	September-March	Occurs in a wide range of habitats, from sandy hills on the margins of dune forests to open rocky grassland; also grows on dry, stony, grassy slopes, mountain slopes and plateaux; appears to be drought and fire tolerant.	Declining
Ilex mitis* var. *mitis	October-December	Riverbanks, streambeds, evergreen forests	Declining
Khadia beswickii	July-April	Open areas on shallow surfaces over rocks in grassland.	Vulnerable
Kniphofia typhoides	February-March	Low-lying wetlands and seasonally wet areas in climax *Themeda triandra* grasslands on heavy black clay soils, tends to disappear from degraded grasslands.	Near Threatened
Lithops lesliei* subsp. *lesliei	March-June	Primary habitat appears to be the arid grasslands in the interior of South Africa where it usually occurs in rocky places, growing under the protection of surrounding forbs and grasses.	Near Threatened

6.6.4 Fauna and Avifauna

No significant fauna activity is within the areas where mining operations are currently being undertaken. However, small fauna species may occur in previously disturbed areas of the site (le Roux, 2012).

Species on site was restricted to cattle and birds that are adapted to live in very disturbed environments. The only sensitive animal species that might occur is the Marsh Sylph Butterfly, due to the food plant, *Leersia hexandra*, being recorded on the site. The butterfly itself was, however, not observed during the field survey (April 2012) and is unlikely to occur on site due to the highly altered state of the habitat (refer to specialist findings **Section 7.2, Appendix 5**).

6.7 LAND USE

The current land use within the proposed site is mining, i.e. clay mining. Gold tailings stored on-site were previously reclaimed. Deep undermining, as a result of gold mining, has also occurred on parts of the study area previously. This deep mining was undertaken on the Main Reef of the Witwatersrand Supergroup, at a depth of more than 1000 m below surface. No coal undermining has taken place within the study area.

A slimes dam was previously located on Area D, which has subsequently been reclaimed Area E has been mined by Corobrik to a depth of about 15 to 20 m over most of the area for the "yellow clay" which is used for the manufacturing of building and paving bricks, as well as plastic and fire clays used for manufacturing of furnace bricks. An undisturbed area remains in the north eastern corner of Area E where the Tonk Meter Road WDF entrance infrastructure will be constructed. Area F is highly disturbed and previously mined. Approximately 7 m of material has been removed from this area for road construction and two quarries were excavated thereafter to obtain plastic and fire clays. The southern quarry on Area F is still open.

Land use surrounding the proposed site is rehabilitated mined areas (i.e. open spaces), the existing EMM Rietfontein WDF, an industrial area to the east and residential areas of Kwa-Thema to the west and south (Refer to **Figure 6-11**).

Should the landfill license application be successful, future mining is intended to be undertaken without further conventional rehabilitation, as the quarries will be rehabilitated by means of waste disposal. Discontinuation of conventional rehabilitation will, however, require an amendment to the mining EMPR in terms of the M&PRDA, which is to be approved by the Department of Mineral Resources (DMR). This is being undertaken as a separate process to this EIA process and only once environmental authorisation has been awarded.

6.8 PHYSICAL INFRASTRUCTURE AND SERVITUDES

The Rietfontein Road borders the study area on the northern side. The main entrance into the Verref and Corobrik brick works is located from the Tonk Meter Road, to the east of the study area. Internal roads provide access to the various areas within the study area. A gravel road provides access to Area F from the Rietfontein Road.

Eskom 132kV power lines (servitude width of 22 m) are located adjacent to the western border of the study area, between the Kwa-Thema residential area and Areas D and F. The power line crosses over the north western corner of the study area (in Area F).

The access road to the waste disposal cells of the EMM Rietfontein WDF (i.e. Area A) separates Area E from Areas D and C. Adjacent to this road servitude is a Rand Water pipeline servitude. A sewer line exists between Areas F and C. These servitudes have been taken into consideration with the design of the Tonk Meter Road WDF (**Appendix 4**).

Verref have a registered servitude along the northern boundary of the study area (provides access to Area F for clay mining) and will serve as an access road between Areas E and F. This servitude will be fenced, with the exception of the area in front of the EMM Rietfontein WDF entrance where gate control will be exercised.

6.9 SOCIAL AND ECONOMIC

The EMM accommodates a population of approximately 2.8 million and constitutes 28% of Gauteng's total population. The EMM is one of the most densely populated areas in Gauteng with a population density of approximately 1,400 people per km^2 (EMM, 2011).

Approximately 48.4% of the population within the EMM is economically active. Approximately 24% of the EMM population lives in poverty and approximately 28% of the population is unemployed. Household income and per capita income exceed the national average by 10% and 33% respectively. The literacy rate is 84%, however the technical skills levels are low and not compatible with the skills requirements of the local economy (EMM, 2011).

The EMM economy accounts for approximately a quarter of the Gauteng economy, which in turn contributes over a third of the nation Gross Domestic Product (GDP). The EMM contributes approximately 7% to South Africa's spending power and approximately 7.4% to South Africa's production (EMM, 2011).

Many of the factories for the production of goods and commodities are located within the EMM. Manufacturing accounts for approximately 28% of total production output in the EMM and approximately 20% of the GDP in Gauteng (EMM, 2011).

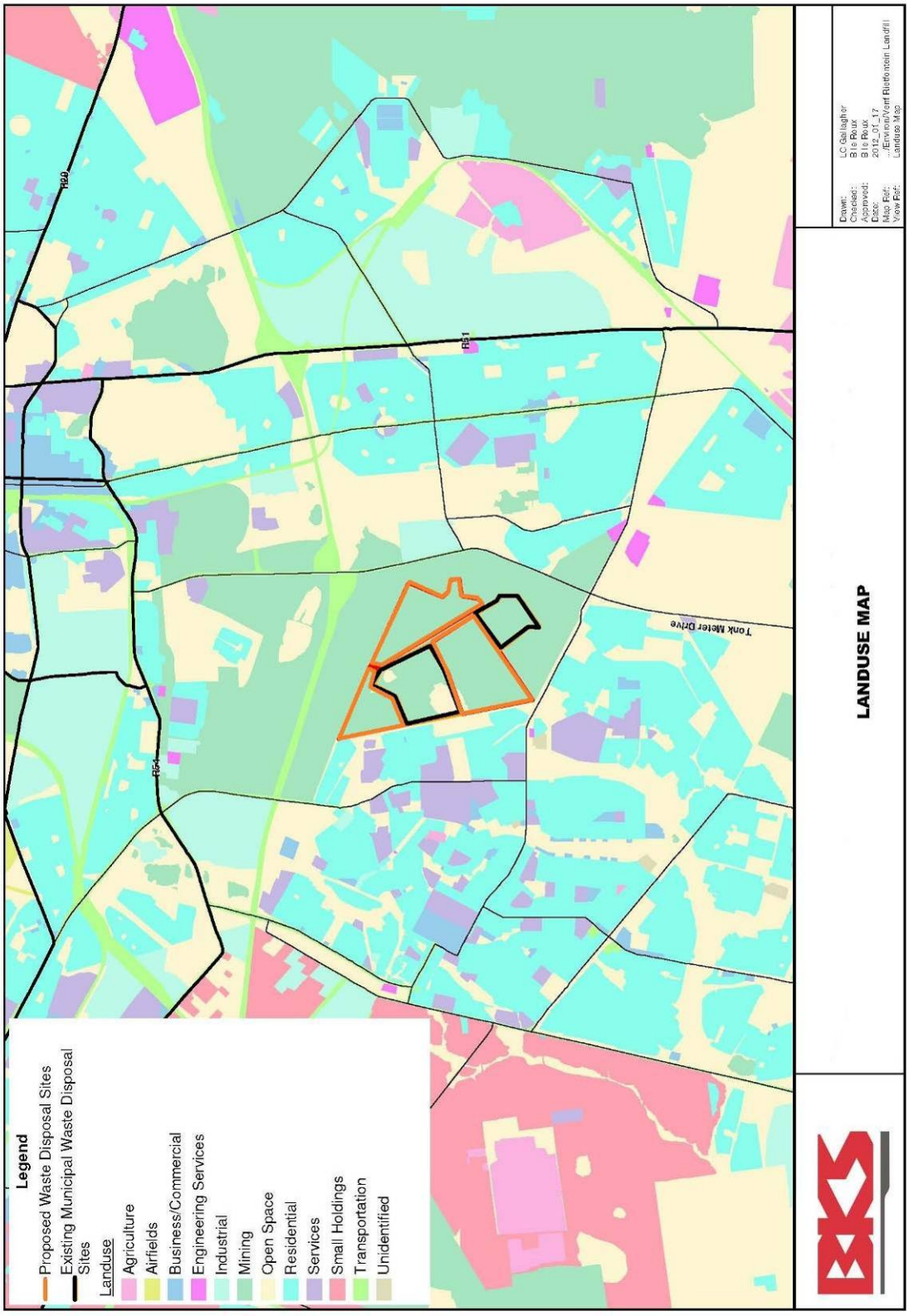

Figure 6-8: Land Use

6.10 HERITAGE RESOURCES

A Heritage Impact Assessment has been conducted on the site. No sites, features or objects of cultural significance dating to the Stone Age, Iron Age or dating to the historic period were identified in the study area (refer to **Section 7.5** and **Appendix 8**).

The following presents a description of the regional overview regarding heritage resources.

6.10.1 Stone Age

Records indicate that stone tools dating to the Early and Middle Stone Age occurred all over, for example in the Primrose Ridge area in nearby Germiston, as well as to the south at Henly-on-Klip. Tools dating to this period are mostly found in the vicinity of watercourses, and no sealed, stratified sites (i.e. rock shelter or cave) are known from the region (van Schalkwyk, 2012).

6.10.2 Iron Age

Iron Age people started to settle in southern Africa c. AD 300, with one of the oldest known sites at Broederstroom south of Hartebeespoort Dam dating to AD 470. Having only had cereals (sorghum, millet) that need summer rainfall, Early Iron Age people did not move outside this rainfall zone, and neither did they occupy the central interior highveld area. The occupation of the larger geographical area (including the study area) did not start much before the 1500s. By the 16th century things changed, with the climate becoming warmer and wetter, creating conditions that allowed Late Iron Age farmers to occupy areas previously unsuitable, for example the Witwatersrand in the region of Klipriviersberg. Here, a large number of settlements dating to the Later Iron Age occur and these sites can be related to the Bafokeng people (van Schalkwyk, 2012).

6.10.3 Historic Period

White settlers moved into the area during the first half of the 19th century. They were largely self-sufficient, basing their survival on cattle/sheep farming and hunting. Few towns were established and it remained an undeveloped area until the discovery of gold and later of coal. From early days this region was subjected to intense gold mining activities. The result is that most sites and features of heritage significance in the larger region derive from this development. The establishment of the town of Springs is closely associated with the coal mining industry and the development of railway infrastructure in the ZAR. The accidental discovery of a coal seam during gold prospecting at Boksburg in 1887 was the impetus for the construction of the first railway line north of the Vaal River, the so-called *Rand Tram*. This coincided with the founding of the *Nederlandsche Zuid-Afrikaansche Spoorweg-Maatschappij* (NZASM) in June 1887 in the Netherlands. This company was established as a concession by the ZAR government to build and operate a railway line between Pretoria and

the Mozambique border. The farm *The Springs* was surveyed by James Brooks in 1883. The neighbouring farms were Geduld, Rietfontein and Brakpan. Geduld, which now forms part of Springs, was bought by President Paul Kruger from the Pretoria businessman Albert Broderick in 1886. Kruger later sold it for "a large sum" to Messrs. Goertz & Co. In July 1888 the ZAR government authorised the NZASM to build and operate the planned light railway line between Johannesburg and Boksburg, and in January 1889 work began. The survey of the route for the railway line indicated the presence of more coal deposits at Brakpan and The Springs. Deciding on the establishment of its own colliery on The Springs, the NZASM obtained a lease in 1889 and sunk a shallow shaft at a spot where the municipal garages used to be. In November 1889 the Springs Colliery produced its first coal. However, it soon proved that the coal seams on the farm were irregular and difficult to mine. Further prospecting proved that the farm Geduld, north of The Springs, was rich in coal. The NZASM bought the coal mining rights on Geduld. The colliery on The Springs was abandoned and the underground part of the mine was extended to Geduld. The exploitation of the coal deposits on Geduld was a success and by 1899 there was a total of 18 km of underground galleries connected to the headgear, giving access to various coal seams varying between 30m and 140 m depth below surface level. In November 1892 the NZASM discovered an underground fire in the abandoned old Springs Mine, which was sealed off. In April 1898 it was found that this fire was still smouldering and in March the following year it had spread to the Geduld works. At the end of this month the Springs Colliery was closed down by flooding the mine and removing the equipment. The mine was finally decommissioned in 1904. Gold had been mined on Geduld since 1902 and by 1909 the prospect of a gold reef extending into the Springs area had become a reality. This led to the establishment of the Springs Gold Mining Company on Rietfontein. Gold mining developed rapidly, particularly after the 1930s, and with it the town grew. By that time it had surpassed the collieries in importance and in the 1950s the last colliery closed down (van Schalkwyk, 2012).

6.11 POLLUTION

6.11.1 Air Pollution

Current activities in the area that contribute to the ambient air quality include:

- industries (e.g. clay mining and brickworks);
- vehicle exhaust emissions;
- domestic fuel burning by the adjacent community (Kwa-Thema) using wood and coal;
- existing EMM Rietfontein waste disposal facility;
- illegal waste burning in the area but outside of the EMM Rietfontein landfill footprint; and
- veld fires.

Low income households in the affected area are likely to combust domestic fuels like wood and coal for space heating and/ or cooking purposes. Exposure to indoor air pollution from the combustion of solid fuels is an important cause of morbidity and mortality in developing communities. Biomass and coal smoke contain a large number of pollutants and known health hazards, including PM, CO, NO2, SO2(mainly from coal), formaldehyde, and polycyclic organic matter, including carcinogens such as benzo[a]pyrene. Although a significant percentage of households in the area are electrified, the burning of domestic fuels for heating and cooking purposes is likely to occur within the residential communities located south west of the proposed landfill (Watson, 2013).

The Verref and Corobrik brickworks are located adjacent to the proposed Tonk Meter Road WDF. The operations are associated with a clay quarry on site. The clay quarry, with its primary function being the mining or clay resources required for brick making, is also responsible for the creation of airspace in order to initiate the development of the landfill. The emissions associated with the crushing activities of the raw materials are fugitive dust emissions. PM, SO_2, NO_x, CO, CO_2 and HF are released from during the firing process. Organic compounds such as VOC and methane are emitted from the dryers and kilns (Watson, 2013).

The proposed Tonk Meter Road WDF is boarded by the Tonk Meter road which consists of high volumes of traffic on a daily basis. Low speed vehicle movements are also characteristic within the surrounding affected communities. Vehicles are a major source of criteria and hazardous air pollutants such as; NOx, CO, CO_2, HCs, SO_2, Particulate matter, Volatile organic matter and lead (Pb) (Watson, 2013).

The Rietfontein landfill (Areas A and C) owned by EMM is situated in close proximity to the proposed Tonk Meter Road WDF. Landfill gas emission and fugitive dust emission represent the main air pollutant aspects related to landfill operations. The sources of fugitive dust emissions include that of vehicle entrainment from paved and unpaved roads, materials handling operations during waste management, compaction and tipping operations, wind erosion of open areas and soil cover. Other contributing sources include vehicle activity on the landfill, including general vehicle traffic (tractor, trucks, etc.), landfill compactors and earth moving activities. The release of particulate emissions presents a health hazard as these compounds may have adsorbed molecules of toxic compounds. Landfill gases of concern associated with the general landfill operations include a range of odiferous and toxic gases. Landfill gas usually contains between 40% and 60% methane (which is currently flared in Area A, resulting in most of the toxic emissions being destroyed) and similar percentages of carbon dioxide. Other gases constitute a small fraction of the total gas and include both inorganic products and a large number of organic compounds. Odorous substances most frequently considered in air quality studies for such operations include hydrogen sulphide, butyric acid and limonene. High concentrations of amine constituents have also been known to be responsible for odour impacts of various local landfills.

Carcinogenic substances frequently measured at waste disposal sites include methylene chloride and benzene (Watson, 2013).

The potential impact of the proposed waste disposal site was assessed in the EIA phase through an air quality assessment, the results of which are summarised in Section 7.8 and are presented in Appendix 11 attached to this Draft EIA Report. The study considered the implications of the proposed Tonk Meter Road WDF and its impact on surrounding portions of land. The information and implications thereof are discussed in the Air Quality Impact Assessment in **Section 7.8**. The assessment has also taken cognisance of the impact of the existing mining operations and brickworks.

6.11.2 Groundwater Pollution

The WASP Index (Waste–Aquifer Separation Principle) is an indication of the suitability of a site for waste disposal, which takes the following into account:

a) Threat factor: the threat of the size and type of waste facility to the groundwater.

b) Barrier factor: the potential for pollutant attenuation in the upper unsaturated zone and the resultant potential for groundwater pollution.

c) Resource factor: the significance of the aquifer for local and/or regional water.

The groundwater quality monitoring around Areas A and C where waste disposal is practised, has not shown any significant deterioration in groundwater quality over the past approximately 15 years since monitoring was initiated. However, at one monitoring borehole on the western side of Area A, the water quality has deteriorated significantly since 2010 due to the partial collapse of the borehole and apparently also as a result of surface water runoff, of which the quality has been negatively impacted by gold mine tailings, that can infiltrate the borehole. The water sampled form this borehole has therefore not been representative of the original groundwater, which creates the impression that the groundwater is contaminated by the waste disposal site. This monitoring borehole needs to be replaced with a set of one shallow and one new borehole in the same area. Other monitoring boreholes at Areas A and C should also be inspected for possible collapse, and if present, consideration should also be given to replace these with similar sets of shallow and deep boreholes in order to monitor both the shallow and deeper groundwater quality at each location.

Consideration should furthermore be given to the establishment of additional pairs of monitoring boreholes along the western, northern and eastern sides of the Area A landfill site, and in view of the future establishment of waste disposal sites on Areas D, E and F, that the existing monitoring programme for Areas A and C be revised and taking into account the proposed monitoring programmes for the new disposal sites. This will ensure the early

detection of any contamination originating for each existing and future landfill sites and that appropriate action can be taken to eliminate or contain possible further contamination.

The three criteria recommended by DWAF for the classification of aquifers, (i) potential sustained yield, (ii) water quality, and (iii) significance of the aquifer, were used to classify the aquifers in the study area. In terms of groundwater significance, and based on the borehole yield and water quality information, the aquifers associated with the Vryheid Formation, and Dwyka and Malmani Groups are considered to be "non-aquifers" and were classified as of low potential sustained yield.

The results of which are summarised in Section 7.7 and presented in the specialist study in Appendix 10 attached to this Draft EIA Report. The information and implications thereof are discussed in the Geohydrological Investigations in **Section 7.7**.

6.11.3 Soil Pollution

Soil erosion prediction in the study area is very low to moderate (AGIS, 2007). The proposed site and surrounding areas have higher rates of erosion due to mining activities and a lack of vegetation cover. Proper rehabilitation of the proposed site will be required to prevent further impacts in the future. The establishment of a waste disposal facility provides a means for rehabilitation of the site as each disposal cell will be progressively capped and properly rehabilitated and vegetated upon closure.

The southern part of Area E and the eastern part of Area D were previously covered by gold tailings dams that have been reclaimed. Initial tests undertaken in Area D indicate the upper 10 – 15 m of clay appears to be contaminated by tailings. Clay further down has been indicated as uncontaminated. Large parts of the overall site are therefore not suitable for other uses (Venter, 2012).

7. SUMMARY OF SPECIALIST STUDIES

7.1 INTRODUCTION

The methodologies for the specialist studies undertaken are presented below under the relevant headings. The results of the various studies are presented and the implications considered, along with presentation of the mitigation measures proposed (where required and viable).

The following specialist studies have been included in the EIA Phase:

a) Biodiversity and Wetland Assessment by BKS (Pty) Ltd (Appendix 5).
b) Visual Impact Assessment by BKS (Pty) Ltd (Appendix 6).
c) Traffic Impact Assessment by BKS (Pty) Ltd (Appendix 7).
d) Heritage Impact Assessment by J A van Schalkwyk Heritage Consultant (Appendix 8).
e) Geotechnical and geological investigations by J P Venter Consulting Services (Appendix 9).
f) Geohydrological investigations by R Meyer Geohydrological Consultants (Appendix 10)
g) Air Quality Assessment by Royal Haskoning DHV (Appendix 11).
h) Preliminary Landfill Design and Landfill Operating Plan by Peter Legg Consulting. (Appendix 4)

7.2 BIODIVERSITY AND WETLAND ASSESSMENT

An ecological and wetland assessment was carried out for the site by CE le Roux of BKS (assisted by I Venter (Spatial Ecological Consulting) in April 2012. The specialist study is presented in Appendix 5

The scope of this study included:

a) Impact assessment:
    i. An assessment of the ecology, including vegetation and plants with specific reference to *Habenaria bicolor* and *Kniphofia typhoides.*
    ii. Sensitivities of wetlands within the site.
    iii. Potential impact of the landfill on wetlands, surface water and groundwater.

b) Baseline assessment:
    i. A *status quo* assessment of the wetlands within the proposed site, including occurrence, extent, functioning and sensitivity.
    ii. A *status quo* assessment on surface water and groundwater quality.

7.2.1 Methods

A. Desktop Study

The desktop study was undertaken by studying maps and literature, Gauteng C-Plan 2 and in accordance with the Gauteng Department of Agriculture, Conservation and Environment (GDACE) Requirements for Biodiversity Assessments Version 2 (2008). The GDARD biodiversity information service was contacted on 11 January 2012 to determine the biodiversity assessment required. Information was acquired on the following aspects of the study site:

a) Red Data Listed (RDL) species that have been recorded.
b) Veld types according to Mucina and Rutherford (2006).
c) Presence of conservation areas in the surrounding environment.
d) The hydrology of the site.

B. Field Survey

An onsite field survey was undertaken to establish the presence of species or habitats of environmental importance. The field study was to determine the occurrence and extent of wetlands within the proposed site.

The delineation of wetlands were conducted according to the DWA guidelines ("*A practical field procedure for identification and delineation of wetlands and riparian areas"*, DWAF 2005) as well as the National Water Act (1998). The following indicators were used to determine the extent of the wetlands:

a) Terrain unit indicator
b) Soil wetness indicators
c) Soil form indicator
d) Vegetation indicator

A reconnaissance walk-about was undertaken to identify and map all environmentally important species, ecosystems and wetlands. This information has been included in the study report.

C. Present Ecological State (PES) of wetlands

The PES was determined based on:

a) Comparisons between current and historical aerial photographs.
b) Current vegetation characteristics compared to those of the original veld type.
c) Land uses exerted on the site.
d) The degree of soil disturbance.
e) Waste disposal.

D. Ecological Sensitivity

Ecological sensitive aspects of the site were identified, which included the following:

a) Sensitive veld types.
b) Red data species.
c) Good PES.
d) Migratory corridors and the degree of connectivity provided by the site.
e) The presence and important functioning of wetlands.

7.2.2 Findings

The site for the proposed Tonk Meter Road WDF is highly impacted on by intensive mining activities and of the original vegetation, very little remains on the site.

No red data species were observed on the proposed development site and due to the degree of overutilization, disturbance and pollution sensitive species are not expected. However, the food plant, *Leersia hexandra*, for the sensitive Marsh Sylph Butterfly, *Metisella meninx,* was recorded on the site. It is therefore possible that the sensitive butterfly could occur on this site but unlikely due to degraded state of the habitat. The butterfly was, however not observed during the field survey.

The abundance of alien plant species in Areas E, F and the eastern portion of D indicates poor ecological conditions and significant disturbances to the soil. The western portion of Area D (now forming part of the buffer area) is more natural with some of the original grassland species present. However, this portion of Area D is impacted on by heavy grazing and illegal waste dumping.

The identification of wetlands on the proposed development site was complicated by mining activities, which disturbed the soil profile through excavations and material dumping (including reclaimed tailings dams). All excavations contain water, supporting wetland plant species, but the excavations are not natural wetlands. Wetlands were also not identified in the less disturbed areas. Although no natural wetlands were identified on the proposed development site, the assessment could not accurately determine the presence of historical natural wetlands prior to the mining activities.

No sensitivities were identified in terms of biodiversity and wetlands on the proposed development site. However, the site currently connects other open spaces and river networks and therefore acts as a migratory corridor.

7.2.3 Recommendations and Mitigation Measures

The following recommendations and mitigation measures will reduce the impact of the development on the relevant ecosystems:

a) Management practices should be in place to prevent sediments, waste, leachates or any other pollution from the landfill site to enter the groundwater and surrounding ecosystems.

b) The remaining natural areas (falling outside the mining and WDF footprints) should be incorporated into an open space system in terms of spatial planning on a large scale.

c) An independent, suitably qualified individual must act as the Environmental Control Officer.

d) Monthly audit reports by the ECO for the duration of the construction and rehabilitation phase, to be submitted to Verref.

e) Erosion control measures should be implemented in the construction area.

f) All invasive species should be controlled, as stipulated by CARA (Act No 43 of 1983), and an on-going monitoring programme is required.

7.3 VISUAL IMPACT ASSESSMENT

A Visual Impact Assessment (VIA) was conducted by MR (Mike) Howard, assisted by CE (Betsie) le Roux, of BKS in August 2012 (Appendix 6).

7.3.1 Method

The visual impact assessment was determined by performing a Viewshed Analysis of the proposed site, which considers the nature of the surrounding environment, the specifics of the proposed Tonk Meter Road WDF, and the receiving viewers.

7.3.2 Findings

The visual quality of the WDF site and its surroundings has been compromised by mines, clay quarries, soil stockpiles, the existing Rietfontein WDF, materials (rock) stockpile, roads, power lines and high density peri-urban residential areas.

The landscape of the proposed landfill site is defined as poor quality landscape (Landscape Institute/IEMA guidelines for the United Kingdom), due to existing impacts on the visual quality of the surroundings. There is an overall lack of natural and mature vegetation within the greater portions of the site.

Eucalyptus trees on the proposed development site will effectively screen the proposed landfill site.

The development will have a low visual impact, in relation to a height of 25m, which was used as a worse case scenario as the actual height will be far less

7.3.3 Mitigation Measures

Mitigation measures would entail the planting of indigenous trees at an early stage of the landfill development process if the existing *Eucalyptus* trees are to be removed.

The placement of a screening berm between the WDF and community; this will consist of materials (soils) to be used in the rehabilitation process.

Figure 7-1: Landscape images of the proposed WDF site from two different viewpoints.

7.4 TRAFFIC IMPACT ASSESSMENT

The traffic impact assessment study was carried out by Gary Edwards, assisted by Naristi Neale, of BKS during August 2012 (Appendix 7). The study assessed the impact of the proposed Tonk Meter Road WDF on the roads immediately around the site, the wider surrounding road network and the proposed access roads. Mitigation measures required have been linked into the draft Site-Specific EMPr.

7.4.1 Methods

The following roads were evaluated as part of the investigation:

a) intersection of Rietfontein Road with Tonk Meter Road; and
b) proposed access to the Tonk Meter Road WDF from Rietfontein Road.

A site investigation was undertaken on 7 August 2012 to observe present traffic volumes and operating conditions within the study area.

The existing traffic volumes were surveyed during the weekday morning peak period (06h00 – 09h00) and the weekday afternoon peak period (15h00 – 18h00) on 7 and 15 August 2012 respectively.

Electronic traffic counts were also conducted on Tonk Meter Road to evaluate the daily and weekly traffic volumes.

The *aaSIDRA for Windows Software Package* was used to evaluate and measure the identified intersection's capacity in accordance with the *Highway Capacity Manual.* The output of the analysis is given as levels of service (LOS) which are based on the average delay experienced and range from A, very good with minimum delay, to F, very bad with unacceptable delays. The V/C ratios depict the volume of vehicles in relation to the available road capacity, where values greater than 0.95 indicate insufficient capacity to accommodate vehicles, resulting in excessive queues and delay.

No recognised trip generation rates are available for landfill sites. It is, however, expected that the trip generation of the proposed Tonk Meter Road WDF will be similar to that of the adjacent landfill site, i.e. the existing EMM Rietfontein WDF. BKS therefore calculated the expected peak hour trip generation by evaluating the traffic volumes accessing the EMM Rietfontein WDF.

A preliminary condition assessment was conducted to establish the state of the roads within the study area. The assessment was done by means of a visual assessment on the condition of Tonk Meter Road and Rietfontein Road.

The roads forming part of the investigations and the proposed access for the landfill site are presented in **Figure 7-2**.

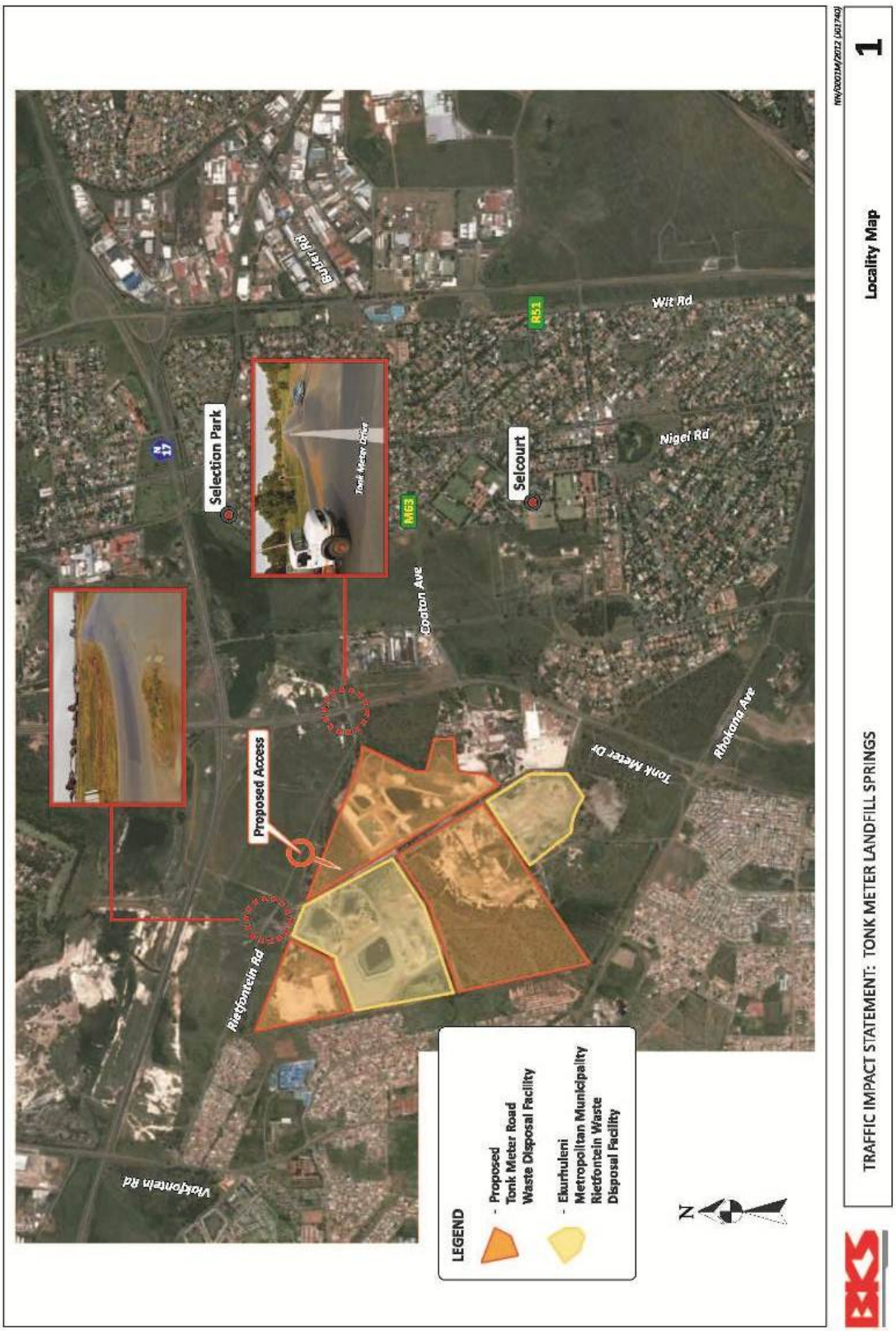

Figure 7-2: Roads under investigation and proposed access (Figure 1 of report)

7.4.2 Findings

In terms of present traffic volumes and operating conditions, the following was noted:

a) Traffic volumes on Rietfontein Road are very low.
b) High traffic volumes are present on Tonk Meter Road.
c) Considering the wider surrounding road network, additional capacity constraints occur along Tonk Meter Road, i.e.:
    i) At the N17 interchange, capacity constraints occur owing to the lack of traffic signals; and
    ii) At the intersection of Tonk Meter Road with Coaton Avenue (south of Rietfontein Road), long queues are present on the eastern approach owing to the single right turn lane.

The results of the operational analysis for the existing conditions indicate that the intersection of Tonk Meter Road Roadwith Rietfontein Road is operating close to capacity during the AM peak periods.

The trip generation expected for the Tonk Meter Road WDF is approximately 60 trucks per hour (with 30 trips inbound and 30 trips outbound). In traffic engineering terms, these additional volumes are very low and will not significantly impact the operational conditions at the proposed access or the surrounding road network. Refer to specialist report for calculations.

The additional landfill site traffic will have a low impact on the traffic flow of the surrounding road network.

Note that owing to the low volumes on Rietfontein Road and the low volumes expected to be generated by the proposed landfill site, no additional capacity analyses were conducted at the proposed access and a LOS A is expected to prevail.

Capacity constraints occur along Tonk Meter Road Roadand improvements will be required at the intersection of Rietfontein Road with Tonk Meter RoadRoad.

The condition of the pavement along Rietfontein Road and Tonk Meter Road Road is fair.

7.4.3 Recommendations

It is recommended that the proposed Tonk Meter Road WDF in Springs be approved from a traffic engineering point of view and that with the implementation thereof, the developer be responsible for the construction of a new access along Rietfontein Road. An additional right turn lane on the western approach (Rietfontein Road) of the intersection of Tonk Meter Road and Rietfontein Road is recommended.

Access to the Tonk Meter Road WDF to be obtained via a new access (one-way stop) along Rietfontein Road, located approximately 400m east of the existing EMM Rietfontein WDF access.

7.5 HERITAGE IMPACT ASSESSMENT

A heritage impact assessment was undertaken by JA van Schalkwyk Heritage Consultant in September-October 2012. The specialist study is presented in Appendix 8.

A heritage assessment includes a study on various cultural and heritage resources that may be located in the area intended for development, such as possible archaeological resources, structures older than 60 years, sites of cultural significance associated with oral histories, burial grounds and graves, graves of victims of conflict and cultural landscapes.

7.5.1 Methods

A. Preliminary Investigation

A survey of the relevant literature was conducted with the aim of reviewing the previous research done and determining the potential of the area. In this regard, various anthropological, archaeological, historical sources and heritage impact assessment reports were consulted. Information on events, sites and features in the larger region were obtained from these sources.

The *Heritage Atlas Database,* the *Environmental Potential Atlas*, the *Chief Surveyor General* (CS-G) and the *National Archives of South Africa* (NASA) were consulted.

Aerial photographs and topocadastral and other maps were also studied.

B. Field Survey

The site was investigated by travelling different transects across it.

7.5.2 Findings

No sites, features or objects of cultural significance dating to the Stone Age, Iron Age or dating to the historic period were identified in the study area.

Most of the study area has been subjected to mining and quarrying activities, which would have destroyed potential sites, features or objects that might have occurred there previously.

As no sites, features or objects of cultural heritage significance were identified in the region, there would be no impact as a result of the proposed development.

7.5.3 Recommendations

From a heritage point of view the proposed development is recommended to continue, on condition of acceptance of the following:

If archaeological sites or graves are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

7.6 GEOLOGICAL AND GEOTECHNICAL INVESTIGATIONS

Geological and geotechnical investigations were carried out by Dr JP Venter of JP Venter Consulting Services. The specialist study is presented in **Appendix 9**.

7.6.1 Methods

The following studies and investigations of the subsurface geology and soils were carried out:

- Desktop studies of available geological information on the site.
- Geophysical surveys to detect anomalies which may indicate intrusions, fault zones or other geologically significant features.
- Studies to determine the depth to dolomite underlying the site.
- Core and percussion drilling was undertaken to ascertain the deeper geology of the site. During the geological and dolomite stability investigations a total of 22 boreholes were drilled. With the existing boreholes this provides a cover of 31 boreholes situated on or very close to Areas D, E and F. Refer to Figure 7-3.
- A field mapping exercise to map geological features.
- A testpit survey with a TLB to investigate the material distribution of the shallow soils on the site.
- A deeper excavator survey to investigate the deeper soils and to sample materials for possible use as WDF liner materials.

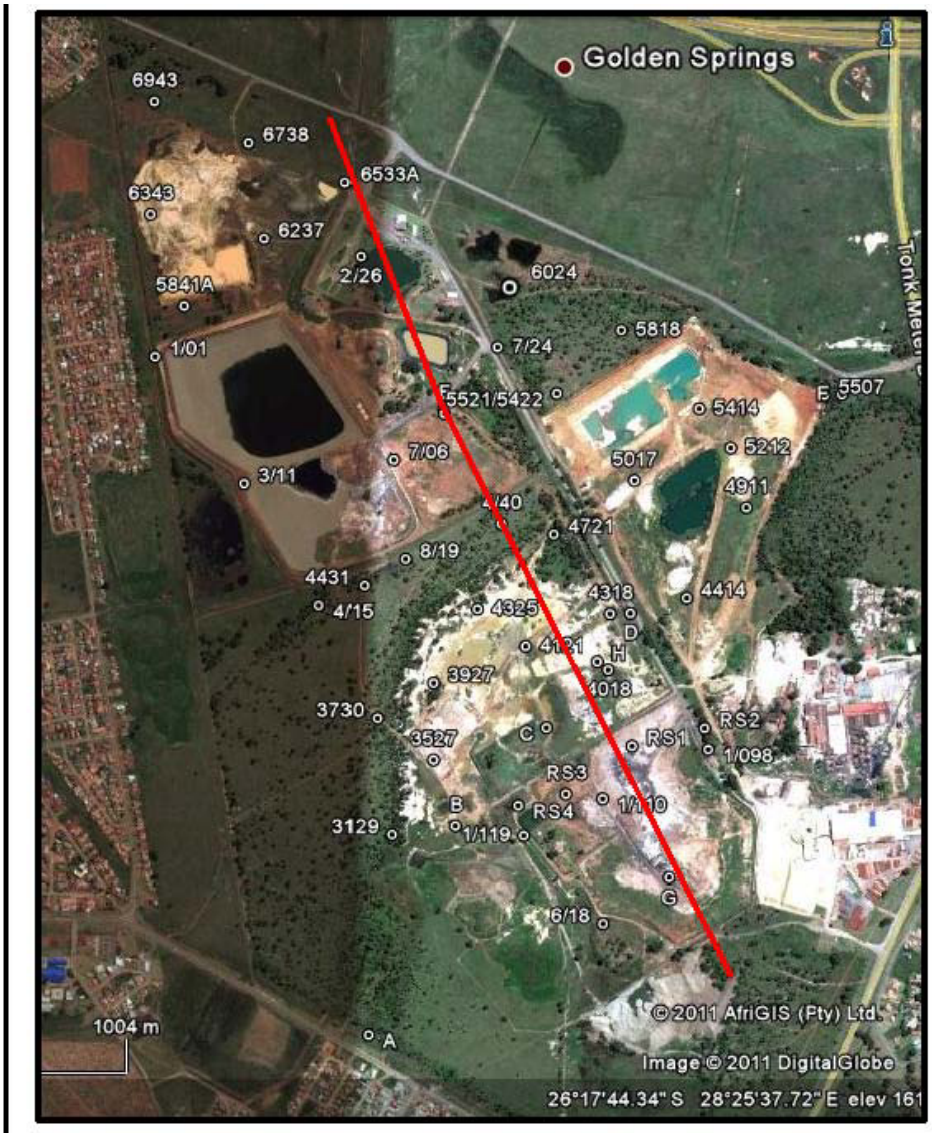

Figure 7-3: Borehole positions and location of dyke

7.6.2 Findings and Recommendations

In Area D the depth to sedimentary rocks described as Dwyka sediments range from 8 to 52 m. The minimum depth to which mudrock was encountered down to the Dwyka Group is 8 m but the depths in the central, southern and eastern areas vary from 8 to 20 m. The depths to Dwyka on the western side, and the western part of the northern area, are deeper, varying from 30 to 52 m. The depths to the dolomite rock on which the Dwyka sediments were deposited vary from 15 to 63 m. No dolomite residuum was found on the dolomite contact but "leached" dolomite rock with penetration times of about 1 to 2 min/m is sometimes present near the contact with the Dwyka sediments and occasionally deeper down in the dolomite bedrock. The geophysical surveys show the dyke to be situated east of the central part of Area D. Extensive intrusions of dolerite were encountered in boreholes west of the dyke. The intrusions are irregularly shaped and no continuous sheets are evident. The thickness of the intersections range from 5 to more than 10 m (dolerite present

at end of borehole) and more than one intersection was encountered in some boreholes and none in other boreholes (to the depths drilled).

The large southern part of Area E has been excavated for clays and only a small area remains to be excavated in the north. The majority of the area has been rehabilitated with overburden material i.e. the ferrugenised overlying sands, ferrugenised mudrock and plastic mudrocks overlying the yellow shale ("clay"). Uncompacted backfill is therefore present in the backfilled areas. In some areas temporary dams have been constructed to retain stormwater. Dwyka sediments were profiled in 5 of the 9 boreholes drilled. The Dwyka Group sediments were found at depths ranging from 17 to 28 m depth (from collar elevation which are often the backfilled overburden level in the quarry). The thicknesses of the Dwyka rocks vary from 2 to 9 m. The depth to dolomite bedrock varies from 20 to 38 m (from approximately calculated original ground surface level). As for Area D dolomite residuum is absent at the contact area with the Vryheid rocks or Dwyka but a slightly leached dolomite rock with penetration times of about 1 to 2 min/m is present in some boreholes.

In Area E only one borehole to the north in the Rand Water (RW) servitude (close to the dyke) intersected dolerite. No dolerite was found in any of the other boreholes drilled in Area E. The maximum depth of boreholes in Area E was somewhat shallower than some of the boreholes drilled in Area D e.g. 40 to 50 m compared to 57 to 70 m and dolerite may therefore be present at deeper levels.

In Area F, a large part of the site has been excavated down to a depth of about 7 m and two quarries (one backfilled) have been excavated to obtain plastic and fire clays. Material identified as belonging to the Dwyka Group was encountered in all the percussion boreholes apart from a borehole on or near to the dyke (borehole 6533A). The depths to Dwyka rocks range from 3 to 7 m in the north to 15 to 20 m in the south, with thicknesses varying from 4 to 13 m. Dolomite was encountered at depths from 11 to 29 m (apart from borehole 6533A mentioned above). Wad was only encountered in one borehole where 3 m of leached dolomite material overlies 3 m of solid dolomite with weathered and hard rock dolerite deeper down. As in the other Areas slightly leached dolomite rock which showed some faster penetration times of about 1 – 2 min/m was encountered in some boreholes. The dyke is present on the eastern side and should be very close to or on borehole 6533A. In borehole 6533A dolerite was found below Vryheid Formation sandstone from a depth of 20 m to the end of the borehole at 49 m. Dolerite, which probably represents irregular sheets or sills, was intersected in five of the remaining seven boreholes. In the boreholes where dolerite was not intersected, it is likely that dolerite is present at deeper levels. Water, mainly stormwater, is present at a depth near to the quarry floor.

Deep gold mining was undertaken on the Main Reef of the Witwatersrand Supergroup, at a depth of more than 1000 m below surface. No coal undermining has been taken within the study area. Deep underground mining activity is a source of low intensity earth tremors. It is,

however, important to note that the proposed landfill site is not within the three areas of greatest seismic hazard in South Africa. The relatively low natural seismic activity and that no major faults have been identified or are mapped to be present in the area, indicate that the potential for reactivation of existing faults or shear zones in the area is low.

No geological structural features were found to be present in the vicinity of the site

The hazard for the development of sinkholes and subsidences is low and the site (Areas D, E and F) was classified as Inherent Hazard Class (IHC) 1.

The site is suitable for the development of waste disposal facilities.

7.7 GEOHYDROLOGICAL INVESTIGATION

A geohydrological study was carried out by Reinhard Meyer, an independent Geohydrological Consultant. It should be noted that the geohydrological study and investigations were interlinked into the geotechnical and geological investigations carried out by Dr Venter (**Section 7.6**). The geohydrological specialist study is presented in Appendix 10**.**

7.7.1 Methods

The geohydrological study was carried out using the following assessment and methodology, and thus a range of aspects were addressed:

- Extensive geological investigations were conducted as part of the geotechnical investigation of the three Areas D, E and F, which included the drilling of 24 new percussion boreholes, supported by field mapping, core drilling, and test pits for soil investigations.
- A general description of the regional geological conditions based on published information followed by a more detailed description of the local geological conditions based on the information obtained from all the boreholes drilled during the current as well as several previous investigations.
- A general description of the regional geohydrological conditions based on published information.
- Sourcing available information for the area from the National Groundwater Archive of the Department of Water Affairs.
- Hydrocensus of Areas A to G, as well as the Verref Rietfontein Refractory premises and areas in the suburb of Selcourt.
- Some of the diamond core boreholes, drilled by Corobrik for clay resource assessment purposes to maximum depths of 25 m, were equipped with 25 mm diameter PVC pipe piezometers to investigate possible perched water level conditions.
- Test pumping of a selection of the newly drilled percussion boreholes.

- Water quality analyses for macro chemistry and a selection of metals at selected boreholes.
- Construction of water level contour maps of the (i) Vryheid Formation aquifer and (ii) the Dwyka Group and Malmani Subgroup aquifers and determination of the groundwater flow patterns for these aquifers.
- An aquifer classification was done according to the prescribed classification system in the DWAF Minimum Requirements documents by using the information collected during the investigations.
- The compilation of a report in which the various aspects of the hydrogeology of the areas are discussed based on an analysis of the information collected during the current and previous investigation.

7.7.2 Findings

The findings from the geohydrological investigation are summarised as follows:

- The geological basement to the area consists of mainly clastic and carbonate sedimentary and volcanic sequences deposited on a granitic basement. The Chuniespoort Group, consisting of several hundred metres of alternating formations of dolomite and chert rich dolomite, form the immediate basement in the area, on which the much younger glacial Dwyka Group was deposited. This is again overlain by mainly shale and mudstone of the Vryheid Formation that outcrop over the entire area. Weathering of the mudrocks formed clay which has been quarried for brick-making purposes.
- The geological and geohydrological information collected during the drilling of more than 80 percussion boreholes drilled across the area, resulted in a good understanding of the geological and geohydrological conditions present in the area.
- In more than 50% of the boreholes drilled, no water strikes were reported and often boreholes were completely dry at the completion of the drilling.
- In those boreholes where groundwater was intersected, the blow yield was very low. The low borehole yield was confirmed by the pump testing results obtained from those boreholes which reported higher blow yields. Only two of the pumptested boreholes had a yield of >0.5 l/s.
- Several boreholes drilled into dolomite of the Malmani Subgroup were dry at completion or had only very low blow yields.
- Of the 51 recorded water strikes, the majority occurred in the rocks of the Vryheid Formation (17x) and the Dwyka Group (14x), or at the Dwyka/dolomite contact (9x).
- No significant seepage occurs from any of the quarry walls into the quarries.
- Two different static piezometric groundwater levels are present in the area:
    - a shallow water level associated with the Vryheid Formation, and
    - a deeper piezometric level associated with the Dwyka Group and Malmani Subgroup rocks.
- Water level contour maps indicate flow directions for both the shallow and deeper groundwater to be towards the central areas and eventually draining towards the west.

- The groundwater quality observed in the majority of the boreholes present on the larger area, is of good quality and conforming to the SA Drinking Water Standards. However, one of the monitoring boreholes (Bh 1/119) at the Area A landfill site has partially collapsed and access to the deeper groundwater sampled earlier is not currently possible. As a result surface water runoff has also been allowed to infiltrate into the borehole. Due to the collapse of the borehole blocking access to the deeper groundwater, the infiltrated surface water has been sampled lately. This borehole needs to be replaced urgently to again allow the sampling of the representative deeper groundwater. None of the other monitoring boreholes around Area A show indications of groundwater contamination originating from the waste disposal activities at Area A.
- Groundwater monitoring results from Area C indicate some occasional local increased concentrations but no increasing trends in concentration are observed in the monitoring data to date. Continued careful monitoring and interpretation of the data are however required.
- According to the DWAF aquifer classification system, the aquifers present in the area have been classified as non-aquifers.

7.7.3 Recommendations

As there are indications of some specific mining related groundwater contamination present in the area, and some indication of possible contamination originating from the existing waste disposal activities, it is recommended that a carefully designed groundwater monitoring system and programme be introduced for the larger site that would be able to differentiate between different contamination sources.

Based on the results obtained during this investigation, it is concluded that from a geological and geohydrological perspective, the Areas D, E and F are considered suitable for the development of waste disposal facilities

7.8 AIR QUALITY IMPACT ASSESSMENT

An air quality impact assessment was undertaken Dr Raylene Watson of RoyalHaskoning DHV in January – March2013. The specialist study is presented in Appendix 11.

7.8.1 Methods

A. Baseline Assessment

- Provide an overview of the prevailing meteorological conditions in the area.
- Review applicable legislation and policies related to air quality management which are applicable to the proposed operations.
- A review of potential health effects associated with emissions from the proposed landfill.
- Identify existing sources of emission and surrounding sensitive receptors such as local communities.

B. Air Quality Impact Assessment

- An emissions inventory was compiled using the Golder UK Gassim Emission Inventory Model.
- Emissions for the brickworks and clay quarry were also quantified using the US EPA emission factor.
- Dispersion modelling simulations were undertaken using the AERMOD dispersion model and presented graphically as isopleths plots.
- Comparison with both national and international standards was made to determine compliance.

C. Odour Impact Assessment

- California Air Resources Board method used for assessing hydrogen sulphide related odours.
- The New South Wales EPA policy used for the assessment and management of odours from stationary sources.

D. Health Risk Assessment

- Comparison of simulated concentrations with local and international ambient air quality guidelines and standards.
- For pollutants for which no ambient guidelines are available, use is made of health and odour thresholds from the general literature with preference being given to refereed sources, e.g. US-EPA Integrated Risk Information System (IRIS) data base.

7.8.2 Findings

Health impacts associated with the proposed development are primarily associated with particulate matter. Assuming that all the Tonk Meter Road WDF is allowed to be established to a height of 20m above ground level, PM10 daily and annual standards set for post 2015 are exceeded at the site boundary. In order to reduce these impacts to within the buffer zones required a scenario whereby Sites D, E and F are only allowed to be developed to a height of 1m above ground level. By doing this impacts are reduced to only daily exceedances of the post 2015 PM10 Standard.

No PM2.5 impacts are noted to exceed the 2015 standards set by DEA. Dustfall is however noted to exceed the non residential limit of 1200 mg/m²/day by up to a factor of 2.8 in Scenario 4 (maximum extent of impacts as all sources will be in place at this stage at a maximum height of 20m). If it is again assumed that only a height of 1m above ground is developed for the Tonk Meter Landfilll sites, these dustfall impacts remain within this threshold at the site boundary (maximum north of site E).

Additional use of rock cladding instead of grassing on the landfill sites, will result in a further reduction in impacts. This brings the exceedances of the daily PM10 Standard to within the site boundary when Tonk Meter Landfill sites are assessed on their own.

Assessment of the gaseous emissions released from the site (assuming a maximum height of 20m per site), health risks, cancer risks and odour impacts remain within the acceptable thresholds cited by the various regulatory authorities. These impacts will however decrease even further if less waste is disposed of at each site due to the height restrictions being imposed.

Based on the impacts associated with the Tonk Meter Landfill sites on their own the buffers set by Gauteng Province will be met with a maximum extent of impact from site during Scenario 4 noted to be 117.6m northward from Site E, 60m westward from site F and 176.47m south easterly from site A (assuming rock cladding is used).

7.8.3 Recommendations

Dust fallout and inhalable dust needs to be managed during the operational phase through watering, grassing/cladding of slopes and long term storage piles, and the use of wind breaks specifically to the north of the site is encouraged.

During site closure rock cladding of the top surfaces of Sites D, E and F will be required to maintain the buffer zones presented. If possible discussions should also be entered into with EMM to cover their two sites to further reduce impacts. It is understood though that this may also be dependant on the availability of rock for use in the immediate vicinity of the site.

Once the landfill is in operation, gaseous samples need to be taken to evaluate the applicability of the modelled results presented in this report.

No burning of waste is to be allowed on site.

No persons are to be allowed to live on the landfill (body of landfill) due to the elevated health and cancer risks associated with doing so.

8. DESCRIPTION & COMPARATIVE ASSESSMENT OF ALTERNATIVES

8.1 OVERVIEW

"*Alternatives are different means of meeting the general purpose and need of a proposed activity. The identification, description, evaluation and comparison of alternatives are important for ensuring the objectivity of the assessment process. In cases where there is no objective and thorough assessment of alternatives, the EIA process usually only confirms a chosen activity and the value of the assessment as an input to a decision-making may be compromised*" (DEAT Guideline 4, 2006).

Various alternatives have been determined, considered and screened based on specialist planning, environmental, social, engineering and economical inputs during the Scoping Phase.

8.2 THE "DO NOTHING" / "NO GO" ALTERNATIVE

The National DEA stresses that the "Do-Nothing" "No Go" option should be considered in cases where the proposed activity will have a significant negative impact that cannot be effectively or satisfactorily mitigated.

In addition, if the proposed site does not meet the DWA's *Minimum Requirements for Landfill*, such a site would then be deemed not to be suitable for a landfill.

The "Do-Nothing" approach entails that the proposed WDF is not developed in the area, i.e. that no development as per the proposal is undertaken. The prevention of the proposed landfill will entail that potential airspace for waste disposal created by mining activities is not effectively used as these areas will be backfilled and rehabilitated as per the existing mining EMPRs.

The advantages for the proposed new WDF include the following:

a) The proposed new WDF will initially cater mainly for non-hazardous industrial waste and as a result potentially extend the life span of the existing EMM waste disposal facilities, which are predominantly used for disposal of domestic waste collected as part of municipal service delivery.

b) Airspace created by mining activities (i.e. quarries) is effectively used and is expected to provide waste disposal capacity for the next 60 years.

c) Waste disposal creates a cost effective means for rehabilitation of quarries created by mining activities and provides an environmentally sound use for areas previously scarred by mining activities (including areas where gold tailings were previously disposed of on a part of the site).

d) Limited employment opportunities are created during the construction and operational phases.

The "Do-Nothing" scenario will be the basis against which the acceptability of the identified environmental issues, and, technically and economically feasible alternatives, are assessed.

8.3 WASTE MANAGEMENT ALTERNATIVES

The waste management alternatives for waste minimisation, recycling and waste-to-energy include a Materials Recovery Facility (MRF), storage facilities for recyclable materials and extraction of landfill gas facilities.

The advantages for the MRF and recycling storage facilities is the minimisation of waste disposed to landfill, creation of a by-product rather than a waste, and potentially additional employment opportunities created. The disadvantages for the implementation of onsite recovery optimally require that the waste be separated at source. Recent projects undertaken in the EMM confirmed that a MRF dealing with mixed waste results in a too low yield to make it financially viable or sustainable at this point in time (Otto, 2012).

The inclusion of a MRF has been considered as part of the overall proposal and may be incorporated on the site once the waste volumes reach a level at which such will be viable to operate. Recycling storage facilities (i.e. public drop-off areas for recyclable materials) will only be included from the second phase of the Tonk Meter Road landfill, due to such facilities currently being available at the adjacent EMM Rietfontien landfill. Anaerobic composting will be undertaken as a means of providing compost for final rehabilitation of the respective waste disposal cells, thereby reducing the amount of garden waste disposed to landfill.

The advantages for the extraction and possible harvesting of landfill gas (i.e. methane) include an alternative energy source (e.g. for electricity generation or the brickmaking process) and a decrease of methane emissions into the atmosphere. The disadvantage is the high capital cost.

The inclusion of the extraction of landfill gas as an alternative energy source has been considered as part of the overall proposal and may be incorporated on the site once the economic viability is confirmed.

A range of technical alternatives were considered in the design of the development and the detailed reasoning as well as the specifics of the design philosophy are provided. These are discussed in the conceptual design report for the project (Appendix 4) which considers the (a) legally required minimum standards, (b) the best practice as per the draft guidelines currently being finalised by the DEA, and (c) consideration of the add-on operations that may be linked to the site.

8.4 BUFFER ZONE ALTERNATIVES

In terms of the *Minimum Requirements for Waste Disposal by Landfill* (DWAF, 2009), a buffer zone is defined as a zone to protect the public from any adverse effects of a waste disposal operation. In general, no development may take place within a proclaimed buffer zone, although certain light industries may be allowed. The width of the buffer zone is not prescribed by the DWA *Minimum Requirements* for large, general waste landfills.

The defined buffer zone study undertaken for the Gauteng Province, outlines specific desired buffer zones for various activities within the province. In relation to general waste landfills, there are two sets of buffer zones (GDARD, 2003):

- Maximum: 400 m
- Minimum: 200 m

The alternatives for the buffer zone include differential buffer zone widths, screening and a range of appropriate land development options within the buffer zone.

Buffer zone widths will vary around the boundary of the proposed waste disposal areas as these depend on site-specific circumstances such as wind strength and direction. Hypothetically, upwind buffers may potentially be narrower than downwind buffers. The buffer zone along the Kwa-Thema residential boundary will require a wider area compared to the internal boundaries (e.g. adjacent to the existing EMM Rietfontein WDF). Buffer zone widths have been investigated as part of the EIA process and determined by specialist investigations, in particular through an air quality impact assessment. Based on the air quality impacts associated with the Tonk Meter Road WDF sites (i.e. Areas D, E and F) the buffers set by Gauteng Province will be met with a maximum extent of impact from the site noted to be 117.6m northward from Site E, 60m westward from site F and 176.47m south easterly from site D (Watson, 2013; **Appendix 11).**

The air quality study results were taken as being a worst case scenario, based on a first world scenario (as no relevant standards exist in South Africa), and with mitigation for the purposes of the model limited wind breaks, screening and gas flaring. The air quality study results were considered in the Conceptual design process, in the context of previous work carried out to design landfills, within the context of the existing legislative controls for landfills, with reference to guidelines in place elsewhere in South Africa, and contextualised within the receiving environment. During site closure, rock cladding on the top surfaces of Areas D, E and F will be required.

The final buffer zones thus applied for are as follows, measured from the proposed WDF boundary to the property boundary:

- 390m west of Area D
- 200m west of Area F

- 100m north of Area F
- 60m north of Area E

Wind breaks are required to the north of the WDF. Windbreaks considered are buildings, berms and trees in order to reduce and redirect wind, thus reducing the wind speed behind the windbreak (leeward side) and reducing the wind erosion and evaporation potential.Screening alternatives include screening berms and trees. Stockpiled material (i.e. that will be used as lining, daily cover and capping material during development, operation and closure of the final cell to be developed in approximately 60 years) will be placed such that it will form a screening berm on the western boundary of Area D (i.e. between the waste cell and Kwa-Thema). As per the recommendations from the visual impact assessment, the visual impact will be lowered with the planting of indigenous trees at an early stage of the landfill development process if the existing *Eucalyptus* trees are to be removed as well as the placement of a screening berm. The screening berms will have grass / cladding on slopes to assist with the reduction of the air quality impacts.

Alternatives for land development within the buffer zones refer to the western boundary of Area D. The alternative for this area included a community cemetery within the buffer zone for Area D, light industrial development and no formal development (i.e. public / private open space). Advantages include community development regarding the cemetery and providing an ecosystem migratory corridor. Disadvantages for keeping as areas for open space include the potential for informal settlement encroachment and illegal dumping. Light industrial development would provide an additional barrier for the reduction of air quality impacts. The western buffer area for Area F would be developed for inert waste materials (i.e. builder's rubble) only and the northern buffer area for light industrial development. Light industrial development is preferred for the western buffer of Area F in order to reduce the air quality impacts associated with this specific area.

8.5 SITE ACCESS ALTERNATIVES

The alternatives for site access included a new access road from the Rietfontein Road versus the existing EMM Rietfontein landfill access road.

The proposed site access is from the Rietfontein Road, 400 m east of the existing EMM Rietfontein WDF entrance, as recommended by the specialist study.

Access to the proposed Tonk Meter Road landfill from the existing EMM Rietfontien landfill was initially considered. However due to a number of operational difficulties anticipated this alternative was not considered further.The detailed consideration of the access alternatives was thus limited to the consideration of the impacts of the new proposed access road. Information and the implications thereof were discussed in **Section 7.4** of the document in terms of the traffic specialist study.

8.6 LOCATION ALTERNATIVES

A detailed investigation on location alternatives was not undertaken in this EIA process as the proposed Tonk Meter Road landfill is site specific, utilising previously, current and future mining footprints. However, a site selection study was undertaken previously, Appendix 12**.**

A site selection study was undertaken in 1994/1995 by BKS to identify landfill sites in the larger Springs area due to the closure of the Nuffield landfill site in Springs and the need for a regional site in the Springs – Kwa Thema – Tsakane area. Considering the outcome of the extensive site selection process undertaken at the time when the EMM Rietfontein landfill was licensed, it can be concluded that the remaining areas adjacent to the existing EMM Rietfontein Landfill, i.e. Areas D, E and F, are likely to be areas best suited for development of a new landfill in the region. Refer to Appendix 12for a summary report on the site selection study.

As alternatives have not been considered in detail in this report it is acknowledged that should the preferred alternative site be rejected, that the “no go” alternative would be the alternative.

9. IMPACT ASSESSMENT METHODOLOGY

9.1 OVERVIEW

In order to determine the significance of an impact, the following criteria would be used: extent, duration, intensity and probability. The extent and probability criteria have five parameters, with a scaling of 1 to 5. Intensity also has five parameters, but with a weighted scaling.

The assessment of the intensity of the impact is a relative evaluation within the context of all the activities and other impacts within the framework of the project. The intensity rating is weighted as 2 since this is the critical issue in terms of the overall risk and impact assessment (thus the scaling of 2 to 10, with intervals of 2). The intensity is thus measured as the degree to which the project affects or changes the environment.

9.2 IMPACT ASSESSMENT CRITERIA

The criteria used for the assessment of the potential impacts of the proposed Tonk Meter Road WDF are described in **Table 9-1**. Cumulative impacts will be included as part of the impact assessment process.

Table 9-1: Impact Assessment Criteria

Criteria	Description
Nature	Includes a description of what causes the effect, what will be affected and how it will be affected.
Extent	The physical and spatial scale of the impact.
Duration	The lifetime of the impact is measured in relation to the lifetime of the proposed development.
Intensity	Examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself.
Probability	This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the lifecycle of the activity, and not at any given time.
Status	Description of the impact as positive, negative or neutral.
Significance	A synthesis of the characteristics described above and assessed as low, medium or high. A distinction will be made for the significance rating without the implementation of mitigation measures and with the implementation of mitigation measures.
Confidence	This is the level of knowledge/information that the environmental impact practitioner or a specialist had in his/her judgement.
Reversibility	Examining whether the impacted environment can be returned to its pre-impacted state once the cause of the impact has been removed.
Replaceability	Examining if an irreplaceable resource is impacted upon
Cumulative	Synthesis of different impacts in concert, considering the knock-on impacts thereof.

9.2.1 Nature and Status

The nature of the impact is the consideration of what the impact will be and how it will be affected. This description is qualitative and gives an overview of what is specifically being considered. That is, the nature considers 'what is the cause, what is affected, and how is it affected?'.

The status is thus given as being positive, negative or neutral, and is deemed to be either direct or indirect in impact.

9.2.2 Extent

The physical and spatial scale of the impact is classified in **Table 9-2**.

Table 9-2: Extent

Description	Explanation	Scoring
Footprint	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.	**1**
Site	The impact could affect the whole, or a significant portion of the site.	**2**
Local	Impact could affect the adjacent landowners.	**3**
Regional	Impact could affect the wider area around the site, that is, from a few kilometres, up to the wider Council region	**4**
National	Impact could have an effect that expands throughout a significant portion of South Africa – that is, as a minimum has an impact across provincial borders.	**5**

9.2.3 Duration

The lifetime of the impact is measured in relation to the lifetime of the proposed project, as per **Table 9-3**.

Table 9-3: Duration

Description	Explanation	Scoring
Short term	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than any of the development phases (i.e. less than 2 years).	**1**
Short to Medium term	The impact will be relevant through to the end of the construction phase (i.e. less than 5 years).	**2**
Medium term	Impact will last up to the end of the development phases, where after it will be entirely negated (i.e. related to each phase development thus less than 10 years).	**3**
Long term	The impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter (i.e. during decommissioning) (i.e. more than 10 years, or a maximum of 60 years).	**4**
Permanent	This is the only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient (i.e. will remain once the site is closed).	**5**

9.2.4 Intensity

This will be a relative evaluation within the context of all the activities and the other impacts within the framework of the project, as per **Table 9-4**.

Table 9-4: Intensity

Description	Explanation	Scoring
Low	The impact alters the affected environment in such a way that the natural processes or functions are not affected.	**2**
Low-Medium	The impact alters the affected environment in such a way that the natural processes or functions are slightly affected.	**4**
Medium	The affected environment is altered, but functions and processes continue, albeit in a modified way.	**6**
Medium-High	The affected environment is altered, and the functions and processes are modified immensely.	**8**
High	Function or process of the affected environment is disturbed to the extent where the function or process temporarily or permanently ceases.	**10**

9.2.5 Probability

This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the lifecycle of the activity, and not at any given time. The probability classes are rated in **Table 9-5**.

Table 9-5: Probability

Description	Explanation	Scoring
Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience (less than 24% chance of occurring).	**1**
Possible	The possibility of the impact occurring is very low, either due to the circumstances, design or experience (25 – 49%).	**2**
Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made (50 – 69%).	**3**
Highly likely	It is most likely that the impacts will occur at some stage of the Development. Plans must be drawn up before carrying out the activity (70 – 89%).	**4**
Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied upon (90 – 100%).	**5**

9.2.6 Confidence

The level of knowledge the EAP or a specialist had in their judgement and is rated in **Table 9-6**.

Table 9-6: Confidence

Description	Explanation
Low	The judgement is based on intuition and not on knowledge or information.
Medium	The judgement is based on common sense and general knowledge.

High	The judgement is based on scientific and/or proven information.

9.2.7 Level of Significance

The level of significance is expressed as the sum of the area exposed to the risk (extent), the length of time that exposure may occur over in total (duration), the severity of the exposure (intensity) and the likelihood of the event occurring (probability). This leads to a range of significance values running from '*no impact*' to '*extreme*'.

The significance of the impacts have been determined as the consequence of the impact occurring (reflection of chance of occurring, what will be affected (extent), how long will it be affected, and how intense is the impact) as affected by the probability of it occurring, this translates to the following formula: **Significance value = (Extent + Duration + Intensity) x Probability**.

Each impact is considered in turn and assigned a rating calculated using the results of this formula, and presented as a final rating classification according to **Table 9-7**. A distinction will be made for the significance rating of (a) without the implementation of mitigation measures, and, (b) with the implementation of mitigation measures.

Table 9-7: Level of Significance

Description	Explanation	Scoring
No Impact	There is no impact.	**0-9**
Low	The impacts are less important, but some mitigation is required to reduce the negative impacts.	**10-24**
Medium	The impacts are important and require attention; mitigation is required to reduce the negative impacts.	**25-49**
Medium to High	The impacts are of medium to high importance; mitigation is necessary to reduce negative impacts.	**50-74**
High	The impacts are of high importance and mitigation is essential to reduce the negative impacts	**75 - 89**
Extreme	The impacts present a fatal flaw, and alternatives must be considered.	**90-100**

9.3 Identification of Mitigation Measures

The purpose of mitigation measures is to reduce the significance level of the anticipated impact. Therefore, the reduction in the significance level after mitigation is directly related to the scores used in the impact assessment criteria. The effect of potential mitigation measures to reduce the overall significance level is also to be considered in each issues table (i.e. values with or without mitigation are presented).

9.4 Cumulative Impacts

A cumulative impact, in relation to an activity, is the impact of an activity that may not be significant but may become significant when added to the existing and potential impacts

arising from similar or other activities in the area. The possible cumulative impacts of this project were considered.

Cumulative impacts are those which have incremental impacts of the activity as a whole, and, others that past, present and future activities will have an impact on a common resource.

10. ASSESSMENT OF IMPACTS

10.1 OVERVIEW

The aim of the Scoping Phase was to identify, record and describe the issues that have been identified and/or raised by stakeholders, I&APs and specialists with regard to the proposed WDF. This enabled the specialist studies to be clearly focused on aspects of significant concern. It also provided a framework for the assessment of the impacts that the proposed Tonk Meter Road WDF will have on the environment, and of the impacts the environment will have on the proposed Tonk Meter Road WDF.

The description of all environmental issues that were identified during the Scoping Phase of the EIA process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures have been considered in this section of the document and the associated draft Site-Specific EMPr. The cumulative impacts anticipated for the proposed development are considered at the end of this section.

The following environmental impacts were identified. Mitigation measures proposed have been included in the assessment and draft EMPr.

Table 10-1: Potential Identified Impacts

Potential Identified Impacts	
Socio-economic Impacts	Social impacts
	Impact on traffic
	Impact on heritage resources
	Impact on visual integrity
	Impact on waste management
Biophysical Impacts	Impact on ecology
	Impact on water resources
	Impact on soils
	Impact on air quality
	Geological impacts
	Structural impacts

The specialist information was considered in terms of a formal quantification of the impact as per facets of the specific field highlighted by the specialist, as presented in **Section 7** of the EIA Report. In each case the specialist's recommendations were converted into potential mitigation measures and linked in the EMPr (Appendix 3). The mitigation measures are summarised in the impact tables.

Note that the consideration of the health impacts have been considered in terms of the media through which the health impact could be delivered, that is, air quality and groundwater contamination impacts.

10.2 BIODIVERSITY IMPACTS

As per the summary of the biodiversity assessment study presented in **Section 7.2** the key points noted were:

- The site for the proposed Tonk Meter Road WDF is highly impacted on by intensive mining activities and very little of the original vegetation, remains on the site.
- No red data species were observed on the proposed Tonk Meter Road WDF site and due to the degree of overutilization, disturbance and pollution sensitive species are not expected.
- The abundance of alien plant species in Areas E, F and the eastern portion of D indicates poor ecological conditions and significant disturbances to the soil. The western portion of Area D (now forming part of the buffer area) is more natural with some of the original grassland species present. However, this portion of Area D is impacted on by heavy grazing and illegal waste dumping.
- No natural wetlands and associated aquifers were identified on the proposed development site.
- No sensitivities were identified in terms of biodiversity and wetlands on the proposed development site. However, the site currently connects other open spaces and river networks and therefore acts as a migratory corridor.

10.2.1 Site Establishment, Infrastructure and Landfill Development

The focal point considers the ecology of the proposed site and its immediate surrounds relating to the impact of the site establishment, infrastructure and landfill development on the ecological status.

Table 10-2: Biodiversity: Site establishment, infrastructure and landfill development

Theme	Biodiversity		
Impact focal point	**Impact on ecosystem(s) – site establishment, infrastructure and landfill development– removal of vegetation, reduction in ecosystem connectivity**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Erosion and/or siltation due to excavation thereby changing the nature of the ecosystem function, removal of vegetation; Negative	Erosion and/or siltation due to excavation thereby changing the nature of the ecosystem function, removal of vegetation; Negative	Erosion and/or siltation from on-going mining and brickworks activities; Negative
Extent	Local (3)	Local (3)	Local (3)
Duration	Short term (1)	Short – Medium term (3)	Long term (4)
Intensity	Medium (6)	Medium (6)	Medium-High (8)
Probability	Highly Likely (4)	Highly Likely (4)	Highly Likely (4)

Theme	Biodiversity		
Impact focal point	**Impact on ecosystem(s) – site establishment, infrastructure and landfill development– removal of vegetation, reduction in ecosystem connectivity**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Confidence	High		Medium
Calculation	(3+1+6)*4=40	(4+4+8)*4=48	(3+4+8)*4=60
Level of significance	Medium	Medium	Medium-High
Reversibility	Yes		Yes
Replaceability	No		No
Mitigation measures	Management practices should be in place to prevent sediments, waste, leachates or any other pollution to enter the groundwater and surrounding ecosystems: • Uncontaminated storm water must be diverted around the waste cells and thereby prevented from coming into contact with waste or contaminants on the site. Discharge of effluents or polluted water from contaminated runoff or leachate into the water resources shall not be allowed. • The Contractor shall during construction prevent the discharge of any pollutants, such as bentonite, cements, concrete, lime, chemicals and fuels into the surrounding area. The remaining natural areas should be incorporated into an open space system in terms of spatial planning on a large scale. The layout and landscaping of the proposed development to allow for migratory corridors in the western portion of Area D. Erosion control measures should be implemented in the construction and landfill operation areas. All classes of clean and contaminated water is to be gravitated / pumped along the 20-m service area (9-m on existing mining areas) between the site boundaries and the edge of the mining excavation. All invasive species to be controlled, as stipulated by CARA (Act No 43 of 1983), and an on-going monitoring programme is required. Disturbed areas that are no longer in use will be rehabilitated with Tsakane Clay Grassveld species. Rehabilitation will be conducted in a progressive manner (i.e. once phased activity in an area has been completed the area will be rehabilitated). The rehabilitation of the area with indigenous vegetation must coincide with the rainfall events and all alien invasive vegetation shall be removed either through chemical or physical means. After construction, the site needs to be inspected by the ECO to ensure that the rehabilitation activities have been successful and to monitor alien vegetation re-growth. The ECO will report the condition of rehabilitation to the Applicant. A Botanical Specialist, as appointed by the Applicant, shall determine prior to the commencement of works, the appropriate seed mix to be used during the rehabilitation and operational phases of the project.		N/A
Level of significance after mitigation	**Low**	**Low**	Medium-High

Table 10-2 indicates that the preliminary site establishment phase and infrastructure development associated with the landfill land-use, the impacts to the potential loss of functionality will be significantly reduced to a "low" potential impact with implementation of the mitigation measures specified in the EMPr. The landfill cells for the Tonk Meter Road

WDF will be situated in mined areas, where vegetation will have already been removed. The area where vegetation will be removed is at the proposed entrance infrastructure.

The vegetation on the site is considered to be of limited ecological value (i.e. degraded, low indigenous vegetation level) and as such the loss of such vegetation is deemed to have a "low" impact in the context of the wider area. The potential loss of ecosystem functionality will be reduced to a "low" potential impact with implementation of the mitigation measures specified in the EMPr. The landfill cells for the Tonk Meter Road WDF will be situated in mined areas, where vegetation will have already been removed.

Note that the impact of the existing land-use, especially the mining and brickworks activities remains unmitigated and thus of a "medium" impact level.

10.2.2 Closure of Landfill and Rehabilitation

The focal point relates to the impact of the closure and rehabilitation of each of the landfill cells in terms of possible ecological impacts.

Table 10-3: Biodiversity: Closure of landfill and rehabilitation

Theme	Biodiversity		
Impact focal point	**Impact on ecosystem(s) – Closure of landfill and rehabilitation– reduction in ecosystem connectivity, damage to ecosystem**		
Phase	**Operational Phase**	**Closure & Rehabilitation Phase**	**"No go"**
Nature and status	Water contamination from leakage of leachate thereby changing the nature of the ecosystem function & loss of ecosystem connectivity; Negative	Water contamination from leakage of leachate thereby changing the nature of the ecosystem function & loss of ecosystem connectivity; Negative	Water contamination and/or loss of ecosystem connectivity from ongoing activities; Negative
Extent	Regional (4)	Regional (4)	Local (3)
Duration	Permanent (5)	Permanent (5)	Long term (4)
Intensity	Medium-High (8)	Medium-High (8)	Medium (6)
Probability	Possible (2)	Possible (2)	Likely (3)
Confidence	High		Medium
Calculation	(4+5+8)*2=34	(4+5+8)*2=34	(3+4+6)*3=39
Level of significance	Medium	Medium	Medium
Reversibility	Yes		Yes
Replaceability	No		No
Mitigation measures	Use of GLB+ / Class B liner system (see Conceptual Design) – liner appropriate to underlying geology. If a spill of any kind occurs, corrective action will be taken (notification of incident, isolation of contaminated material and safe disposal on appropriately licensed landfill). Construction waste should be disposed of properly to prevent any surface and groundwater pollution. Construction and maintenance of site drainage, including storm water-, contaminated runoff- and leachate control. As soon as feasible after completion of a lift to the final finished outer profile, the Landfill Operator will undertake the dressing (smoothening) of the outer face in preparation of the construction of the final capping, all of which will be in accordance with the Minimum Requirements for Waste		Rehabilitation per the EMPR

Theme	Biodiversity		
Impact focal point	**Impact on ecosystem(s) – Closure of landfill and rehabilitation– reduction in ecosystem connectivity, damage to ecosystem**		
Phase	**Operational Phase**	**Closure & Rehabilitation Phase**	**"No go"**
	Disposal by Landfill, 1998. All pollution monitoring boreholes will be maintained and protected for use during routine monitoring of subsurface water quality. The layout and landscaping of the proposed development to allow for migratory corridors in the western portion of Area D (i.e. buffer zone). Rehabilitation will be conducted in a progressive manner (i.e. once phased activity in an area has been completed the area will be rehabilitated). The rehabilitation of the area with indigenous vegetation must coincide with the rainfall events and all alien invasive vegetation shall be removed.		
Level of significance after mitigation	**Low**	**Low**	Low

Closure and rehabilitation is part of an ongoing process that is repeated every time a cell is filled to capacity. Capping of the landfill is undertaken as the initial step in closure and rehabilitation.

It can be concluded (**Table 10-3**) that, with mitigation as presented , the "medium" impact encountered to the ecosystem from potentially contaminated ground and surface water and thus the potential loss of functionality thereof, may be reduced to a low potential impact. This is dominantly due to the use of best practice landfill processes and the use of a Class B liner (as detailed previously Section 3). The advantages from the liner class chosen is further enhanced by monitoring mechanisms and controls from both the EMPr and Operational Management Plan which further limit the risk to the wider area.

Note that the impact of the existing land-use, remains unmitigated and thus of a low impact level.

10.3 VISUAL INTEGRITY IMPACTS

As per the summary of the visual impact assessment study presented in **Section 7.3** the key points noted were:

- The visual quality of the WDF site and its surroundings has been compromised by mines, clay quarries, soil stockpiles, the existing Rietfontein WDF, materials (rock) stockpile, roads, power lines and high density peri-urban residential areas.
- The landscape of the proposed landfill site is defined as poor quality landscape, (Landscape Institute/IEMA guidelines for the United Kingdom), due to existing impacts on the visual quality of the surroundings. There is an overall lack of natural and mature vegetation within the greater portions of the site.

- *Eucalyptus* trees on the proposed development site will effectively screen the proposed landfill site. Planting of indigenous trees at an early stage of the landfill development process if the existing *Eucalyptus* trees are to be removed.

10.3.1 Landscape Quality

The focal point with respect to visual impacts relates to potential changes in the landscape quality as an overall consideration.

Note that "construction" in **Table 10-4** is related to the preliminary development of the greater site, including the construction of ancillary infrastructure (e.g. buildings, weighbridge, and access road). Operation is related to the development and leading to the final closure of the landfill cells.

Table 10-4: Visual: Reducing landscape visual quality

Theme	Visual		
Impact focal point	**Reducing the visual quality of the landscape**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Change in visual landscape due to infrastructure development and associated activities; Negative	Change in visual landscape due to infrastructure development and associated activities; Negative	Change in visual landscape due to ongoing existing land-uses; Negative
Extent	Local (3)	Local (3)	Local (3)
Duration	Long term (4)	Permanent (5)	Long term (4)
Intensity	Low (2)	Medium (6)	Medium (6)
Probability	Possible (2)	Highly Likely (4)	Possible (2)
Confidence	High		Medium
Calculation	(3+4+2)*2=18	(3+5+6)*4=56	(3+4+6)*2=26
Level of significance	Low	Medium to High	Medium
Mitigation measures	*Eucalyptus* trees on the proposed development site will effectively screen the proposed landfill site. Planting of indigenous trees at an early stage of the landfill development process if the existing *Eucalyptus* trees are to be removed. The placement of a screening berm between the WDF and community, consisting of materials to be used in the final rehabilitation process. As soon as feasible after completion of a lift to the final finished outer profile, the Landfill Operator will undertake the dressing (smoothening) of the outer face in preparation of the construction of the final capping, all of which will be in accordance with the Minimum Requirements for Waste Disposal by Landfill, 1998. Disturbed areas that are no longer in use will be rehabilitated. Rehabilitation will be conducted in a progressive manner (i.e. once phased activity in an area has been completed the area will be rehabilitated). The rehabilitation of the area with indigenous vegetation must coincide with the rainfall events and all alien invasive vegetation shall be removed. After construction, the site needs to be inspected by the ECO to ensure that the rehabilitation activities have been successful and to monitor alien vegetation re-growth. The ECO will report the condition of rehabilitation to the Applicant. All aspects of the Landfill will be maintained in order to ensure		None

Theme	Visual		
Impact focal point	**Reducing the visual quality of the landscape**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
	its smooth and efficient operation and to prevent undue deterioration of any item.		
Level of significance after mitigation	**Low**	**Low**	Medium

Although the proposed landfill development will have a visual impact, it falls within a highly modified visual environment. Through the inclusion of mitigation measures in the form of screening by planting of trees, especially between the site and adjacent developments, the overall impact post-mitigation will be deemed to be "low".

10.4 TRAFFIC IMPACTS

As per the summary of the traffic study presented in **Section 7.4** the key points noted were:

In terms of present traffic volumes and operating conditions, the following was noted:

d) Traffic volumes on Rietfontein Road are very low.
e) High traffic volumes are present on Tonk Meter Road.
f) Considering the wider surrounding road network, additional capacity constraints occur along Tonk Meter Road, i.e.:
   iii) At the N17 interchange, capacity constraints occur owing to the lack of traffic signals; and
   iv) At the intersection of Tonk Meter Road with Coaton Avenue (southeast of Rietfontein Road), long queues are present on the eastern approach owing to the single right turn lane.

The results of the operational analysis for the existing conditions indicate that the intersection of Tonk Meter Road with Rietfontein Road is operating close to capacity during the AM peak periods.

The trip generation expected for the Tonk Meter Road WDF is approximately 60 trucks per hour (with 30 trips inbound and 30 trips outbound). In traffic engineering terms, these additional volumes are very low and will not significantly impact the operational conditions at the proposed access or the surrounding road network.

The additional landfill site traffic will have a low impact on the traffic flow of the surrounding road network.

Note that owing to the low volumes on Rietfontein Road and the low volumes expected to be generated by the proposed landfill site, no additional capacity analyses were conducted at the proposed access and a LOS A is expected to prevail.

Capacity constraints occur along Tonk Meter Road and improvements will be required at the intersection of Rietfontein Road with Tonk Meter Road.

The condition of the pavement along Rietfontein Road and Tonk Meter Road is fair.

It is recommended that the proposed Tonk Meter Road WDF in Springs be approved from a traffic engineering point of view and that with the implementation thereof, the developer be responsible for the construction of the new access along Rietfontein Road.

An additional right turn lane on the western approach (Rietfontein Road) of the intersection of Tonk Meter Road and Rietfontein Road is recommended.

Access to the WDF to be obtained via a new access (one-way stop) along Rietfontein Road, located approximately 400m east of the existing EMM Rietfontein WDF access.

10.4.1 Increased Traffic in Greater Area

The focal point with respect to traffic implications relates simply to potential increases in traffic within the area, with resultant potential congestion, road damage, noise, etc. issues.

Table 10-5: Traffic: Increased traffic in greater area

Theme	**Traffic**		
Impact focal point	**Increased traffic in greater area**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Increased traffic on local roads; Negative	Increased traffic on local roads; Negative	No change in status
Extent	Regional (4)	Regional (4)	
Duration	Short to medium term (2)	Long term (4)	
Intensity	Low (2)	Medium (6)	
Probability	Likely (3)	Likely (3)	
Confidence	High		
Calculation	(4+2+2)*3=32	(4+4+6)*3=42	
Level of significance	Medium	Medium	No impact
Mitigation measures	The Contractor during construction shall provide safe points for pedestrian and vehicular crossing at designated points. These points will be "stop-and-go" systems manned by flag persons. Orange safety fencing / netting must be utilised by the Contractor to keep pedestrians away from the construction work area. Danger tape must not be used, as this breaks easily and could litter the surrounding environment. Appropriate notification signs shall be erected by the Contractor at entrances to the construction site to warn visitors and pedestrians about the hazards around the construction site and the presence of heavy vehicles, where appropriate. Construction vehicles are to keep to the speed limits (25km/h on the construction site). Quarry vehicles shall be allowed access to mining areas. Proactive warning signs shall be erected in the case of traffic disruption or diversion and along access roads. Construction of the new access along Rietfontein Road and also an additional right turn lane on the western approach (Rietfontein Road) of the intersection of Tonk Meter Road Road and Rietfontein Road. A point control during the landfill operation where Tonk Meter		N/A

Theme	Traffic		
Impact focal point	**Increased traffic in greater area**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
	traffic crosses the EMM Rietfontein landfill access when waste is to be disposed of in Area F.		
Level of significance after mitigation	**Low**	**Low**	No impact

Given the specialist's input and professional consideration, and contextualised within the impact assessment as presented in **Table 10-5**, the potential implications in terms of changes to the existing traffic patterns are considered to be "low" once appropriate mitigation measures have been implemented.

The potential "medium" impact during operations is due to the uncertainty as to what the authorities will require in terms of modifications to the existing road network in the area and the site's access road. Once confirmed this will be able to be put in place and the impact will thus be significantly reduced and thus considered a "low" potential impact.

Note that it is the opinion of the specialist that the impact of the proposed additional vehicles to the site is considered to be low and that the road network has sufficient capacity to accommodate the additional traffic generated.

10.5 HERITAGE RESOURCES IMPACTS

As per the summary of the heritage impact assessment presented in **Section 7.5** the key points noted were:

No sites, features or objects of cultural significance dating to the Stone Age, Iron Age or dating to the historic period were identified in the study area.

Most of the study area has been subjected to mining and quarrying activities, which would have destroyed potential sites, features or objects that might have occurred there previously.

As no sites, features or objects of cultural heritage significance were identified in the region, there would be no impact as a result of the proposed development.

From a heritage point of view the proposed development is recommended to continue, on condition of acceptance of the following: If archaeological sites or graves are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

10.5.1 Loss of Heritage Resources

The focal point with respect to heritage relates to the possible loss of heritage artefacts, including archaeological and paleontological artefacts.

Table 10-6: Heritage: Loss of heritage resources

Theme	Heritage		
Impact focal point	**Possible loss of heritage resources**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Loss of / damage to artefacts due to initial infrastructure development and associated activities; Negative	Loss of / damage to artefacts due to landfill cell development and associated activities; Negative	Loss of / damage to artefacts due to ongoing mining; Negative
Extent	Site (2)	Site (2)	Site (2)
Duration	Permanent (5)	Permanent (5)	Permanent (5)
Intensity	Medium - High (8)	Medium – High (8)	Medium – High (8)
Probability	Possible (2)	Possible (2)	Possible (2)
Confidence	High		High
Calculation	(2+5+8)*2=30	(2+5+8)*2=30	(2+5+8)*2=30
Level of significance	Medium	Medium	Medium
Mitigation measures	Should a find of heritage importance be unearthed, construction activities will stop immediately at the site of discovery. The area will be fenced off with a radius of 20m around the unearthed item, demarcated as a no-go area and access will be prohibited. Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on site. The Contractor and workers, during construction, shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or paleontological artefacts, as set out in Section 51(1) of the NHRA. If archaeological sites or graves are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made		. If archaeological sites or graves are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made
Level of significance after mitigation	**Low**	**Low**	Low

Given the specialist's input and professional consideration, and contextualised within the impact assessment as presented in **Table 10-6**, the potential loss of heritage artefacts are considered to be low, especially with appropriate mitigation measures being implemented.

10.6 GEOHYDROLOGICAL IMPACTS

As per the summary of the geohydrological study (i.e. hydrocensus) presented in **Section 7.7**, the following main points were presented:

- The geological basement to the area consists of mainly clastic and carbonate sedimentary and volcanic sequences deposited on a granitic basement. The Chuniespoort Group, consisting of several hundred metres of alternating formations of dolomite and chert rich dolomite, form the immediate basement in the area, on which the much younger glacial Dwyka Group was deposited. This is again overlain by mainly shale and mudstone of the Vryheid Formation that outcrop over the entire area. Weathering of the mudrocks formed clay which has been quarried for brick-making purposes.

- The geological and geohydrological information collected during the drilling of more than 80 percussion boreholes drilled across the area, resulted in a good understanding of the geological and geohydrological conditions present in the area.
- In more than 50% of the boreholes drilled, no water strikes were reported and often boreholes were completely dry at the completion of the drilling.
- In those boreholes where groundwater was intersected, the blow yield was very low. The low borehole yield was confirmed by the pump testing results obtained from those boreholes which reported higher blow yields. Only two of the pumptested boreholes had a yield of >0.5 l/s.
- Several boreholes drilled into dolomite of the Malmani Subgroup were dry at completion or had only very low blow yields.
- Of the 51 recorded water strikes, the majority occurred in the rocks of the Vryheid Formation (17x) and the Dwyka Group (14x), or at the Dwyka/dolomite contact (9x).
- No significant seepage occurs from any of the quarry walls into the quarries.
- Two different static piezometric groundwater levels are present in the area:
    - a shallow water level associated with the Vryheid Formation, and
    - a deeper piezometric level associated with the Dwyka Group and Malmani Subgroup rocks.
- Water level contour maps indicate flow directions for both the shallow and deeper groundwater to be towards the central areas and eventually draining towards the west.
- The groundwater quality observed in the majority of the boreholes present on the larger area, is of good quality and conforming to the SA Drinking Water Standards. However, one of the monitoring boreholes (Bh 1/119) at the Area A landfill site has partially collapsed and access to the deeper groundwater sampled earlier is not currently possible. As a result surface water runoff has also been allowed to infiltrate into the borehole. Due to the collapse of the borehole blocking access to the deeper groundwater, the infiltrated surface water has been sampled lately. This borehole needs to be replaced urgently to again allow the sampling of the representative deeper groundwater. None of the other monitoring boreholes around Area A show indications of groundwater contamination originating from the waste disposal activities at Area A.
- Groundwater monitoring results from Area C indicate some occasional local increased concentrations but no increasing trends in concentration are observed in the monitoring data to date. Continued careful monitoring and interpretation of the data are however required.
- According to the DWAF aquifer classification system, the aquifers present in the area have been classified as non-aquifers.

10.6.1 Preliminary Site Establishment and Infrastructure Development

The first focal point with respect to groundwater quality and the impacts thereon considers the preliminary site establishment and infrastructure development.

Table 10-7: Groundwater: Preliminary site establishment and infrastructure development

Theme	Groundwater		
Impact focal point	**Impact on groundwater – site establishment and infrastructure development, groundwater quality changes**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Infrastructure construction – impact on groundwater quality; Negative	Potential contamination from infrastructure / services; Negative	Potential contamination from ongoing mining / brickworks activities; Negative
Extent	Site (2)	Site (2)	Site (2)
Duration	Short term (1)	Long term (4)	Long term (4)
Intensity	Medium (3)	Medium-high (4)	Medium (3)
Probability	Very likely (4)	Likely (3)	Very likely (4)
Confidence	High		Medium
Calculation	(2+1+3)*4=24	(2+4+4)*3=30	(2+4+3)*4=36
Level of significance	Low	Medium	Medium
Mitigation measures	Uncontaminated storm water runoff must be prevented from coming into contact with waste or contaminants on the site. Contaminated runoff from the waste body and leachate generated will be collected separately for appropriate treatment or disposal to sewer (where approved). Discharge of effluents or polluted water into the water resources / surrounding area shall not be allowed. All berms and water canals will be maintained in good condition and free from any blockages to effectively perform its intended function. Silt accumulating in the storm water drains will be removed at regular intervals. Where required, temporary berms and storm water drainage channels will be provided to ensure the safe and sound operation of the Landfill and daily cover borrow pit. Temporary berms and channels will only be constructed once it was ensured that it will not interfere with the long-term development plan for the Site. Canals will be lined to prevent soil and ground water pollution / provided with erosion protection as required. The Construction Contractor shall prevent the discharge of any pollutants, such as bentonite, cements, concrete, lime, chemicals and fuels into any water resource. The Construction Contractor shall ensure all works undertaken do not negatively impact upon drainage lines, either natural or man-made. Should the Contractor be required undertake works and impact upon a drainage line, the ECO shall be notified. The Contractor shall be required to make good on all damage upon completion of construction related works.		None
Level of significance after mitigation	**Low**	**Low**	**Medium**

10.6.2 Industrial Operational Substances on Site

The second focal point considers the impact of industrial operational substances kept on the site during the life of the landfill. Such substances include fuels and such for the operation of the vehicles on the site, as well as the chemicals used in the waste testing laboratory for instance.

Table 10-8: Groundwater: Industrial operational substances on site

Theme	Groundwater		
Impact focal point	**Impact on groundwater – presence of industrial operational substances on site**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Fuel, vehicle-specific substances (e.g. hydraulic, brake fluids, oil, grease) for construction specific vehicles – stored and leaking from vehicles; Negative	Vehicle-specific substances (as per construction) for all vehicles on site – stored and leaking from vehicles, and laboratory stocks; Negative	Minimal quantities spillage from vehicles on site; Negative
Extent	Site (2)	Site (2)	Footprint (1)
Duration	Short term (1)	Long term (4)	Long term (4)
Intensity	Medium (3)	Medium-high (4)	Medium (3)
Probability	Very likely (4)	Very likely (4)	Very likely (4)
Confidence	High		Medium
Calculation	(2+1+3)*4=24	(2+4+4)*4=40	(1+4+3)*4=32
Level of significance	Low	Medium	Medium
Mitigation measures	Undue contact between waste and storm water will be prevented, so as to minimise the volume of contaminated run-off and leachate generated on the Landfill. Three drainage systems will therefore be operated on Site; one for clean storm water and uncontaminated run-off from rehabilitated parts of the Landfill, the second for contaminated runoff from the operational part of the waste body that is to be directed into a contaminated water containment pond, and the third for leachate extracted from the leachate collection system forming part of the landfill liner. Throughout the operation of the landfill, the primary objective will be to reduce the generation of contaminated runoff and leachate, with the secondary objective being to treat and dispose of contaminated runoff and leachate formed in an environmentally sound manner without unnecessary exposure to the atmosphere. All chemicals will be stored in specifically designed, lockable and lined storage areas where reactive substances are classed and segregated. All hazardous substances must be stored in a lined bunded area and sufficient spill absorbent material must be provided for the type of hazardous substance stored. If a spill of any kind occurs, corrective action will be taken (notification of incident, isolation of contaminated material and safe disposal on an appropriately licensed landfill). Construction waste should be disposed of properly to prevent any surface and groundwater pollution. Construction and maintenance of Site drainage, including storm water-, contaminated runoff- and leachate control Storm water runoff must be prevented from coming into contact with waste or contaminants on the site. Discharge of effluents or polluted water into the water resources shall not be allowed. The Construction Contractor shall prevent the discharge of any pollutants, such as bentonite, cements, concrete, lime, chemicals and fuels into any water resource. The Construction Contractor shall ensure all works undertaken do not negatively impact upon drainage lines, either natural or man-made. Should the Contractor be required undertake works and impact upon a drainage line, the ECO shall be notified. The Contractor shall be required to make good on all damage upon completion of construction related works.		None

Theme	Groundwater		
Impact focal point	**Impact on groundwater – presence of industrial operational substances on site**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
	All berms and water canals will be maintained in good condition and free from any blockages to effectively perform its intended function. Silt accumulating in the storm water drains will be removed at regular intervals. Where required, temporary berms and storm water drainage channels will be provided to ensure the safe and sound operation of the Landfill and daily cover borrow pit. Temporary berms and channels will only be constructed once it was ensured that it will not interfere with the long-term development plan for the Site. Canals will be lined or provided with erosion protection as required to prevent soil and ground water pollution. The Contractors are to practice good housekeeping throughout the project life-cycle. Substances required for on-site use on plant and vehicles (e.g. top-up oil, brake fluid, hydraulic fluid) will be kept in a lock-up store within the workshop area. • The chemicals in the laboratory will be kept in an appropriate lock-up store within the laboratory, access thereto being strictly controlled. Waste materials (e.g. fuel spilt into the bunded area during delivery / filling of vehicles, top-up operations, used reagent chemicals from the laboratories), will be disposed of at a hazardous waste landfill. Used oil will be put into the oil recycling programme run by the Rose Foundation.		
Level of significance after mitigation	**Low**	**Low**	**Medium**

10.6.3 Establishment and Filling of Landfill Cells

The third focal point relates to how the cycle of landfill cell establishment and disposal of waste into the cells may impact on the groundwater quality.

Table 10-9: Groundwater: Establishment and filling of landfill cells

Theme	Groundwater		
Impact focal point	**Impact on groundwater – establishment of new landfill cells**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Water resource contamination from spillages during construction; Negative	Water resource contamination from leakage of leachate; Negative	Water resource contamination from ongoing agricultural / brickworks activities; Negative
Extent	Regional (3)	Regional (3)	Local (2)
Duration	Short to medium term (2)	Permanent (5)	Long term (4)
Intensity	Low (2)	High (5)	Medium (3)
Probability	Likely (3)	Very likely (4)	Very likely (4)
Confidence	High		Medium
Calculation	(3+2+2)*3=21	(3+5+5)*4=52	(2+4+3)*4=36
Level of significance	Low	Medium to high	Medium
Mitigation measures	Use of GLB+ / Class B liner system (see Conceptual Design) – liner appropriate to underlying geology. Undue contact between waste and storm water will be prevented, so as to minimise the volume of contaminated run-off and leachate generated on the Landfill. Three drainage systems will therefore be operated on Site; one		None

Theme	Groundwater		
Impact focal point	**Impact on groundwater – establishment of new landfill cells**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
	for clean storm water and uncontaminated run-off from rehabilitated parts of the Landfill, the second for contaminated runoff from the operational part of the waste body that is to be directed into a contaminated water containment pond, and the third for leachate extracted from the leachate collection system forming part of the landfill liner. Throughout the operation of the landfill, the primary objective will be to reduce the generation of contaminated runoff and leachate, with the secondary objective being to treat and dispose of contaminated runoff and leachate formed in an environmentally sound manner without unnecessary exposure to the atmosphere. The Contractors are to practice good housekeeping throughout the project life-cycle As soon as feasible after completion of a lift to the final finished outer profile, the Landfill Operator will undertake the dressing (smoothening) of the outer face in preparation of the construction of the final capping, all of which will be in accordance with the Minimum Requirements for Waste Disposal by Landfill, 1998. • All pollution monitoring boreholes will be maintained and protected for use during routine monitoring of subsurface water quality..		
Level of significance after mitigation	**Low**	**Low**	**Medium**

10.6.4 Closure of Landfill Cells and Rehabilitation

The fourth focal point relates to the end of the operational life for each specific landfill cell and the options followed to ensure that closure is optimally carried out.

Table 10-10: Groundwater: Closure of landfill cells and rehabilitation

Theme	Groundwater	
Impact focal point	**Impact on ecosystem(s) – Closure of landfill cells and rehabilitation**	
Phase	**Rehabilitation and Closure Phase**	**"No go"**
Nature and status	Water resource contamination from leachate during rehabilitation; Negative	Water resource contamination from ongoing mining / brickworks activities; Negative
Extent	Local (3)	Site (2)
Duration	Permanent (5)	Long term (4)
Intensity	High (5)	Medium (3)
Probability	Very likely (4)	Very likely (4)
Confidence	High	Medium
Calculation	(3+5+5)*4=52	(2+4+3)*4=36
Level of significance (without mitigation)	Medium to high	Medium
Mitigation measures	Use of GLB+ / Class B liner system (see Conceptual Design) – liner appropriate to underlying geology. Undue contact between waste and storm water will be prevented, so as to minimise the volume of contaminated run-off and leachate generated on the Landfill. Three drainage systems will therefore be operated	None

Theme	Groundwater	
Impact focal point	**Impact on ecosystem(s) – Closure of landfill cells and rehabilitation**	
Phase	**Rehabilitation and Closure Phase**	**"No go"**
	on Site; one for clean storm water and uncontaminated run-off from rehabilitated parts of the Landfill, the second for contaminated runoff from the operational part of the waste body that is to be directed into a contaminated water containment pond, and the third for leachate extracted from the leachate collection system forming part of the landfill liner. Throughout the operation of the landfill, the primary objective will be to reduce the generation of contaminated runoff and leachate, with the secondary objective being to treat and dispose of contaminated runoff and leachate formed in an environmentally sound manner without unnecessary exposure to the atmosphere. The Contractors are to practice good housekeeping throughout the project life-cycle As soon as feasible after completion of a lift to the final finished outer profile, the Landfill Operator will undertake the dressing (smoothening) of the outer face in preparation of the construction of the final capping, all of which will be in accordance with the Minimum Requirements for Waste Disposal by Landfill, 1998. All pollution monitoring boreholes will be maintained and protected for use during routine monitoring of subsurface water quality.	
Level of significance after mitigation	**Low**	**Medium**

10.7 AIR QUALITY IMPACTS

The air quality impacts considered in this section of the report are based on the findings of the Air Quality Assessment presented in **Section 7.8**. As indicated in this section's overview, the specialist's recommendations were converted into mitigation measures, as proposed, and linked in the EMPr. The key mitigation measures only are presented in the impact consideration tables.

As indicated previously, the consideration of the health impacts are considered in terms of the media through which the health impact could be delivered, that is, air quality and water contamination impacts.

To summarise, the findings of the Air Quality Assessment for the proposed Tonk Meter Road landfill found that:

> Health impacts associated with the proposed development are primarily associated with particulate matter. Assuming that all the Tonk Meter Road WDF is allowed to be established to a height of 20m above ground level, PM10 daily and annual standards set for post 2015 are exceeded at the site boundary. In order to reduce these impacts to within the buffer

zones required a scenario whereby Sites D, E and F are only allowed to be developed to a height of 1m above ground level. By doing this impacts are reduced to only daily exceedances of the post 2015 PM10 Standard.

The primary source responsible for these exceedances in Scenario 4 is Area A the municipal site. When the impacts from the Tonk Meter landfill are further assessed on their own exceedances for all scenarios fall below the allowable 4 exceedances threshold.

No PM2.5 impacts are noted to exceed the 2015 standards set by DEA. Dustfall is however noted to exceed the non residential limit of 1200 mg/m²/day by up to a factor of 2.8 in Scenario 4 (maximum extent of impacts as all sources will be in place at this stage at a maximum height of 20m). If it is again assumed that only a height of 1m above ground is developed for the Tonk Meter Landfilll sites, these dustfall impacts remain within this threshold at the site boundary (maximum north of site E).

Additional use of rock cladding instead of grassing on the landfill sites, will result in a further reduction in impacts. This brings the exceedances of the daily PM10 Standard to within the site boundary when Tonk Meter Landfill sites are assessed on their own.

Assessment of the gaseous emissions released from the site (assuming a maximum height of 20m per site), health risks, cancer risks and odour impacts remain within the acceptable thresholds cited by the various regulatory authorities. These impacts will however decrease even further if less waste is disposed of at each site due to the height restrictions being imposed.

Based on the impacts associated with the Tonk Meter Landfill sites on their own the buffers set by Gauteng Province will be met with a maximum extent of impact from site during Scenario 4 noted to be 117.6m northward from Site E, 60m westward from site F and 176.47m south easterly from site A (assuming rock cladding is used).

The information generated by the air quality report was considered and assessed in terms of the assessment methodology, for the identified impact focal points relating to air quality, namely:

- Dust generation during construction and related maintenance of ancillary infrastructure: The first focal point with respect to air quality relates to the generation of dust during the initial wider site construction phase (including construction of the entrance infrastructure), along with the ongoing maintenance of the ancillary infrastructure across the lifespan of the proposed landfill site (liner construction (**Table 10-11**).
- Development of landfill cells (landfill operations), including gaseous emissions: The second focal point relates to the generation of dust during each landfill cell's development and closure, plus generation of a range of gases from the landfill body during disposal and subsequent decomposition of organic substances (**Table 10-12**).

- The issue of Particulate Matter (PM) specifically (**Table 10-13**).

10.7.1 Dust Generation - Construction, Related Maintenance of Ancillary Infrastructure

The first focal point with respect to air quality relates to the generation of dust during the initial wider site construction phase (including construction of the entrance infrastructure), along with the ongoing maintenance of the ancillary infrastructure across the lifespan of the proposed landfill site (liner construction). Dust includes particulate matter (PM).

Table 10-11: Air Quality: Dust generation – construction, related maintenance of ancillary infrastructure

Theme	Air Quality		
Impact focal point	**Impact on air quality of study area – Construction and maintenance of landfill ancillary infrastructure**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Construction of infrastructure (dust); Negative	Maintenance of infrastructure (dust); Negative	Dust from mining, and brickworks operations; Negative
Extent	Site (2)	Site (2)	Site (2)
Duration	Short term (1)	Long term (4)	Long term (4)
Intensity	Low-Medium (4)	Low-Medium (4)	Low-Medium (4)
Probability	Highly Likely (4)	Possible (2)	Highly Likely (4)
Confidence	High		High
Calculation	(2+1+4)*4=28	(2+4+4)*2=20	(2+4+4)*4=40
Level of significance	Medium	Low	Medium-High
Mitigation measures	Wind breaks in the form of trees or similar porous structure should be constructed and maintained along the northern side of the site. All dust-generating surfaces to be routinely sprayed with water, a dust suppressing agent or similar substance to prevent dust generation. Potable and contaminated water will not be used as a dust-suppressing agent and only recycled and/or rain water is to be used, when available. Contaminated runoff may however be used within the lined footprint of the waste disposal cells. Rehabilitated landfill slopes and long term soil storage stockpiles are to be grassed. During site closure rock cladding of the top surfaces of Sites D, E and F will be required to maintain the buffer zones presented. A weather station should be situated on site to assess prevailing wind fields so that complaints can be addressed based on empirical data. Dust monitoring shall be undertaken as per the prevailing regulatory requirements. A complaints register should be maintained with dust related complaints assessed and adjustments made to management measures as needed to mitigate impacts on surrounding receptors. Development of appropriate buffer zones around the site as informed by the Air Quality study and the Conceptual design – as part of the final detailed design process.		None
Level of significance after mitigation	**Low**	**Low**	**Medium-High**

It can thus be concluded from **Table 10-11** as supported by the information presented that, with mitigation in the form of dust control / minimisation mechanisms, that the expected impact can be mitigated to a low impact.

10.7.2 Development of Landfill Cells, Including Gaseous Emissions

The second focal point relates to the generation of dust (including PM) during each landfill cell's development and closure, plus generation of a range of gases from the landfill body during disposal and subsequent decomposition of organic substances.

Table 10-12: Air Quality: Development of landfill cells, including gaseous emissions

Theme	Air Quality		
Impact focal point	**Impact on air quality of study area – Development of landfill cells**		
Phase	**Construction / Closure of Cell Phases**	**Operational Phase**	**"No go"**
Nature and status	Construction and closure of landfill cell (dust); Negative	Gaseous emissions from active landfill cells (odour, health impacting substances); Negative	Dust / gaseous emissions from mining, and brickworks operations; Negative
Extent	Site (2)	Local (3)	Site (2)
Duration	Short term (1)	Long term (4)	Long term (4)
Intensity	Low (2)	Medium (6)	Low (2)
Probability	Highly Likely (4)	Highly Likely (4)	Highly Likely (4)
Confidence	High		High
Calculation	(2+1+2)*4=20	(3+4+6)*4=52	(2+4+2)*4=32
Level of significance	Low	Medium-High	Medium
Mitigation measures	Wind breaks in the form of trees or similar porous structure should be constructed and maintained along the northern side of the site. All dust-generating surfaces to be routinely sprayed with water, a dust suppressing agent or similar substance to prevent dust generation. Potable and contaminated water will not be used as a dust-suppressing agent and only recycled and/or rain water is to be used, when available. Rehabilitated landfill slopes and long term soil storage stockpiles are to be grassed. During site closure rock cladding of the top surfaces of Sites D, E and F will be required to maintain the buffer zones presented. A weather station should be situated on site to assess prevailing wind fields so that complaints can be addressed based on empirical data. Dust monitoring shall be undertaken as per the prevailing regulatory requirements. A complaints register should be maintained with odour related complaints assessed and adjustments made to management measures as needed to mitigate impacts on surrounding receptors. Gas extraction and flaring must be undertaken on site to limit the quantities of pollutants being released to atmosphere. At least a 70 – 80% efficiency should be achieved. Options other than flaring should be investigated to make use of this energy source, e.g. as a source of heat for brickmaking or for electricity generation. Sampling of landfill gas should be undertaken at intervals prescribed by the authorities in order to evaluate the levels and		None

Theme	Air Quality		
Impact focal point	**Impact on air quality of study area – Development of landfill cells**		
Phase	**Construction / Closure of Cell Phases**	**Operational Phase**	**"No go"**
	migration of gaseous pollutants in the landfill body. This information should be used to inform adequate gaseous extraction and flaring is taking place. Development of appropriate buffer zones around the site as informed by the Air Quality study and the Conceptual design – as part of the final detailed design process.		
Level of significance after mitigation	**Low**	**Medium(1)** **Low(2)**	**Medium**

It can thus be concluded from **Table 10-12** as supported by the information presented that, mitigation in the form of dust control and dust minimisation mechanisms, that the "low" impact will be further lowered for the construction / closure phase. The existing industrial and mining related infrastructure, was an important consideration. Dust minimisation mechanisms plus, critically, the inclusion of a landfill gas flaring programme(1) linked to the active, gas generating cells, will reduce the potential "medium to high" impact to a "medium" impact.

The risk to the surrounding area will most importantly be reduced by the finally selected buffer zones around the site(2) which reduce the potential impact to "low" for the receivers around the site itself. The currently proposed buffer zones are based on the information generated / gathered to date and have resulted in the proposed buffer zones as presented in Section 8.

10.8 SOCIAL IMPACTS

10.8.1 Infrastructure and Services

The infrastructure and services focal point relates to the implications to the local area's infrastructure and services.

Table 10-13: Social: Infrastructure and Services

Theme	Social		
Impact focal point	**Infrastructure and Services – Study, surrounding areas and municipal area**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Variable refers to impact the project may have on infrastructure and services during construction; Negative	Variable refers to impact the project may have on infrastructure and services during operation; Negative	No contribution to services and infrastructure; Negative
Extent	Regional (4)	Regional (4)	Regional (4)
Duration	Short to medium term (2)	Long term (4)	Long term (4)
Intensity	Medium (6)	Medium (6)	Medium (6)
Probability	Highly Likely (4)	Likely (3)	Likely (3)
Confidence	High		Medium
Calculation	(4+2+6)*4=48	(4+4+6)*3=42	(4+4+6)*3=42
Level of significance	Medium	Medium	Medium

Theme	Social		
Impact focal point	**Infrastructure and Services – Study, surrounding areas and municipal area**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Mitigation measures	The pre-construction survey must be conducted prior to the commencement of the construction works. It must be attended by Verref (or designated representative) and the ECO. Information and agreements to be captured in the document (a copy of which is to be submitted to the Project Manager): • Existing services, buildings and structures: Position, type, condition and other details of existing services (fencing, gates, roads, telephone lines, power lines etc.), buildings and structures within the construction site. • This survey must include photographical records. Location of existing services and widths of existing servitudes to be demarcated to avoid damage and to ensure disruption to surrounding areas are avoided. Existing infrastructure and services should not be damaged or interrupted during the construction phase.		None
Level of significance after mitigation	**Low**	**Low**	Medium

The impact assessment thus concluded (**Table 10-14**) that the potential risks can be mitigated to a low impact during construction in terms of disruption to the infrastructure and services. Maintenance and management of the landfill should not impact on existing infrastructure and services either.

Mitigation to minimise potential impacts on infrastructure and services around the site are included in the EMPr. To ensure successful mitigation, these controls must be implemented.

10.8.2 Noise Nuisance

The focal point with respect to noise impacts relates to potential changes in the nuisance impacts from noise generation from the site. Mining operations are being undertaken on the site and adjacent waste disposal operations are considered to have a similar or higher noise generation potential.

Table 10-14: Social: Noise Nuisance

Theme	Social		
Impact focal point	**General Noise Nuisance – site and surrounding areas**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Noise impacts to local receivers; Negative	Noise impacts to local receivers; Negative	Noise impacts to local receivers due to ongoing mining, brickworks and waste operations; Negative
Extent	Local (3)	Local (3)	Local (3)
Duration	Short term (1)	Long term (4)	Long term (4)
Intensity	Medium (6)	Medium (6)	Medium (6)
Probability	Highly Likely (4)	Highly Likely (4)	Highly Likely (4)
Confidence	Low		Low
Calculation	(3+1+6)*4=40	(3+4+6)*4=60	(3+4+6)*4=60
Level of significance	Medium	Medium - High	Medium - High

Theme	Social		
Impact focal point	**General Noise Nuisance – site and surrounding areas**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Mitigation measures	Noise sources include construction and landfill operation plant, power tools and compressors, vehicle movements, general construction activity and drilling. To limit noise levels, the following actions will be taken: Vehicles and machinery will be kept in good working order and equipped with silencers. The speed of waste delivery and construction vehicles in construction areas will be limited to 25km/h. Any complaints will be investigated and corrective action implemented and documented within 7 days. Initial construction activities should be limited to normal working hours and should not be undertaken over weekends. The Landfill will be operated every day of the year, including Saturdays, Sundays and the Public Holidays (excluding Christmas day) during pre-determined and agreed upon operating hours, as per Operating Management Plan and EMPr. The placement of a screening berm between the WDF and affected community, consisting of materials to be used in the final rehabilitation process. Buffer zones to be implemented.		None
Level of significance after mitigation	**Low**	**Medium**	Medium-High

The proposed landfill site is within an area already highly modified due to mining activities, factories and waste disposal operations, which generate significant noise to receivers in the area. Noise, during the operational phase, is limited dominantly to normal business hours as defined in the Operational Management Plan and underwritten in the EMPr.

It was thus concluded from the assessment (presented in **Table 10-15**) that, with the mitigation measures, the potential impacts can be significantly reduced to a "low" potential impact. Mitigation to minimise potential impacts on the neighbours around the site are included in the EMPr. To ensure successful mitigation, these controls must be implemented.

10.8.3 Employment Opportunities

This focal point relates to consequences in terms of employment opportunities and inequities in skills for the site, surrounding area and region as a whole.

Table 10-15: Social: Employment opportunities and skills inequities

Theme	Social		
Impact focal point	**Employment Opportunities and Skills Inequities – Site, surrounding areas and region**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	The impact of skills and employment inequities; Positive	Redressing the skills and employment inequities over the longer term; Positive	No change in status
Extent	Regional (4)	Regional (4)	
Duration	Short to medium term (2)	Long term (4)	
Intensity	Low - Medium (4)	Low - Medium (4)	
Probability	Possible (2)	Possible (2)	
Confidence	High		

Theme	Social		
Impact focal point	**Employment Opportunities and Skills Inequities – Site, surrounding areas and region**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Calculation	(4+2+4)*2=20	(4+4+4)*2=24	
Level of significance	Low	Low	No impact
Mitigation measures	Municipal representatives could assist in identifying local subcontractors and/or labourers that should be considered for possible employment. The tender documentation should stipulate the use of local labourers or enterprises. Contractors should be made to use local skills or to train semi-skilled people for employment purposes, where possible. Onsite training should focus on the development of transferable skills to ensure long term benefits to individuals and to mitigate overall community vulnerability. No scavenging will be allowed on the landfill workface. The removal of sharp steel objects from the workface that could cause punctures to waste collection vehicle tyres as well as tyres disposed of with the general waste will however be the only exceptions and removal thereof from the disposable waste stream a requirement		N/A
Level of significance after mitigation	**Low (positive)**	**Low (positive)**	No impact

From the assessment presented in terms of **Table 11-16** the impact of the proposed landfill site in terms of "job creation" opportunities was determined to be limited to a certain degree due to the skilled personnel requirement. However, the development of the waste disposal facility requires not only skilled personnel, but also a limited number of unskilled individuals. Labour intensive methods are thus recommended to be used during the construction phase, which could thus ensure that skills inequities would be limited and that more locals would be employable as feasible. Some limited local benefits could thus accrue and would mainly focus on areas where unskilled labour is required. Approximately 50 short term (temporary) positions will be created during the construction of the proposed Tonk Meter Road WDF. Approximately 15 permanent positions will be created as part of the operations. Once waste separation at source becomes a reality in Gauteng, approximately 40 additional permanent positions may be created through the addition of a Material Recovery Facility (MRF) at the proposed Tonk Meter Road WDF. The anticipated social impacts with regards to employment during the construction and operational phases for the local study area would thus remain low but positive.

10.8.4 Safety and Security

The focal point relates to the safety and security concerns.

Table 10-16: Social: Safety and Security

Theme	Social		
Impact focal point	**Safety and security – Site, surrounding areas**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Accidents involving pedestrians and road users, possible increase in crime, fires and resulting economic losses; Negative	Accidents involving pedestrians and road users, possible increase in crime, fires and resulting economic losses; Negative	No change in status
Extent	Local (3)	Local (3)	
Duration	Short to medium term (2)	Long term (4)	
Intensity	Medium (6)	Low - Medium (4)	
Probability	Likely (3)	Possible (2)	
Confidence	High		
Calculation	(3+2+6)*3=33	(3+4+4)*2=22	
Level of significance	Medium	Low	No impact
Mitigation measures	General risks associated with the construction activities should be addressed through compliance with the relevant health and safety procedures and regulations. The movement of construction vehicles should be carefully managed. Construction vehicles must be kept in good working order, adhere to speed limits and avoid areas with large numbers of pedestrians. Local employment must be maximised. This could minimise the potential for criminal activity or perception of an increase in criminal activity due to the presence of an outside workforce. The implementation of the landfill management measures should be monitored continuously. Construction sites should be secured to avoid unauthorised entry. The property should be securely fenced. The operations area should be fenced, and access to the area should be controlled to avoid unauthorised people entering the area. The construction sites should be clearly marked and "Danger" and "No Entry" signs should be erected. Speed limits on the local roads surrounding the proposed waste disposal facility should be enforced by the Contractors.		N/A
Level of significance after mitigation	**Low**	**Low**	No impact

The main impacts with regard to safety and security, as presented in **Table 10-17**, with regards to the safety of the receiving or affected communities are associated with the possible increase in crime associated with the influx of strangers or outsiders to the area.

In a similar vein, the impact of increased and unsafe vehicle traffic during the construction and operational phases of the proposed waste disposal facility is perceived as risky.

Safety and security impacts during the operational phase are similar, although construction vehicles and plantare replaced by waste delivery vehicles and operational plant.

The controls as specified must be implemented and reviewed periodically for efficacy. The normal period of review for such a project type is set at either five or ten years – the setting of this timeline is at the authorities' discretion.

10.8.5 Vermin and Vector Impacts

The focal point with respect to potential vermin and vector spread within the wider area impacts relates to the presence of waste materials acting as a food source to animal species that tend to frequent landfills and may potentially carry disease and or vermin.

Table 10-17: Social: Vermin and Vectors

Theme	Social		
Impact focal point	**Vermin and vectors – Site, surrounding areas**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Increased vermin and vector species in area; Negative	Increased vermin and vector species in area; Negative	Increased vermin and vector species in area; Negative
Extent	Local (3)	Local (3)	Local (3)
Duration	Short to medium term (2)	Long term (4)	Long term (4)
Intensity	Low-Medium (4)	Medium - High (8)	–Low-Medium (4)
Probability	Likely (3)	Highly Likely (4)	Likely (3)
Confidence	High		Medium
Calculation	(3+2+4)*3=27	(3+4+8)*4=60	(3+4+4)*3=33
Level of significance	Medium	Medium - High	Medium
Mitigation measures	The Applicant will ensure that all components associated with site establishment are designed and positioned to limit the nuisance factor affecting surrounding land owners/users. All aspects of the Landfill will be maintained in order to ensure its smooth and efficient operation and to prevent undue deterioration of any item. The buildings and structures will be maintained on an on-going basis. This will include, but not be limited to the following: ▪ General housekeeping to ensure that all buildings are maintained and kept clean inside and outside as well as all areas surrounding the buildings. ▪ Upkeep and maintenance of gardens and landscaped areas, as it may apply. ▪ Ensuring clean and hygienic conditions in all ablution facilities as well as kitchen/dining areas. The Landfill Operator will take all reasonable measures to operate the Landfill so as to reduce and, where possible, prevent nuisances such as: Vectors and rodents (by applying sanitary landfill procedures of compaction and covering, as well as by providing fly bait and fly traps at the waste disposal working face, public disposal area, etc. Rat traps or natural rodent control measures will be implemented to prevent poisoning of birds in the area). .		None
Level of significance after mitigation	**Low**	**Low**	Medium

Although it is acknowledged that the proposed landfill site will lead to the presence or increase in the number of certain vermin and vector species, the disturbed nature of the wider area with the existing neighbouring land-uses mean that the area is likely to have a population of some of these species already present.

The requirement to limit the presence of such animals is to (a) limit the amount of scavangeable material available through requiring, over time, a reduced level of organic

materials in the waste stream, (b) ensuring that daily cover of the open waste face is always covered so as to limit the area to which such animals can have access.

It was thus concluded from the assessment (presented in **Table 11-18**) that, with the mitigation measures as recommended in the Operational Management Plan and integrated into the EMPr, that the potential impacts that could arise during the Construction, and especially the Operational phase, can be significantly reduced to a "low" potential impact.

Mitigation to minimise potential impacts on the neighbours around the site are included in the EMPr. To ensure successful mitigation, these controls must be implemented.

10.8.6 Local Economic Benefits and Local Procurement

The focal point relates to the potential local economic benefits and local procurement opportunities.

Table 10-18: Social: Local economic benefits and local procurement

Theme	**Social**		
Impact focal point	**Local economic benefits and local procurement – Site, surrounding areas and region**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Local economic benefit and contribution to additional economic spinoffs during construction phase; Positive	Local economic benefit, contribution to additional economic spinoffs during operational phase, enhancing potential for further economic development; Positive	Contribution to local economic benefit, spinoffs and economic wellbeing. Positive
Extent	Regional (4)	Regional (4)	Regional (4)
Duration	Short to medium term (2)	Long term (4)	Long term (4)
Intensity	Medium (6)	Low (2)	Low (2)
Probability	Likely (3)	Likely (3)	Likely (3)
Confidence	High		Medium
Calculation	(4+2+6)*3=36	(4+4+2)*3=30	(4+4+2)*3=30
Level of significance	Low	Medium	Medium
Mitigation measures	Local procurement should be aimed at local businesses where possible. Local sourcing of materials would help provide economic and employment opportunities for the local people. Local procurement could result in local economic sectors, indirect economic spinoffs and benefits such as increased income, and expansion of other Maximise the use of local labour even if the number of locals that would be employed is limited. Should permanent employment opportunities arise, locals should be considered.		None
Level of significance after mitigation	**Low (positive)**	**Medium (positive)**	Medium

It can be concluded from **Table 11-19** that on the regional level, the proposed Tonk Meter Road WDF would assist in meeting the demand for a waste management facility in the EMM, as the current EMM Rietfontein waste management facility would reach its maximum

capacity in approximately 10 years. The proposed Tonk Meter Road WDF could therefore, have a positive and constructive economic impact at the regional level.

On a local community level, the economic benefits are less direct and localised. The proposed Tonk Meter Road WDF is implemented and funded by Verref. During the construction and operation phases, some local economic benefits may be realised through the purchase and/or contract of local goods and services associated with the proposed Tonk Meter Road WDF. Once waste separation at source becomes a reality in Gauteng, approximately 40 additional permanent positions may be created through the addition of a Material Recovery Facility (MRF) at the proposed Tonk Meter Road WDF.

10.8.7 Sense of Place and Land Value

The focal point relates to the ephemeral consideration of "sense of place" – that is, the perception held of what makes a place unique, an individual's sense of personal identity and the feeling of belonging (i.e. the degree of alienation) and related potential change in land value.

Table 10-19: Social: Sense of place and land value

Theme	**Social**		
Impact focal point	**Sense of place and land value – Site, surrounding areas and region**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
Nature and status	Impacts on sense of place and land value due to construction activities; Negative	Impacts on sense of place and land value due to construction activities; Negative	No change in status
Extent	Local (3)	Regional (4)	
Duration	Short to medium term (2)	Long term (4)	
Intensity	Low (2)	Medium (6)	
Probability	Likely (3)	Likely (3)	
Confidence	High		
Calculation	(3+2+2)*3=21	(4+4+6)*3=45	
Level of significance	Low	Medium	No impact
Mitigation measures	Disturbed areas that are no longer in use to be rehabilitated. Overall site rehabilitation to occur as soon as the waste disposal process allows. The sites to be kept litter free. Site to be managed according to the conditions in the EMPr. Mitigation measures proposed by the Visual Impact Assessment to be strictly adhered to. Traffic management measures to be adhered. The facility to be managed in a strict best-practice manner. The Landfill Operator will take all reasonable measures to operate the Landfill so as to reduce and, where possible, prevent nuisances such as: ▪ Odour (by applying sanitary landfill procedures for waste compaction and daily covering, as well as the removal and treatment of leachate exposed to the atmosphere) ▪ Dust (by means of watering Site roads) ▪ Flies and rodents (by applying sanitary landfill procedures of compaction and covering, as well as by providing fly bait and fly traps at the waste disposal working face, public disposal area, etc. Rat traps or natural rodent control		N/A

Theme	Social		
Impact focal point	**Sense of place and land value – Site, surrounding areas and region**		
Phase	**Construction Phase**	**Operational Phase**	**"No go"**
	measures will be implemented to prevent poisoning of birds in the area). ▪ Noise (by ensuring that all plant silencers, etc. are in good working order and by limiting the operations to the prescribed hours.) ▪ Windblown litter (by applying sanitary landfill procedures of waste compaction and daily covering, as well as using litter catch nets where required. Litter that has been scattered in the area will be collected and disposed of on a daily basis). No scavenging will be allowed on the landfill work face. The removal of sharp steel objects from the work face that could cause punctures to waste collection vehicle tyres as well as tyres disposed of with the general waste will however be the only exceptions and removal thereof from the disposable waste stream a requirement.		
Level of significance after mitigation	**Low**	**Low**	No impact

In terms of the sense of place and its related perceptions, the assessment of the impact concluded (as per **Table 11-20**) that during the construction phase limited impacts on the sense of place may be foreseen and would relate to the temporary disturbances of the visual environment due to the construction activities. This would refer to the actual construction sites themselves, and to possible storage of material and equipment (i.e. stockpiles, lay-down areas, temporary construction plant), as well as the disruption of the soil and vegetation due to the construction activities.

Impacts on the sense of place during the operations phase are strongly linked to the manner in which the disposal facility is managed. The levels of malodour, litter, dust and visual impacts will have an impact on the sense of place, if these impacts occur. The controls as specified must be implemented and reviewed periodically for efficacy.

10.9 SUMMARY OF IMPACTS

The consideration of the impacts and their change pre- and post-mitigation is summarised in **Table 11-21.**

Table 10-20: Summary of Impacts

Phase	Construction Phase	Operational Phase	"No go"
Biodiversity			
Impact on ecosystem(s) – site establishment, infrastructure and landfill development– removal of vegetation, reduction in ecosystem connectivity (Table 10.2)			
Level of significance (without mitigation)	Medium	Medium	Medium-High
Level of significance (with mitigation)	Low	Low	Medium-High
Impact on ecosystem(s) – Closure of landfill and rehabilitation– reduction in ecosystem connectivity, damage to ecosystem (Table 10.3)			
Level of significance (without mitigation)	Medium	Medium	Medium

Phase	Construction Phase	Operational Phase	"No go"
Level of significance (with mitigation)	Low	Low	Low
Visual			
Reducing the visual quality of the landscape (Table 10.4)			
Level of significance (without mitigation)	Low	Medium to High	Medium
Level of significance (with mitigation)	Low	Low	Medium
Traffic			
Increased traffic in greater area (Table 10.5)			
Level of significance (without mitigation)	Medium	Medium	No impact
Level of significance (with mitigation)	Low	Low	No impact
Heritage			
Loss of heritage resources (Table 10.6)			
Level of significance (without mitigation)	Medium	Medium	Medium
Level of significance (with mitigation)	Low	Low	Low
Geohydrological			
Impact on groundwater – Site establishment and infrastructure development, groundwater quality changes (Table 10.8)			
Level of significance (without mitigation)	Low	Medium	Medium
Level of significance (with mitigation)	Low	Low	Medium
Impact on groundwater – presence of industrial operational substances on site (Table 10.9)			
Level of significance (without mitigation)	Low	Medium	Medium
Level of significance (with mitigation)	Low	Low	Medium
Impact on groundwater – establishment of new landfill cells (Table 10.10)			
Level of significance (without mitigation)	Low	Medium to high	Medium
Level of significance (with mitigation)	Low	Low	Medium
Impact on groundwater – Closure of landfill cells and rehabilitation (Table 10.11)			
Level of significance (without mitigation)	Medium to high	Medium to high	Medium
Level of significance (with mitigation)	Low	Low	Medium
Air Quality			
Impact on air quality of study area – Construction and maintenance of landfill ancillary infrastructure (Table 10.12)			
Level of significance (without mitigation)	Medium	Low	Medium-High
Level of significance (with mitigation)	Low	Low	Medium-High
Impact on air quality of study area – Development of landfill cells (Table 10.13)			
Level of significance (without mitigation)	Low	Medium-High	Medium
Level of significance (with mitigation)	Low	Medium (1) / Low (2)	Medium
Social			
Infrastructure and Services – Study, surrounding areas and municipal area (Table 10.15)			
Level of significance (without mitigation)	Medium	Medium	Medium
Level of significance (with mitigation)	Low	Low	Medium
General Noise Nuisance – site and surrounding areas (Table 10.16)			
Level of significance (without mitigation)	Medium	Medium - High	Medium - High
Level of significance (with mitigation)	Low	Medium	Medium-High
Employment Opportunities and Skills Inequities – Site, surrounding areas and region (Table 10.17)			
Level of significance (without mitigation)	Low	Low	No impact
Level of significance (with mitigation)	Low (positive)	Low (positive)	No impact
Safety and security – Site, surrounding areas (Table 10.18)			
Level of significance (without mitigation)	Medium	Low	No impact
Level of significance (with mitigation)	Low	Low	No impact
Vermin and vectors – Site, surrounding areas (Table 10.19)			
Level of significance (without mitigation)	Medium	Medium - High	Medium

Phase	Construction Phase	Operational Phase	"No go"
Level of significance (with mitigation)	Low	Low	Medium
Local economic benefits and local procurement – Site, surrounding areas and region (Table 10.20)			
Level of significance (without mitigation)	Low	Medium	Medium
Level of significance (with mitigation)	Low (positive)	Medium (positive)	Medium (positive)
Sense of place and land value – Site, surrounding areas and region (Table 10.21)			
Level of significance (without mitigation)	Low	Medium	No impact
Level of significance (with mitigation)	Low	Low	No impact

The overall impact for the landfill site after mitigation (and assuming best practice operations) are determined to be "low" with mitigation measures being implemented. In comparison, the impact of the current land use activities can be considered as "medium" – "medium – high" (i.e. "business as usual" scenario).

10.10 CUMULATIVE IMPACTS

Cumulative impacts are changes to the environment that are caused by an action in combination with other past, present and future actions. Each impact identified was assessed and considered as a combined or cumulative impact. Impacts associated with the proposed clay mining activities and the brickworks in association with the landfill were assessed cumulatively for that specific impact type.

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In terms of the forms of impact the points specific to cumulative impacts were considered in order below.

- Ability of the biophysical and social environment to assimilate cumulative stresses placed thereon:
  - It is reflected that the biophysical and social environment has been considered in the report.
  - The surrounding area comprises of clay quarries, soil stockpiles, the existing Rietfontein WDF, materials (rock) stockpile, roads, power lines and high density peri-urban residential areas. The level of pollution of a similar nature to that potentially gained from a landfill is minimal, or markedly different from the existing potential contamination profile of the existing land-uses. Thus, should the landfill be managed and operated as per the legislative requirements, as enhanced to the best practice level, the potential increase over existing contaminants in the groundwater will be insignificant.
- Likelihood of negative synergistic effects:
  - A synergistic effect is when the sum of two or more issues is greater than merely the sum thereof. This could be called a 'multiplier effect'.

- As indicated in the point above, due to the nature of the surroundings it is unlikely that any synergistic interaction could occur with any of the potential waste streams from the proposed development.
- Mitigation to ensure that effluent streams of all forms (i.e. air, water, soil,) through strict designs, as linked to construction and operation controls (i.e. EMPr, and standard landfill operating controls), are kept to minimal or zero levels will ensure that any potential synergistic interaction is not given the opportunity to occur.

- Determination of whether the proposed development will have a significant impact on, or be constrained by existing or future developments rights in the area:
  - The proposed development is considered to be suitable as detailed in a previous site selection process carried out for the EMM Rietfontein landfill prior to this EIA process.
  - The proposed landfill is an integral part of the wider waste management programme for the wider region.
- Feed-flow and anticipated traffic volume:
  - The aim of the site is to primarily service the EMM.
  - The cumulative impact on the traffic volume is noted to be a low increase over the existing traffic volumes experienced in the area.
- Feasibility consideration (including feed-flow and anticipated traffic volume):
  - Although the proposed landfill may have a limited negative impact on the adjacent EMM Rietfontein landfill, it has been determined that the impact is not a negative point as the EMM Rietfontein site will not be able to continue servicing the EMM area for more than 10 years under current conditions. Diversion of some waste to the proposed new WDF will reduce the load on the EMM Rietfontein landfill, thereby conserving airspace for disposal of its municipal waste.
  - Demand (necessity) and desirability of the proposed development, with an indication of the potential of the proposed landfill in terms of fulfilling the need of the targeted consumer has been considered.

It is thus concluded that although the landfill has the potential to have cumulative knock-on impacts within the various environmental spheres (i.e. bio-physical, social and economic), it is contended that due to the current *status quo* thereof, when linked to the development trends in the wider region, that these impacts are negligible.

It is further indicated that the direct pollution potential impacts may be minimised and through the careful construction and operation of the facility as controlled by the mechanisms captured in this document as a whole.

Mitigation for the indicated significant issues has been incorporated into the EMPr for planning, construction, operation and decommissioning of the proposed Tonk Meter Road WDF development.

11. ENVIRONMENTAL MANAGEMENT PROGRAMME

A draft site-specific Environmental Management Programme (EMPr) has been included as part of the EIA Report (Appendix 3).

The EMPr outlines the impacts and mitigation measures for the planning and design, construction, operational phases and rehabilitation of the WDF project. The EMPr comprises of the following:

a) Summary of Impacts: The identified negative environmental impacts for which mitigation is required are summarised. Positive impacts requiring enhancement have been listed.

b) Description of mitigation measures: The EMPr identifies feasible and cost effective mitigation measures to reduce significant negative environmental impacts to acceptable and legal levels. Mitigation measures are described in detail and accompanied by designs, equipment descriptions, and operating procedures, where appropriate. The technical aspects of implementing the mitigation measures are also described.

c) Description of a monitoring programme: Environmental performance monitoring is designed to ensure that mitigation measures are implemented. The monitoring programme clearly indicates the linkages between impacts, indicators to be measured, measurement methods and definition of thresholds that will signal the need for corrective actions.

d) The institutional arrangements depict and define the responsibilities for mitigation and monitoring actions.

e) Legal enforceability: The key legal considerations with respect to the EMPr are:

   i. Legal framework for environmental protection.

   ii. Legal basis for mitigation.

f) The implementation schedule and reporting procedures that specify the timing, frequency, and duration of the mitigation measures.

g) A description of requirements for record keeping, reporting, review, auditing and updating of the EMPr have been provided.

12. ENVIRONMENTAL IMPACT STATEMENT

The proposed Tonk Meter Road landfill site was selected due to its already degraded nature (i.e. a brown-field site) as a result of the clay mining activities on the site, together with gold tailings storage, that have taken place over many years and that is still to continue for many years to come. Moreover, the site is already excavated at least within the proposed first phase of the landfill development, which lowers development costs per cubic meter airspace provided and thus increases the overall cost effectiveness of the project.

The ongoing operation of the quarries and brickworks will allow for the continued supply of bricks to the building industry, while the availability of clay on site will provide capping and lining material for the landfill. By rehabilitating the excavations through waste disposal, this leads to a long-term cost effective means of providing rehabilitation, while at the same time increasing the viability of the landfill development.

Recycling facilities and a composting facility were considered for the new landfill site, with materials such as glass, various grades of paper, plastics, and metals being reclaimed and stored onsite prior to being sold to recyclers of the materials. The decision has been made that a formal Materials Recovery Facility (MRF) and a composting facility will not be developed immediately, but rather that this will be further investigated once the type and volume of separated recyclable materials and compostable plant material coming onto the site validates the economic development thereof.

A percentage of all the waste to be disposed of at the proposed Tonk Meter Road landfill will include organic materials, that will generate landfill gases – these gases will at first be flared as a means of eliminating such gases, but methane may later be harvested as a form of energy that could, depending on its viability, be used for on-site as a fuel source for the adjacent brickmaking processes as well as electricity generation. These options will be investigated in detail once sufficient waste has been disposed of to generate the required volume of methane.

Negative impacts associated with the proposed Tonk Meter Road landfill were determined and assessed and it was found that, with implementation of specialist recommended mitigation measures, all potential impacts can be reduced to a “low” or “medium” negative and/or positive significance (as per summary presented in **Section 10.9**).

The establishment of a state-of-the art landfill development, such as the one proposed, will provide an opportunity to manage waste in an environmentally sound manner while contributing to waste minimisation to a greater or lesser degree through recycling.

No sensitivities were identified in terms of biodiversity and wetlands on the proposed development site. The vegetation on the site is considered to be of limited ecological value

(i.e. degraded, low indigenous vegetation level). The landfill cells for the Tonk Meter Road WDF will be situated in mined areas, where vegetation will have already been removed. The area where vegetation will be removed is at the proposed entrance infrastructure. However, the site currently connects other open spaces and river networks and therefore acts as a migratory corridor..

In terms of visual impacts, the landscape of the proposed landfill site is defined as poor quality landscape, due to existing impacts on the visual quality of the surroundings. The area is characterised by mines, clay quarries, soil stockpiles, the existing Rietfontein WDF, materials (rock) stockpile, roads, power lines and high density peri-urban residential areas and there is an overall lack of natural and mature vegetation. It was concluded by the specialist that the existing *Eucalyptus* trees on the proposed landfill site will effectively screen the proposed landfill site. However should the *Eucalyptus* trees be removed, planting of indigenous trees at an early stage of the landfill development process is to be undertaken. The visual impact will be further reduced with the placement of a screening berm between the landfill and the adjacent community. The landfill cells will be rehabilitated and grassed, once full, which will improve the visual quality of the sitein the long term, whilst also acting as wind shields.

In terms of traffic impacts, the traffic volumes on the Rietfontein Road are very low, however higher traffic volumes are present on the Tonk Meter Road. In relation to the wider surrounding road network, additional capacity constraints occur along the Tonk Meter Road specifically at the N17 interchange and at the intersection with Coaton Avenue. The intersection of Tonk Meter Road with Rietfontein Road is operating close to capacity during the morning peak periods and improvements are required at this intersection. The additional landfill site traffic will have a low impact on the traffic flow of the surrounding road network. The main recommendations of the traffic study are the construction of the new access (one-way stop) along Rietfontein Road for the landfill (developer responsibility) and an additional right turn lane on the western approach (Rietfontein Road) of the intersection of Tonk Meter Road and Rietfontein Road (EMM responsibility).

No sites, features or objects of cultural significance dating to the Stone Age, Iron Age or dating to the historic period were identified. This is due to the majority of the site having been subjected to mining and quarrying activities, which would have destroyed potential sites, features or objects that might have occurred there previously. A control measure has been included in the EMPr in that if heritage artefacts or graves are exposed during construction work, it will be immediately reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

In general the monitoring boreholes around the waste disposal site at Area C, do not show ground water contamination that is of any major concern. However, in some of the

monitoring boreholes (for example RWD2, 8/19S and RF-C3) a slight increase in the concentration of the Chemical Oxygen Demand (COD), sulphate (SO_4) and potassium (K) can be observed. The concentrations are still relatively low, but the monitoring results should be critically evaluated in future to determine whether longer term increasing trends are developing.

Apart from the areas mentioned above, it can be concluded that the groundwater quality, outside of areas impacted by the mining and other industrial manufacturing operations, is generally of a good quality and the indications are from the limited analytical results, that the groundwater in the area conforms to the national drinking water standards.

Potential health impacts (relating to particulate matter) that are associated with the proposed Tonk Meter Road WDF were assessed as part of the air quality impact assessment. This assessment indicated that the proposed Tonk Meter Road WDF will not negatively affect the human health of receptors in the area should the buffer zones and height restriction be implemented. Similarly, dust and odours were shown to be of low significance, particularly if mitigation measures such as daily covering of waste and appropriate dust suppression on gravel roads are implemented. Additional use of rock cladding instead of grassing on the landfill sites, will result in a further reduction in impacts. An Operational Management Plan has been included as Appendix 4 and mitigation measures have been included in the EMPr (Appendix 3). Noise will be generated during construction and operation of the landfill site. Noise during construction is likely to be higher than during operation, but will, however, vary in loudness and timing and will thus not be a constant nuisance to receptors who may be able to hear it. In addition to this, if loud activities are limited to daylight hours and residents are consulted when particularly loud activities are planned, the impact of construction noise can be reduced. The construction phase is temporary in nature (i.e. less than 2 years, potentially as short as 6 months), further reducing the significance of this impact. The nearest residences are also some distance (650m) from the first phase of the proposed landfill site (i.e. Area E), and operation will be limited to daylight hours, and thus the impact should be minimal. Due to the fact that the landfill will only generate noise during day time hours, the impact of noise on these receptors is not envisaged to be significant.

Impacts will be limited to the surrounding areas of Area E during the first phase of the landfill development, 25 years. Thereafter, as the landfill development progresses to Areas F (second phase, 4 years) and D (third phase, 30 years) these impacts will increase on the adjacent Kwa-Thema community. Impacts will be reduced with the implementation of the Operational Management Plan (Appendix 4) and mitigation measures have been included in the EMPr (Appendix 3).

It should be noted that before construction of the proposed landfill can begin, the existing mining right/permit and EMPR will need to be amended to include the landfill development. This is being undertaken separate to this EIA process. As the landfill will be linked to a mining related development (i.e. the existing quarry), it should be noted that no person may erect or construct any buildings, roads, railways, or any structure within a horizontal distance of 100m from the workings of a mine (i.e. GNR 93, Mine Health and Safety Regulations, Section 17(7,8) of Mine Health and Safety Act (Act No. 29 of 1996)) unless a lesser distance has been determined safe by risk assessment undertaken by the employer or a professional geotechnical specialist. This aspect will need to be addressed in the amended EMPRs.

13. CONCLUSION AND RECOMMENDATIONS

Based on the findings documented in this report, the EAP is of the opinion that the proposed Tonk Meter Road landfill in Springs will assist in meeting current and future demands for environmentally sound waste management in the EMM.

The preliminary design of the landfill was done in terms of the *Minimum Requirements for Waste Disposal by Landfill* (2nd Edition, DWAF 2009), and is within the constraints of the draft regulations currently under review (GNR 432, 433 and 435 of 2011; GNR 613, 614 and 615 of 2012) making use of latest technologies and best practice for landfill development.

An Operational Management Plan has been drafted to ensure the site is operated in an environmentally sound manner across its entire life cycle. It is noted that this plan will be updated as required by the competent authority so as to ensure that the site remains operating at best practice level.

The assessment of the issues identified in the Scoping Report or as raised by I&APs, and considered in greater detail in the EIA Report with its related specialists studies, indicated that the significance of potential impacts associated with the proposed development can all be reduced to a "low"/"medium", if the recommended mitigation measures are implemented.

The EAP is of the opinion that the proposed Tonk Meter Road WDF, to be located on the Remaining Extent of Portion 81 of the Farm Rietfontein 128 IR, Gauteng Province, should be authorised.

Conditions of the environmental authorisation should include the implementation of mitigation measures in the draft Site-Specific EMPr and the appointment of an independent Environmental Control Officer to monitor compliance with the draft Site-Specific EMPr. It is also recommended that a condition of environmental authorisation be that construction should not begin until written consent for the activities proposed on the mine property from the DMR has been attained.

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15. APPENDICES

EIA process related:

Appendix 1: Authority Correspondence

Appendix 2: Public Participation Report

Management control mechanisms & Design Information:

Appendix 3: Site-Specific Environmental Management Programme

Appendix 4: Design and Operational Management Plan

Specialist Studies

Appendix 5: Biodiversity and Wetland Delineation / Impact Assessment

Appendix 6: Visual Impact Assessment

Appendix 7: Traffic Impact Assessment

Appendix 8: Heritage Study

Appendix 9: Geological and Geotechnical Report

Appendix 10: Geohydrological Report

Appendix 11: Air Quality Assessment

Appendix 12: Site Selection Report