

DIGBY WELLS

ENVIRONMENTAL



Authorisation of Sludge Disposal Facility and Pipelines Associated with Treatment of Acid Mine Drainage in the Eastern Basin of the Witwatersrand, Gauteng Province

Notification of Intent to Develop

Project Number:

AEC2588

Prepared for:

AECOM South Africa (Pty) Ltd

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Report Type:	Notification of Intent to Develop
Project Name:	Authorisation of Sludge Disposal Facility and Pipelines Associated with Treatment of Acid Mine Drainage in the Eastern Basin of the Witwatersrand, Gauteng Province
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Name	Responsibility	Signature	Date
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EXECUTIVE SUMMARY

Introduction

Digby Wells' services have been enlisted by AECOM to conduct the Environmental Authorisation (EA) process. The EA process is supported by detailed specialist studies for the preferred sites for sludge disposal facilities and associated pipelines for the treatment of Acid Mine Drainage (AMD) in the eastern basin of the Witwatersrand. The EA process is conducted in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and National Environmental Management: Waste Act, 2009 (Act No. 58 of 2009) (NEM:WA).

The Scope of Work (SoW) for the heritage study was to complete a Notification of Intent to Develop (NID) required in terms of Section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) for submission to the South African Heritage Resources Agency (SAHRA) and Gauteng Provincial Heritage Resources Authority (PHRA-G). The NID included appropriate information regarding the nature of the development and the existence of potential heritage resources that may occur within the project location. This information was obtained through primary and secondary data collection, and desktop review of text-based sources respectively.

Project Location

Province	Gauteng Province	
Magisterial district	Springs Magisterial District	
District municipality	Grootvlei 6L16	Ekurhuleni Metropolitan Municipality
	Largo Site 4	Ekurhuleni Metropolitan Municipality
		Sedibeng District Municipality
Local municipality	Grootvlei 6L16	Ekurhuleni Metropolitan Local Municipality
	Largo Site 4	Ekurhuleni Metropolitan Local

		Municipality
		Lesedi Local Municipality
Nearest town	Springs	
1:50 000 topographical map	2628	
Relative centre coordinates of project area	South:-26.251433 East: 28.488733	
Erf or Farm Number(s)	Rietfonten 279-IR RE Grootvaly 124 IR Portion 2 Grootvaly 124 IR Portion 17 Grootvaly 124 IR RE Palmeitkuilen 241 IR Portion 9	
Current land use	Mining and Agriculture	
Surrounding properties land use	Mining, Agriculture and Urban	
Recording method	ArcGIS 10.2	

Registered Owner/s of Property/ies

Farm Boundary	Farm Portion	Owner/Title Position	Notification Method
Grootvaly AH	100	GROOTVLEI PROP MINES LTD	Email and Registered Mail
	101		
	102		
	103	Gauteng Provincial Government	
	105	Mayborn INV 75 Pty Ltd	
	95	Gauteng Provincial Government	
	96		
	97		
	98	GROOTVLEI PROP MINES LTD	
	99		
Palmietkuilen 241-IR	9	PATERSON MANAGEMENT PTY LTD	
Grootvaly 124-IR	17	JACOBS & SEUNS LANDGOED CC	
	R/	GROOTVLEI PROP MINES LTD	
	31	LARGO PROP PTY LTD	
	2	CITY COUNCIL OF SPRINGS	

Project / Development Details

The proposed Eastern Basin AMD STI water treatment plant will be situated at the Grootvlei Mine Shaft No. 3 about 4,6km due east of the Springs Central Business District (CBD). The site is accessible via the R29 Ermelo Road and Grootvaly Road through the suburb of Casseldale. The activities associated with the STI measures will include:

- Abstraction of AMD via installed pumps in Grootvlei No. 3 shaft at a pump depth to achieve the Environment Critical Level (ECL);
- Construction of a new High Density Sludge (HDS) treatment plant adjacent to the Grootvlei No. 3 shaft;
- Construction of a waste sludge pipeline to link the proposed HDS plant to the preferred sludge disposal site; and
- Construction of a treated water pipeline to a suitable discharge point along the Blesbokspruit.

Two proposed sludge disposal sites have been selected and are listed below:

- Grootvlei 6L16; and
- Largo Site 4.

In light of the exemption received by the Department of Environmental Affairs in January 2013, the scope of this Project is limited to the construction of the sludge disposal site and associated sludge pipeline and the detailed project description is described in Section 2.1.1. The remainder of the project scope has been approved in terms of the previous exemption issued.

NHRA Section 38 Triggers

The proposed development triggered the following thresholds for a HIA in terms of Section 38 of the NHRA.

		NHRA Section 38 (1) Activities / Triggers	Summary description (e.g. 500 m conveyor belt, open cast pit, etc.)
<input checked="" type="checkbox"/>	a	Any linear development or barrier >300 m	Construction of a pipeline
<input type="checkbox"/>	b	Any bridge or similar structure >50 m	
<input type="checkbox"/>	c	Any development or activity that will change the character of a site:	
	<input type="checkbox"/>	i $\geq 5\,000\text{m}^2$ in extent	
	<input type="checkbox"/>	ii Involving ≥ 3 existing erven/ subdivisions	
	<input type="checkbox"/>	iii Involving ≥ 3 or more erven/ divisions consolidated within past 5 years.	

NHRA Section 38 (1) Activities / Triggers		Summary description (e.g. 500 m conveyor belt, open cast pit, etc.)
<input type="checkbox"/>	d	Rezoning of a site $\geq 10\,000\text{m}^2$ in extent.
<input checked="" type="checkbox"/>	e	Other triggers, e.g.: in terms of other legislation, (i.e.: National Environment Management Act, etc.)

Activities

The following activities will take place during the lifespan of the proposed project.

NEMA Notice	Activity No (s) and description (in terms of the relevant notice):	Description of Listed Activity
GN R544 – Listing Notice 1: List of Activities Identified in Terms of Sections 24(2) and 24D for which a Basic Assessment Process is required.	Activity No. 9: The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water – <ul style="list-style-type: none"> i. With an internal diameter of 0.36 metres or more; or ii. With a peak throughput of 120 litres per second or more, Excluding where: <ul style="list-style-type: none"> a) Such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b) Where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse. 	Pipelines will be constructed for the transportation of sludge from the AMD water treatment plant via pipelines for disposal at the proposed sludge disposal sites.
	Activity No.11: The construction of: <ul style="list-style-type: none"> i. Canals; ii. Channels; iii. Bridges; iv. Dams v. Weirs 	The proposed pipeline routes will cross streams.



NEMA Notice	Activity No (s) and description (in terms of the relevant notice):	Description of Listed Activity
	<ul style="list-style-type: none"> vi. Bulk storm water outlet structures; vii. Marinas; viii. Jetties exceeding 50 square metres in size; ix. Slipways exceeding 50 square metres in size; x. buildings exceeding 50 square meters in size; or xi. Infrastructure or structures covering 50 square metres or more <p>where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.</p>	
<p>GN R545 - Listing Notice 2: List of Activities Identified in Terms of Sections 24(2) and 24D for which Scoping and an Environmental Impact Assessment is Required.</p>	<p>Activity No.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 which case that Act will apply.</p>	<p>The disposal of sludge will require a licence in terms of the National Environmental Management: Waste Act, Act 59 of 2008 (NEM:WA)</p>

Description of NEMWA Notice	Activity No (s) (in terms of the relevant notice):	Description of Activity
GN R912 - Category B: List of waste activities identified in terms of Section 24 (5) for which an Environmental Impact Assessment is Required.	Activity No.8: The disposal of general waste to land covering an area in excess of 200m ² and with a total capacity exceeding 25 000 tons.	The disposal of general waste of approximately 208.5 tons of general waste per day on the proposed sludge disposal site, which is greater than 200 m ² .

Additional Impact Assessment Process

The following impact assessment process/es are currently being undertaken for the proposed project.

Legislation, i.e. NEMA, MPRDA, etc.	NEMA, NEM:WA
Consenting Authority that has/will receive information	DEA
Present phase of process at Authority, e.g. Draft Scoping Report	Draft Scoping

Identified / Known Heritage Resources and Potential Impacts

The following categories of heritage resources as defined in Section 3 of the NHRA are known to occur within the proposed project area.

<input checked="" type="checkbox"/>	3(2)(a)	Places, buildings, structures and equipment of cultural significance
		Description of resource: Built Environment associated with mining history – Modderfontein Mine, mining compounds
		Potential impact: None envisaged
<input type="checkbox"/>	3(2)(b)	Places to which oral traditions are attached or which are associated with living heritage
		Description of resource: None
		Potential impact: None
<input type="checkbox"/>	3(2)(c)	Historical settlements and townscapes
		Description of resource: None
		Potential impact: None
<input type="checkbox"/>	3(2)(d)	Landscapes and natural features of cultural significance
		Description of resource: None

		Potential impact: None
<input checked="" type="checkbox"/>	3(2)(e)	<p>Geological resources of scientific or cultural importance</p> <p>Description of resource: Madzaringwe Formations and Malmani</p> <p>Potential impact: If exposed during construction, potential to accidentally damage palaeontological remains</p>
<input checked="" type="checkbox"/>	3(2)(f)	<p>Archaeology and/or palaeontology (<i>Including archaeological sites and material, fossils, rock art, battlefields & wrecks</i>)</p> <p>Description of resource: Iron Age archaeological sites</p> <p>Potential impact: Damage / destruction of Iron Age settlements</p>
<input checked="" type="checkbox"/>	3(2)(g)	<p>Graves and burial grounds (<i>eg: ancestral graves, graves of victims of conflict, historical graves & cemeteries</i>)</p> <p>Description of resource: Burial grounds associated with indentured Chinese labourers; Military Cemetery for coloured soldiers who perished during World War II.</p> <p>Potential impact: None envisaged</p>
<input type="checkbox"/>	3(2)(a)	<p>Other human remains</p> <p>Description of resource: None</p> <p>Potential impact: None</p>
<input type="checkbox"/>	3(2)(h)	<p>Sites of significance relating to the history of slavery in South Africa</p> <p>Description of resource: None</p> <p>Potential impact: None</p>
<input type="checkbox"/>	3(2)(i)	<p>Movable objects</p> <p>Description of resource: None</p> <p>Potential impact: None</p>

Illustrative Material

Please see Plans in Appendix B



Recommendation

Is a Heritage Impact Assessment required?		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
If NO, provide motivation:			
If YES, provide suggested components that may be required or undertaken during HIA.			
<input type="checkbox"/>	Archaeology	<input type="checkbox"/>	Architecture
<input type="checkbox"/>	Built Environment	<input type="checkbox"/>	Burial Grounds and Graves
<input type="checkbox"/>	Palaeontology	<input type="checkbox"/>	Public Participation
<input type="checkbox"/>	Townscapes	<input type="checkbox"/>	Visual Impact
<input type="checkbox"/>	Other:		
<p>It is recommended that exemption from any additional heritage assessments be granted for:</p> <ul style="list-style-type: none"> ■ Sludge disposal site 6L16; ■ Sludge disposal site Largo Site 4; and ■ Associated pipelines <p>The proposed location of Grootvlei 6L16 situated on an existing sludge storage facility younger than 60 years, and no impact on heritage resources is envisaged for this sites. The pipeline associated with this location is also routed through existing servitudes that have been impacted upon by previous activities.</p> <p>The proposed location of Largo Site 4 is situated in an area that has been disturbed through agricultural activities. Desktop based research has identified several heritage resources to the north associated with archaeological remains and burial grounds. No such finds were made in the proposed footprint location during the screening survey.</p> <p>It is recommended that Chance Find Procedures (CFPs) be adopted and incorporated into the Environmental Management Programme (EMPr) for the proposed project. The CFPs must clearly outline the procedure and responsible resource in the event of accidental discovery of heritage resources in line with the requirements of the NHRA.</p>			
Recommendation made by:			
Name: Justin du Piesanie			
Capacity: Heritage Management Consultant: Archaeologist			



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LIST OF ABBREVIATIONS AND TERMS

Terms and Abbreviations	
AECOM	AECOM South Africa (Pty) Ltd
AMD	Acid Mine Drainage
CBD	Central Business District
CFPs	Chance Find Procedures
Digby Wells	Digby Wells Environmental
EA	Environmental Authorisation
ECL	Environment Critical Level
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
ESA	Early Stone Age
HDS	High Density Sludge
ka	Thousand Years Ago
LIA	Late Iron Age
LSA	Late Stone Age
LTI	Long Term Intervention
MJS	Major Jackson Series
MSA	Middle Stone Age
mya	Million Years Ago
NEM:WA	National Environmental Management: Waste Act, 2009 (Act No. 58 of 2009)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NID	Notice of Intent to Develop
PHRA-G	Gauteng Provincial Heritage Resources Authority
PSM	Palaeontological Sensitivity Map
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SoW	Scope of Work
STI	Short Term Intervention
TCTA	Trans-Caledon Tunnel Authority

1 Introduction

AECOM South Africa (Pty) Ltd (AECOM) has been appointed by the Trans-Caledon Tunnel Authority (TCTA) as the Principal Consultant in respect to the implementation of the Short Term Intervention (STI) measures for a sludge disposal facility and associated pipeline within the Eastern Basin of the Witwatersrand Gold Fields. Digby Wells Environmental (Digby Wells) was appointed by AECOM as the Environmental Consultants to undertake a site screening and fatal flaw assessment (Phase 1 of the project) for the STI measures to ensure that environmental and social consideration was given during the site selection process for the proposed sludge disposal facility and associated pipeline. This has been completed. Digby Wells has commenced with the environmental authorisation process (Phase 2) for the construction of the sludge disposal facility associated with the treatment of Acid Mine Drainage (AMD) in the Eastern Basin of the Witwatersrand.

Based on the outcomes of the fatal flaw analysis, AECOM has selected two preferred options for the location of the sludge disposal facilities and associated pipelines. These are:

- Grootvlei 6L16; and
- Largo Site 4.

1.1 Terms of Reference

Digby Wells' services have been enlisted by AECOM to conduct the Environmental Authorisation (EA) process supported by detailed specialist studies for the preferred sites in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and National Environmental Management: Waste Act, 2009 (Act No. 58 of 2009) (NEM:WA).

1.2 Scope of Work

The agreed Scope of Work (SoW) for the heritage study was to compile a Heritage Statement to inform a Notification of Intent to Develop (NID) required in terms of Section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) for submission to the South African Heritage Resources Agency (SAHRA) and Gauteng Provincial Heritage Resources Authority (PHRA-G). The NID included appropriate information based on primary and secondary data to describe:

- The nature of the development; and
- The existence of potential heritage resources that may occur within the project location.

2 Background Information of Project

This proposed project is limited to the consideration of the sludge disposal site for STI measures required for the management of AMD within the Eastern Basin of the

Witwatersrand. Although the scope of this project is limited to the STI for the Eastern Basin, consideration was given to the land requirements for the disposal of sludge and brine associated with the Long Term Intervention (LTI) measures. The STI and LTI require a total of 60 hectares of land (i.e. 30 hectares each). In doing so, the sites considered for the STI will consider the LTI requirements through the identification of feasible sites that can accommodate the development footprint. Consideration and consolidation of the planning for the STI and LTI was a preferred approach to this study.

2.1 Project Details

The proposed Eastern Basin AMD STI water treatment plant will be situated at the Grootvlei Mine Shaft No. 3 about 4,6 km due east of the Springs Central Business District (CBD). The site is accessible via the R29 Ermelo Road and Grootvaly Road through the suburb of Casseldale. The activities associated with the STI measures will include:

- Abstraction of AMD via installed pumps in Grootvlei No. 3 shaft at a pump depth to achieve the Environment Critical Level (ECL);
- Construction of a new High Density Sludge (HDS) treatment plant adjacent to the Grootvlei No. 3 shaft;
- Construction of a waste sludge pipeline to link the proposed HDS plant to the preferred sludge disposal site; and
- Construction of a treated water pipeline to a suitable discharge point along the Blesbokspruit.

Two proposed sludge disposal sites have been selected and are listed below:

- Grootvlei 6L16; and
- Largo Site 4.

The scope of this Project is limited to the construction of the sludge disposal site and associated sludge pipeline and the detailed project description is described in Section 2.1.1. The remainder of the project scope has been approved in terms of the previous exemption issued.

The Environmental Impact Assessment (EIA) will entail the following:

- Compilation of EIA and Waste License Application Form;
- Detailed specialist studies on the preferred and alternative sites;
- Conduct a Scoping and Environmental and Social Impact Assessment (ESIA) process (under the NEMA and NEM:WA); and
- All necessary public participation.

2.1.1 Detailed STI Project Description

Sludge will be transported from the treatment facility to one of the two proposed sludge disposal sites via pipelines included within the assessment. A total extent of 30 hectares will be required to dispose the 3.5 million m³ sludge that will be disposed to a height of 14 m. The proposed disposal sites are described below.

2.1.1.1 Grootvlei 6/L/16

The Grootvlei 6/L/16 site is located on an existing tailings facility. A one kilometre long pipeline will be required from the Grootvlei Mine Shaft No. 3 water treatment plant to the Grootvlei 6/L/16 proposed sludge disposal site. This route will be predominantly located in the existing railway servitudes.

2.1.1.2 Largo Site 4

The Largo Site 4 is located in agricultural fields. A two kilometre pipeline will required from the Grootvlei Mine Shaft No. 3 water treatment plant to the Largo Site 4. The proposed route will follow Van Niekerk Road.

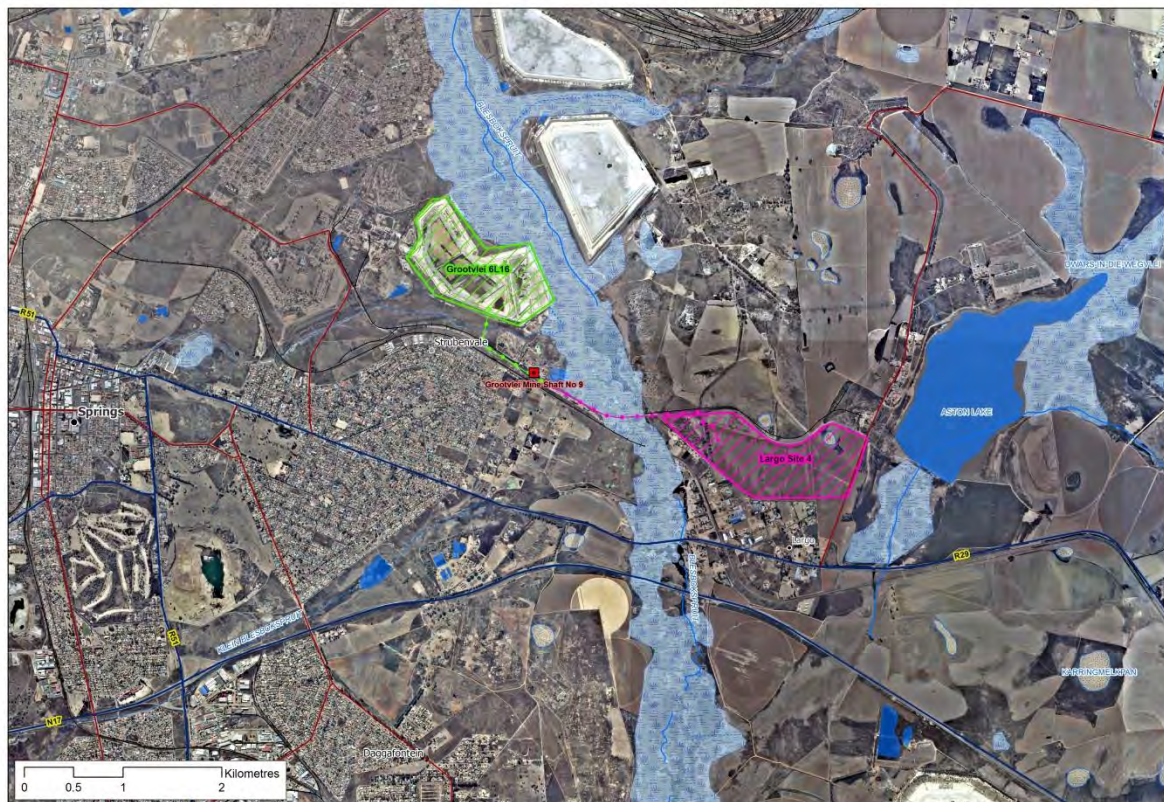


Figure 2-1: Proposed location of the two sludge disposal facilities and associated pipelines

2.1.2 Long Term Intervention Measures for the Eastern Basin

The LTI measures for the Eastern Basin will likely include a desalination process to treat regional AMD discharge. The desalination process is expected to produce brine. Evaporation dams for associated treatment and management will therefore be required. Although this forms part of future LTI measures and is therefore excluded from the current project, it will be considered in the site screening exercise proposed for the STI measures in consideration of long-term integrated planning purposes.

2.2 Relevant Contact Details

The contact details of the developer, consultant and landowners are provided in the tables below.

Table 2-1: Client contact details

ITEM	COMPANY CONTACT DETAILS
Company	Trans-Caledon Tunnel Authority
Contact person	Sophia Tlale
Tel no	012 683 1362
E-mail address	stlale@tcta.co.za
Postal address	P.O. Box 10335, Centurion, 0046

Table 2-2: Applicant contact details

ITEM	COMPANY CONTACT DETAILS
Project applicant	Department of Water Affairs
Contact person	Bashan Govender
Tel no	012 392 1415
E-mail address	govenderb@dwa.gov.za
Postal address	Private Bage X995, Pretoria

Table 2-3: Consultant contact details

ITEM	COMPANY CONTACT DETAILS
Company	Digby Wells Environmental
Contact person	Mellerson Pillay
Tel no	011 789 9495
E-mail address	mel.pillay@digbywells.com
Postal address	Private Bag X10046, Randburg, 2125

Table 2-4: Land owner contact details

FARM	POR	OWNER / TITLE POSITION	CONTACT DETAILS
Grootvaly AH	100	Grootvlei Prop Mines Ltd	Deon Botha (082) 377 5016 deon@cl-insol.co.za
	101		
	102		
	103	Gauteng Provincial Government	Tsepiso Tsotetsi (011) 740 1342 tsepiso.tsotetsi@gauteng.gov.za
	105	Mayborn INV 75 Pty Ltd	CF de Wet (011) 402 3170 tersia@kaapvaal.co.za
	95	Gauteng Provincial Government	Tsepiso Tsotetsi (011) 740 1342 tsepiso.tsotetsi@gauteng.gov.za
	96		
	97		
	98		
	99	Grootvlei Prop Mines Ltd	Deon Botha (082) 377 5016 deon@cl-insol.co.za
Palmietkuilen 241-IR	9	Paterson Management Pty Ltd	Carol Boulah (082) 972 9782 carolbp@gmail.com
Grootvaly 124-IR	17	Jacobs & Seuns Langoed Ltd	Jackie Jacobs (082) 561 1367 jackiejacobs@wifidirect.co.za
	R/	Grootvlei Prop Mines Ltd	Deon Botha (082) 377 5016 deon@cl-insol.co.za
	31	Largo Prop Pty Ltd	Stefano Darrigo (011) 362 1551 s.darrigo@gmail.com
	2	City Council of Springs	Ivan Kadungure (011) 999 4044 ivan.kadungure@ekurhuleni.gov.za

2.3 Legal Framework

2.3.1 National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)

The NEMA stipulates under Section 2 (4)(a) that sustainable development requires the consideration of all relevant factors including (iii) the disturbance of landscapes and sites that constitute the nation's cultural heritage must be avoided, or where it cannot be altogether avoided, is minimised and remedied. Under Sections 23 (2) b it states "identify, predict and evaluate the actual and potential impact on the...cultural heritage... the risks and consequences and alternatives and options for mitigation of activities, with a view to minimizing negative impacts, maximizing benefits and promoting compliance with the principles of environmental management set out in Section 2". Sections 24 (1) c and 24 (7) b state "the potential impact on...the cultural heritage of activities that require authorisation or

permission by law and which may significantly affect the environment, must be considered investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing permitting, or otherwise allowing the implementation of an activity.”

2.3.2 National Environmental Management: Waste Act, 2009 (Act No. 59 of 2009) (NEM:WA)

The NEM:WA stipulates under Section 48 that “ when considering an application for a waste management licence, the licencing authority must take into account all relevant matters, including, - (b) the pollution caused or likely to be caused by the activity that is the subject of the application, whether alone or together with existing operations or pollution and the effect or likely effect of that pollution on the environment, including health, social conditions, economic conditions and cultural heritage, - (c) the best practicable environmental option available and alternatives that could be taken – (ii) to protect the environment, including health, social conditions, economic conditions and cultural heritage from harm as a result of the undertaking of the waste management activity.

2.3.3 National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)

The Heritage Study was completed in terms of Section 38(8) of the NHRA where impacts on potential heritage resources must be assessed as part of the EIA required under Sections 23 (2) b; 24 (1) c and 24 (7) b of the NEMA.

A development is defined in the NHRA as the “physical intervention, excavation, or action, other than those caused by natural forces, which may in the opinion of a heritage authority in any way result in a change to the nature, appearance or physical nature of a place, or influence its stability and future well-being, including- (a) construction, alteration, demolition, removal or change of use of a place or a structure at a place”.

2.3.4 Summary of Stakeholder Engagement Plan (SEP)

The SEP is a legislative requirement governed by principles embodied in the NEMA. In addition to NEMA Section 24(5) the consultation process is further regulated in terms of NEMA Regulations 54-57 (G. N. R. 543).

The primary purpose of the SEP is to ensure transparency throughout the process and to promote informed decision-making which reflects the interests and concerns of the potentially interested and affected parties (I&APs).

3 Methodology

The research methodology followed a relatively generalised archaeological landscape approach employing qualitative (text-based) methods. This approach is innately multidisciplinary as it underlines the connections between material culture, the cultural

landscape and the natural environment thereby providing the necessary context within which any identified heritage resources can be interpreted and assessed.

The research methodology included several steps outlined below.

3.1 Background Information / Data Collection

Background information was identified and reviewed (analysed) to obtain salient information summarised in this NID to provide the necessary background. Information sources that were consulted are summarised listed below and listed in the Bibliography. It included text-based and cartographic sources, and database information.

3.1.1 Published Literature

Published literature that was found relevant to this study included:

- Deacon & Deacon, 1999;
- Ekurhuleni Metropolitan Municipality, 2013
- Eriksson & Altermann, 1998;
- Goodwin & Van Riet Lowe, 1929;
- Hilton-Barber & Berger, 2002;
- Lavin, 2013;
- Lombard, et al., 2012;
- Maggs, 1976;
- Mark, 2010;
- Mason, 1986;
- Panagos, 1999;
- Richardson, 1977;
- Rubidge, 2013a
- Rubidge, 2013b
- Smillie, 2011; and
- Warwick, 1983.

3.1.2 Reviewed Heritage Reports

Previously completed heritage studies were reviewed to expand on the background described above. The findings provide evidence-based inferences to be made with regard to the potential for, and description of heritage resources that are likely to occur in the project region. The following reports were found to be relevant:

- Huffman, T.N. and van der Merwe, H.D. 1993. *Archaeological survey of the Withoekspruit, Brakpan*. Unpublished report by Archaeological Resources Management on file at SAHRA as: 1993-SAHRA-0021.
- Van Schalkwyk, J.A. and Naude, M. 1995. *A survey of Cultural Resources along the proposed PWV 16 Road Corridor, Brakpan District*. An unpublished report by the National Cultural History Museum on file at SAHRA as: 1995-SAHRA-0012.
- Van Schalkwyk, J.A. 1997. *A Survey of Cultural Resources in the Proposed Erwat Sewer Outfall Route, North of Springs, Gauteng Province*. Unpublished Report by the National Cultural History Museum on file at SAHRA as: 1997-SAHRA-0012
- Fourie, W., Ramsden, M. 2002. *Cultural Heritage Assessment for Consolidated Modderfontein Mines, GEDEX Project*. Unpublished report by Matakoma Consultants on file at SAHRA as: 2002-SAHRA-0088
- Van Schalkwyk, J.A. 2004. *Heritage Impact Assessment: Payneville Ext. 3*. Unpublished report by the National Cultural History Museum on file at SAHRA as: 2004-SAHRA-0139
- Van Schalkwyk, J.A. 2004. *Heritage Impact Assessment: Vlakfontein Ptn 35 and 36*. An unpublished report by the National Cultural History Museum on file at SAHRA as: 2004-SAHRA-0140
- Van Schalkwyk, J.A. 2005. *Heritage Impact Assessment: Leeupan*. An unpublished report by the National Cultural History Museum on file at SAHRA as 2005-SAHRA-0059.
- Huffman, T.N. 2006. *Archaeological Assessment for the Modder East Gold Mine: A phase I report prepared for Prime Resources*. Unpublished report completed by Archaeological Resources Management on file at SAHRA as: 2006-SAHRA-0102
- Küsel, U. 2007. *Cultural Heritage Resource Impact Assessment on the farm Vlaklaagte 161 Tsakane Benoni, Gauteng*. An unpublished report by African Heritage Consultants CC on file at SAHRA as: 2007-SAHRA-0143
- Birkholtz, P.D. 2008. *Heritage Impact Assessment proposed Selcourt Ext 5 Residential Development on Portion 3 of the farm Vlakfontein 103 IR, Ekurhuleni Metropolitan Municipality, Gauteng Province*. An unpublished report by Archaeology Africa CC on file at SAHRA as: 2008-SAHRA-0015
- Coetzee, F.P. 2008. *Cultural Heritage Survey of Portion 1 of Portion 228 (a Portion of 213) and Portion 63 of the Farm Geduld 123 IR, Gauteng Province*. Unpublished report completed by the Department of Anthropology & Archaeology, University of South Africa on file at SAHRA as: 2008-SAHRA-0650
- Pelser, A.J. and van Vollenhoven, A.C. 2008. *A Report on a Basic Archaeological and Cultural Resources Assessment for Apollo Bricks on the Farm Grootvaly 124 JR near*

Springs, Gauteng. Unpublished report completed by Archaetnos Culture & Cultural Resources Consultants on file at SAHRA as: 2008-SAHRA-0504

- Van der Walt, J. 2008. *Archaeological Impact Assessment: Sluice Gate Upgrade at the Marrievale Nature Reserve, Nigel, Gauteng.* Unpublished report completed by Matakoma-ARM Heritage Contracts Unit on file at SAHRA as: 2008-SAHRA-0180
- Van der Walt, J. 2008. *Archaeological Impact Assessment on Remainder of Portion 7 of the Farm Modderfontein East 72 IQ, Benoni, Gauteng Province.* Unpublished report completed by Heritage Contracts Unit on file at SAHRA as: 2008-SAHRA-0540
- Van Vollenhoven, A.C. 2012. *A Report on a Heritage Impact Assessment for the Steynol Umthombo Project near Springs in the Gauteng Province.* Unpublished report completed by Archaetnos Culture & Cultural Resources Consultants on file on SAHRIS as: Case ID 290

3.1.3 Databases

A review of relevant databases was completed to identify potential heritage resources within the project area. These include:

- The National Archives of South Africa;
- The Genealogical Society of South Africa;
- The University of the Witwatersrand Archaeological Site Database;
- The South African Heritage Information System; and
- The Artefacts Architectural Online Database.

3.1.4 Historical Layering

A review of historical maps was completed. Aerial imagery was overlaid to assess the changes in the receiving environment over time. Published geological maps and the new palaeontological sensitivity map (PSM) available on the South African Heritage Resources Information System (SAHRIS) website were also assessed.

- Major Jackson Series; and
- Jeppes 1899 Map of the Transvaal

Table 3-1: Aerial imagery reviewed for historical layering

Aerial photographs						
Job no.	Flight plan	Photo no.	Map ref.	Area	Date	Reference
133	14	06550	2628	Johannesburg	1938	133/1938
	15	06598				
	17	06601				

Aerial photographs						
	18	06650				
055	13	02079	2628	Heidelberg	1945	055/1945
	14	00981				
314	6	43600	2628	Johannesburg / Vereeniging	1952	314/1952
	7	44520				
	8	43120				
412	6	02075	2628	Springs / Delmas	1958	412/1958
	7	02070				
603	23	01095	2628	Johannesburg / Pretoria	1968	
	24	01145				
	25	08505				

3.2 Site Naming

Sites may be identified based on previous relevant reports. The site names and / or numbering that were used in the original reports will be used, but prefixed with the relevant SAHRA report number or case ID if available. For example, a heritage resource identified by Roodt (1999) described as an archaeological site and numbered Site 1 in that report will be:

1999-SAHRA-0021/1

If the relevant report does not have a SAHRA report number, then the site names and / or numbering that were used in the original reports will be used, but prefixed with the relevant author. For example, a heritage resources identified by Van Schalkwyk (2007) described as an archaeological site and numbered '1' in that report will be:

Van Schalkwyk-2007/1

Potential sites not previously identified, but noted as a result of historical layering, desktop studies or through indicators such as vegetation, were named using the SAHRIS Case ID number, followed by the map sheet number and reference to the relevant NHRA section suffixed with the site number:

5154/2628AB/S.35-001.

3.3 Screening Survey

A screening survey of the project area was undertaken on 8 May 2014 by a qualified and accredited archaeologist. The survey was conducted through both pedestrian and vehicular survey.

4 State of the Receiving Environment

4.1 Description of the Affected Environment

The project is located within the Springs Magisterial District in the Gauteng Province. Situated directly to the north and east of the town Springs, the landscape is characterised by an urban and mining landscape.

4.1.1 Location Data

Detailed locational data for the project is summarised in Table 4-1 below.

Table 4-1: Location details for the project

Province	Gauteng Province	
Magisterial district	Springs Magisterial District	
District municipality	Grootvlei 6L16	Ekurhuleni Metropolitan Municipality
	Largo Site 4	Ekurhuleni Metropolitan Municipality
		Sedibeng District Municipality
Local municipality	Grootvlei 6L16	Ekurhuleni Metropolitan Local Municipality
	Largo Site 4	Ekurhuleni Metropolitan Local Municipality
		Lesedi Local Municipality
Nearest town	Springs	
1:50 000 topographical map	2628	
Relative centre coordinates of project area	South: -26.251433 East: 28.488733	
Recording method	ArcGIS 10.2	

4.1.2 Location Maps

Location maps are provided in Appendix B. These plans include the regional, local and geological setting, as well as the identified heritage resources in the project area.

4.1.3 Rezoning and/or land subdivision

Rezoning will be required for the proposed Largo Site 4 option as it is currently situated in agricultural fields.

No rezoning is required for the sludge disposal facilities of 6L16 as this is currently zoned for disposal.

4.1.4 Development Context / Regional Planning

The Ekurhuleni Municipality Integrated Development Plan (IDP) (Ekurhuleni Metropolitan Municipality, 2013) highlights seven achievable outcomes which include:

- Transformed service delivery;
- Increased effective, accountable and clean local government;
- Housing solutions that are affordable and sustainable;
- Active community participation in local government;
- Social inclusion and equity;
- Preserve the natural environment and resource base; and
- Equal opportunity for growth and development.

Within social inclusion and equity, the IDP refers to the implementation of public arts, heritage, culture and theatrical development programmes to build more unity, non-racial and safer communities. The identification and management of heritage resources within the municipal boundaries could potentially play a role in engaging communities with the historical context of their environs and establishing development programmes as stipulated within the IDP.

4.2 Literature Review

Geologically, the lowermost geological unit of the Karoo Supergroup is the *Dwyka Formation*. The *Dwyka Formation* is a glacial deposit laid down 300 million years ago (mya) when Gondwana was experiencing a melting of ice sheets. This formation is of low palaeontological significance (Lavin, 2013). The lithologies of the *Madzaringwe Formation* comprise of shales, sandstones, mudstones and coals. It corresponds to the basal unit of the Ecca Group and both of these rock units were deposited in a deltic environment in which rivers deposited shales and sandstones onto an alluvial plain. (Rubidge, 2013a; Rubidge, 2013b). This formation has a very high palaeontological significance and has a fossil heritage inclusive of glossopterid coal flora (Lavin, 2013).

The Transvaal Supergroup is an extensive sedimentary rock sequence of which the *Chuniespoort Group* is the lowermost sequence. The *Malmani Subgroup* is a singular rock formation within this sequence of the Transvaal Supergroup, typified by a thick succession of dolomites formed 2.6 - 2.5 billion year ago (Eriksson & Altermann, 1998). This group has a

high palaeontological significance and has a fossil heritage inclusive of a range of shallow marine to intertidal stromatolites (Lavin, 2013).

The Stone Age is a period in time defined by the manipulation of lithics to produce tools. In an African context, this period can be broadly divided into three periods, the Early (ESA), Middle (MSA) and Late Stone Age (LSA) (Goodwin & Van Riet Lowe, 1929; Deacon & Deacon, 1999; Lombard, et al., 2012). Through time, an evolution in the production of tools is evident, with deliberate choices being made with regard to raw material and 'style' (Hilton-Barber & Berger, 2002). The MSA is identified as a flake-and-prepared-core industry dating to roughly 250 000 years ago (ka) – 20 ka. More significantly, it is during this period that technological complexity and abstract thought arises (Hilton-Barber & Berger, 2002) and the emergence of modern *H. sapiens* occurs.

The earliest formal settlement in the region may date to the Late Iron Age (LIA). A considerable number of LIA stone walled sites dating from the 18th and 19th centuries occur along and on top of the rocky ridges of the eastern part of the Klipriviersberg towards Alberton some 40 km west (Mason, 1986). The occurrence of stone walled settlements similar to those identified by Maggs (1976) may be found within the study area. These have been defined as Type V and N where characteristically both settlement units consist of a number of primary enclosures grouped around in a ring. The primary difference is that the settlement unit in Type N is surrounded and defined by a wall which encloses all the structural components (Maggs, 1976).

The historical period is generally defined as the settlement of an area by and/or contact between Europeans and indigenous peoples. Within the study area, this only occurred from the mid-19th century after the Voortrekkers migrated into the interior during the Great Trek. Prior to the 1880s, the area was open farm land until the discovery of gold on the Witwatersrand in 1886 and the establishment of its first coal mine 1888. Gold was first discovered in 1899 on the farm Geduld, and the main reef was discovered in 1902, ultimately leading to the establishment of the Grootvlei Proprietary Mine Limited and town of Springs in 1904. Architecturally, many mine and public buildings were designed by Sir Herbert Baker for the working middle class. (Mark, 2010). Additionally, Springs also holds the second largest collection of small scale Art Deco buildings in the world (Anonymous, 2000).

Prior to this, the Second Anglo-Boer War, which broke out on 11 October 1899, also impacted upon the region. Various battles occurred in areas surrounding the Eastern Basin, Witpoort being the most notable battle in close proximity to the project area. Remnants of skirmishes in this region can be seen in the form of '*sangars*' – a line of stone shelters (Panagos, 1999). Migrant African mine workers suffered during this period. Those that remained in the mining compounds suffered through outbreaks of scurvy due to the lack of fresh produce, while those that fled were robbed of their wages and possessions by Boer commandos (Warwick, 1983). During 1901, 'native' concentration camps were established to deal with African refugees in the aftermath of the war.

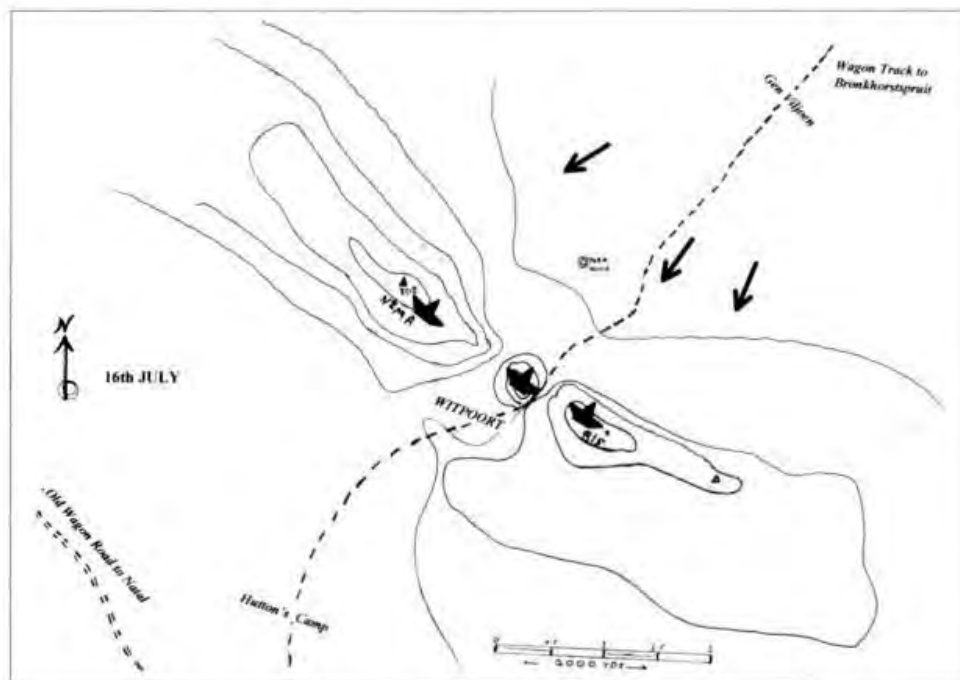


Figure 4-1: Battle of Witpoort, 16 July 1900 (© samilitaryhistory.org)

Other heritage resources that add to the cultural landscape include historical burial grounds associated with homesteads and mining complexes. Such cemeteries may be perceived as intangible memorials of the workers who lived, worked and died on the mines. A case in point is the recent discovery of human remains exposed by erosion from beneath a reclaimed slimes dump opposite the Crown Mines Plant. The remains were determined to be of Chinese origin (Smillie, 2011). Between 1904 and 1908 labour was 'imported' from China and employed on several of the Witwatersrand mines (Richardson, 1977). One result thereof was the establishment of Chinese communities in 'pockets' around the region. The discovery of the Chinese cemetery is a very tangible example of intangible heritage¹.

4.3 Historical Layering

A desktop cartographic survey was conducted in order to determine the potential of sites to exist within the project area and the surrounding region, as well as relative age based on the dates of the maps. Historical aerial photographs, historical maps, current topographic maps and satellite imagery were used to this end. Overall, the Eastern Basin area showed high levels of development associated with industrial and mining activities. Present satellite imagery indicates that the Eastern Basin has over time become progressively more industrial with an increase in residential settlements as well.

¹ Intangible refers to heritage associated with living practices such as rituals, but also sense of place, oral histories and significance associated with sacred places.



The earliest cartographic information for the study area is the 1899 Jeppe Map of the Transvaal. On this map, telegraph lines on Grootvlei 45 (now Grootvaly 124 IR) and on Daggafontein 94 intersected on G.G De Springs 396 (now Springs CBD) station. The location of this station would suggest that the region was inhabited during this period and associated settlement infrastructure would have been located in the area.

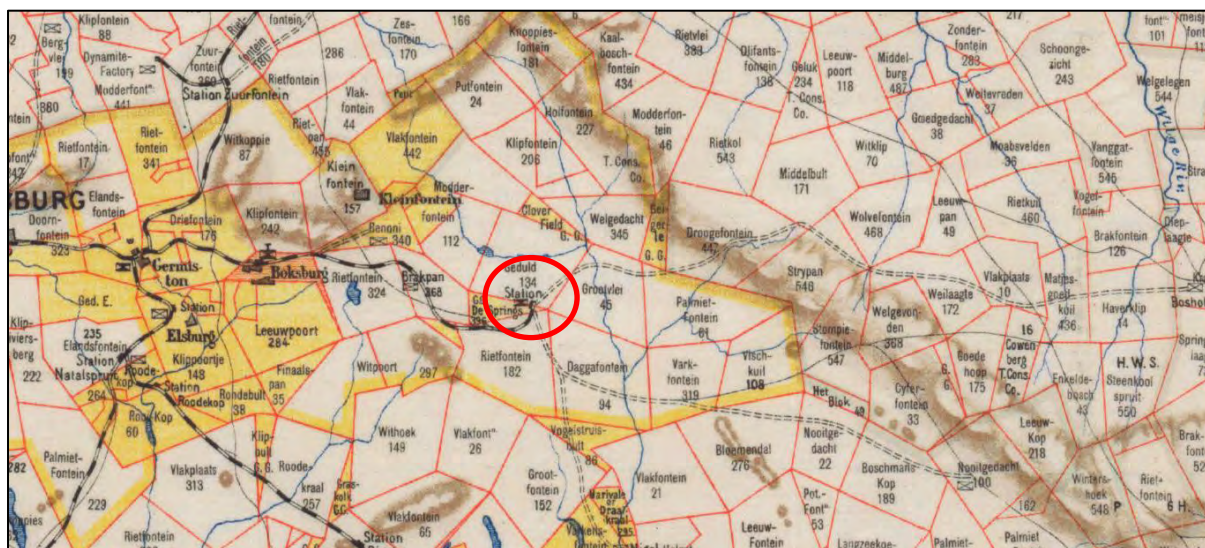


Figure 4-2: Location of Station on G.G. De Springs 396

The earliest aerial imagery of the study area dates to 1938. Within these photographs, it is evident that agricultural and mining operations within the region are well established. The existence of the mining and agriculture industries within the region suggest that built environments protected under Section 34 of the NHRA and burial grounds and graves protected under Section 36 of the NHRA are likely to occur.

4.4 Identified Heritage Resources

Heritage resources and sites that were identified from sources included as Background Information are listed in Table 4-2 below.

Table 4-2: Identified heritage resources from the desktop study





Site Number	Latitude	Longitude	Description
S.35-001	-26.24668702	28.49840121	Possible Iron Age stone walling
S.36-002	-26.24643307	28.50300275	Burial grounds and graves - possibly indentured Chinese labourers
S.36-003	-26.25112874	28.51852166	Military cemetery containing graves of coloured soldiers who perished during World War II. Also contains memorial for other soldiers who died outside of South

Site Number	Latitude	Longitude	Description
			Africa. Listed on the GSSA
S.36-004	-26.20738705	28.38234508	Fourie & Ramsden (2002-SAHRA-0088) CM1 Possible graves of Chinese mine labourers from turn of 20th century as suggested by Julian Baker in Van Schalkwyk 1997
S.34-005	-26.21448154	28.38448073	Built Environment associated with Modderfontein Mine Fourie & Ramsden (2002-SAHRA-0088) CM2 - CM5 dating from 1910 through 1930s
2008-SAHRA-0540/Site 1	-26.16732800	28.42861300	S.34-006 - Built Environment, Foundation remains of mining compound.
2008-SAHRA-0650/Site 1	-26.18830134	28.42600131	S.34-007 - Built Environment
2008-SAHRA-0650/Site 2	-26.18943100	28.43059500	S.36-008 - Burial Ground, Listed on GSSA
2008-SAHRA-0650/Site 3	-26.19645300	28.42698200	S.34-009 - Built Environment
2006-SAHRA-0102/Site 1	-26.18944444	28.45722222	S.36-010 - Burial ground, African cemetery
CaseID290/Site 1	-26.23873333	28.50578333	S.34-011 - Built Environment, Industrial remains
CaseID290/Site 2	-26.24015000	28.50541667	S.34-012 - Built Environment
CaseID290/Site 3	-26.24578333	28.50370000	S.36-013 - Built Environment
CaseID290/Site 4	-26.23675000	28.50315000	S.36-014 - Built Environment
CaseID290/Site 5	-26.24443580	28.50830241	S.34-015 - Built Environment
CaseID290/Site 6	-26.23521667	28.50558333	S.34-016 - Built Environment
CaseID290/Site 7	-26.23765000	28.50773333	S.34-017 - Built Environment
CaseID290/Site 9	-26.24513333	28.50533333	S.34-018 - Built Environment

Site Number	Latitude	Longitude	Description
CaseID290/Site10	-26.24070000	28.50676667	S.34-019 - Built Environment

Heritage resources identified during the screening survey are indicated in Table 4-3.

Table 4-3: Identified heritage resources from the screening survey

Site Number & Location	Description	Photograph						
5154/S.34-001 -26.256090 28.521805	<p>S.34 – Built Environment</p> <p>Location of Grootvlei Mine Shaft No. 3. Historic mining infrastructure is in a dilapidated state.</p> <p>Statement of Significance:</p> <table border="1"> <thead> <tr> <th>VALUE</th> <th>Designation</th> <th>Recommended Mitigation</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Negligible</td> <td>Sufficiently recorded, no mitigation required</td> </tr> </tbody> </table>	VALUE	Designation	Recommended Mitigation	1	Negligible	Sufficiently recorded, no mitigation required	 
VALUE	Designation	Recommended Mitigation						
1	Negligible	Sufficiently recorded, no mitigation required						
5154/S.34-002 -26.251433 28.488733	<p>S.34 – Built Environment</p> <p>Mining infrastructure that is in a dilapidated state. Adjacent to agricultural fields, outside of the project footprint.</p> <p>Statement of Significance:</p> <table border="1"> <thead> <tr> <th>VALUE</th> <th>Designation</th> <th>Recommended Mitigation</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Negligible</td> <td>Sufficiently recorded, no mitigation required</td> </tr> </tbody> </table>	VALUE	Designation	Recommended Mitigation	1	Negligible	Sufficiently recorded, no mitigation required	 
VALUE	Designation	Recommended Mitigation						
1	Negligible	Sufficiently recorded, no mitigation required						

5 Sources of Risk

Potential sources of risk on heritage resources are primarily associated with activities during the construction phase of projects, although operational and decommissioning phase activities may also pose certain risks.

The potential sources of risk that have been identified are discussed separately below.

5.1 Construction Phase

Clearing activities are the largest risk posed to heritage resources, where accidental damage and / or destruction are known to have occurred. In addition, the presence of workers in new areas during construction increases the potential for vandalism, most prominently on archaeological resources associated with Iron Age stone walled settlement and burial grounds and graves.

5.2 Operational Phase

The transportation and deposition of sludge during the operational phase pose minimal risk to heritage resources in the area. Potential envisaged risk is limited to burst pipes and or spillages which could potentially damage heritage resources located in close proximity to the established infrastructure.

5.3 Decommissioning Phase

During decommissioning, the established closure plan may require the dismantling of infrastructure that is older than 60 years. Although not all infrastructure will be deemed significant, some infrastructure may be intrinsically associated with the mining history of the area, and appropriate assessment may be required.

5.4 Cumulative Impacts

No cumulative impacts on heritage resources are envisaged at this stage of the project.

6 Discussion of Findings

Palaeontologically, the project area is predominantly within a highly sensitive area, as indicated by the SAHRIS PSM (Figure 6-1).

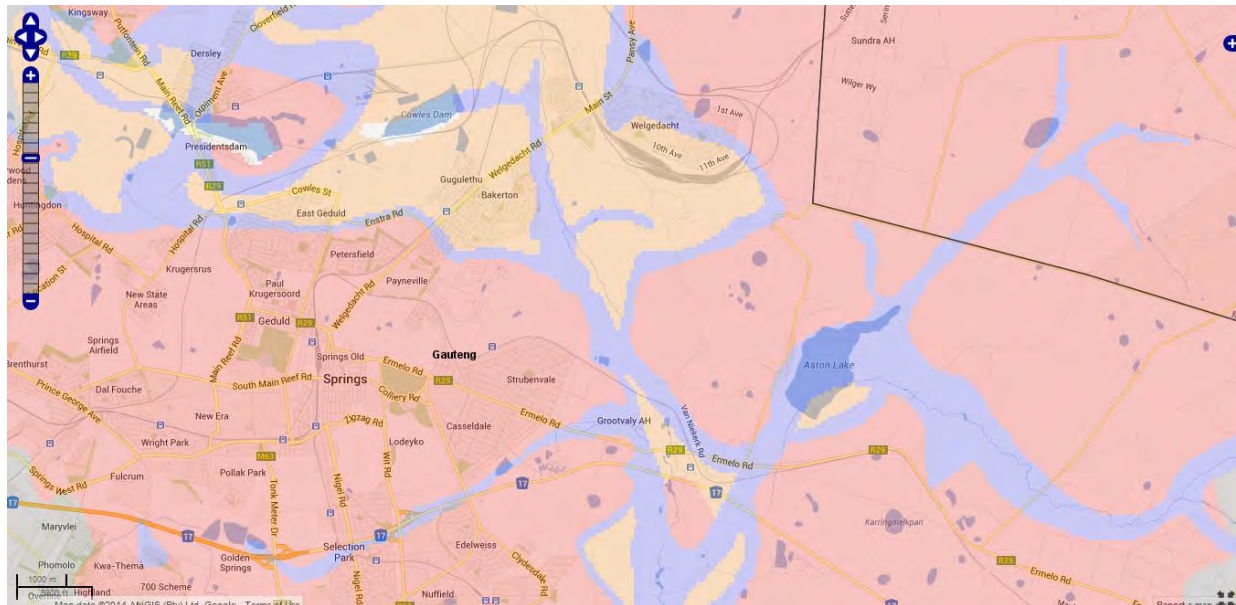


Figure 6-1: PSM of the project area (© SAHRIS 2014).

Outcrops associated with the *Madzaringwe Formations* and *Malmani* may be negatively impacted upon by the development of a newly established sludge storage facility. Based on the high palaeontological significance of these geological formations and the potential for fossil finds to exist within them, a palaeontological screening assessment will be required in undisturbed areas.

Historically, the study area is associated with an agricultural, but primarily mining landscape. Mining in the region began with the discovery of gold on the Witwatersrand in 1886 which resulted in the establishment of Grootvlei Proprietary Mine Limited and town of Springs in 1904. Architecturally, a number of mining and town buildings were designed by Sir Hebert Baker, the architect of the Union Buildings in Pretoria. Socially, the mining industry promoted an influx of mine workers, both African migrant labour and indentured Chinese labourers. The result of which was the construction of mining compounds and establishment of burial grounds for these workers. Other heritage resources identified during previous studies are primarily associated with the Stone Age, built environment and burial grounds and graves. A survey of historical aerial and satellite imagery has identified potential sites associated with the Iron Age, built environment and burial grounds and graves in areas previously not impacted upon by storage facilities.

Based on the review of available information, areas previously not impacted upon by sludge storage facilities are the most sensitive as *in situ* heritage resources may be present and would require mitigation. Existing sludge storage facilities are less sensitive as the footprint is already established, and potential damage to previously unidentified heritage resources is reduced.

As such, the screening survey was primarily focused on the relatively undeveloped location of Largo Site 4 and associated pipeline.

The proposed location for Largo Site 4 is currently utilised as agricultural fields and has been heavily disturbed through these activities. Any heritage resources that may have occurred within this area would have been disturbed, removed from its original context, or completely destroyed.



Figure 6-2: Current state of the Largo Site 4 footprint area – West Portion



Figure 6-3: Current state of the Largo Site 4 footprint area – East Portion

During the survey, only two historical resources were identified (See Table 4-3). These lie outside of the present footprint. These are remnants of previous mining activities in the area, and are in a dilapidated state. Through an assessment of the significance of these ruins, taking into consideration aesthetic, historic, scientific and social criteria in relation to the integrity of the site, it was determined that these resources have a negligible heritage value. Based on this Statement of Significance, it was deemed to have been sufficiently recorded.

Similarly, the proposed routes of the pipelines are located within existing servitudes associated with power lines, the old and current railway line, and the old Van Niekerk Road.



Figure 6-4: Servitude of the power line, road and railway within which the proposed pipelines lay

7 Recommendations

It is recommended that exemption from any additional heritage assessments be granted for:

- Sludge disposal site 6L16;
- Sludge disposal site Largo Site 4; and
- Associated pipelines

The proposed location of Grootvlei 6L16 situated on an existing sludge storage facility younger than 60 years, and no impact on heritage resources is envisaged for this sites. The pipeline associated with this location is also routed through existing servitudes that have been impacted upon by previous activities.

The proposed location of Largo Site 4 is situated in an area that has been disturbed through agricultural activities. Desktop based research has identified several heritage resources to the north associated with archaeological remains and burial grounds. No such finds were made in the proposed footprint location during the screening.

It is recommended that Chance Find Procedures (CFPs) be adopted and incorporated into the Environmental Management Programme (EMPr) for the proposed project. The CFPs must clearly outline the procedure and responsible resource in the event of accidental discovery of heritage resources in line with the requirements of the NHRA.

8 Conclusion

Digby Wells was enlisted by AECOM to conduct the necessary studies for the EA process of the STI measures for a sludge disposal facility and associated pipeline within the Eastern Basin of the Witwatersrand Gold Fields. A review of the available data for the project area indicated that the proposed locations are situated within a culturally sensitive area.

Having noted this, exemption has been requested for the both sites and associated pipelines as an existing disposal facility exists at the location of Grootvlei 6L16, the proposed location of Largo Site 4 is heavily disturbed and identified heritage resources have negligible value, and proposed pipeline routings are within existing servitudes.

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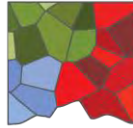
Notification of Intent to Develop

Authorisation of Sludge Disposal Facility and Pipelines Associated with Treatment of Acid Mine Drainage in the Eastern Basin of the Witwatersrand, Gauteng Province

AEC2588



Appendix A: Curriculum Vitae



DIGBY WELLS

ENVIRONMENTAL

Mr. Justin du Piesanie
Heritage Management Consultant: Archaeologist
Social Sciences Department
Digby Wells Environmental

1 Education

Date	Degree(s) or Diploma(s) obtained	Institution
2013	Continued Professional Development Programme, Architectural and Urban Conservation: Researching and Assessing Local Environments	University of Cape Town
2008	MSc	University of the Witwatersrand
2005	BA (Honours) (Archaeology)	University of the Witwatersrand
2004	BA	University of the Witwatersrand
2001	Matric	Norkem Park High School

2 Language Skills

Language	Written	Spoken
English	Excellent	Excellent
Afrikaans	Proficient	Good

3 Employment

Period	Company	Title/position
08/2011 to present	Digby Wells Environmental	Heritage Management Consultant: Archaeologist

Digby Wells and Associates (South Africa) (Pty) Ltd (Subsidiary of Digby Wells & Associates (Pty) Ltd). Co. Reg. No. 2010/008577/07. Fern Isle, Section 10, 359 Pretoria Ave Randburg Private Bag X10046, Randburg, 2125, South Africa
Tel: +27 11 789 9495, Fax +27 11 789 9498, info@digbywells.com, www.digbywells.com

Directors: A Sing*, AR Wilke, DJ Otto, GB Beringer, LF Koeslag, AJ Reynolds (Chairman) (British)*, J Leaver*, GE Trusler (C.E.O)
*Non-Executive

Period	Company	Title/position
2009-2011	University of the Witwatersrand	Archaeology Collections Manager
2009-2011	Independent	Archaeologist
2006-2007	Maropeng & Sterkfontein Caves UNESCO World Heritage Site	Tour guide

4 Professional Affiliations

Position	Professional Body	Registration Number
Member	Association for Southern African Professional Archaeologists (ASAPA); ASAPA Cultural Resources Management (CRM) section	270
Member	International Council on Monuments and Sites (ICOMOS)	14274
Member	Society for Africanist Archaeologists (SAfA)	N/A

5 Publications

- Huffman, T.N. & du Piesanie, J.J. 2011. Khami and the Venda in the Mapungubwe Landscape. *Journal of African Archaeology* 9(2): 189-206

6 Experience

I have 5 years experiences in the field of heritage resources management (HRM) including archaeological and heritage assessments, grave relocation, social consultation and mitigation of archaeological sites. During my studies I was involved in academic research projects associated with the Stone Age, Iron Age, and Rock Art. These are summarised below:

- Wits Fieldschool - Excavation at Meyersdal, Klipriviersberg Johannesburg (Late Iron Age Settlement).
- Wits Fieldschool - Phase 1 Survey of Prentjiesberg in Ugie / Maclear area, Eastern Cape.
- Wits Fieldschool – Excavation at Kudu Kopje, Mapungubwe National Park Limpopo Province.

- Wits Fieldschool – Excavation of Weipe 508 (2229 AB 508) on farm Weipe, Limpopo Province.
- Survey at Meyerdal, Klipriviersberg Johannesburg.
- Mapping of Rock Art Engravings at Klipbak 1 & 2, Kalahari.
- Survey at Sonop Mines, Windsorton Northern Cape (Vaal Archaeological Research Unit).
- Excavation of Kudu Kopje, Mapungubwe National Park Limpopo Province.
- Excavation of KK (2229 AD 110), VK (2229 AD 109), VK2 (2229 AD 108) & Weipe 508 (2229 AB 508) (Origins of Mapungubwe Project)
- Phase 1 Survey of farms Venetia, Hamilton, Den Staat and Little Muck, Limpopo Province (Origins of Mapungubwe Project)
- Excavation of Canteen Kopje Stone Age site, Barkley West, Northern Cape
- Excavation of Khami Period site AB32 (2229 AB 32), Den Staat Farm, Limpopo Province

Since 2011 I have been actively involved in environmental management throughout Africa, focusing on heritage assessments in compliance with International Finance Corporation (IFC) Performance Standards and other World Bank Standards and Equator Principles. This exposure to environmental, and specifically heritage management has allowed me to work to international best practice standards in accordance with international conservation bodies such as UNESCO and ICOMOS. In addition, I have also been involved in the collection of quantitative data for a Relocation Action Plan (RAP) in Burkina Faso. The exposure to this aspect of environmental management has afforded me the opportunity to understand the significance of integration of various studies in the assessment of heritage resources and recommendations for feasible mitigation measures. I have worked throughout South Africa, as well as Burkina Faso, the Democratic Republic of Congo, Liberia and Mali.

7 Project Experience

Please see the following table for relevant project experience:



Project Title	Project Location	Date:	Description of the Project	Role of Firm in the Project	Own Role in the Project	Time involved (man months)	Name of Client	Contract Outcomes	Reference
Klipriviersberg Archaeological Survey	Meyersdal, Gauteng, South Africa	2005 2006	Survey of residential development in Meyersdal. This included the recording of identified stone walled settlements through detailed mapping and photographs. Included was the Phase 2 Mitigation of two stone walled settlements	Archaeological Impact Assessments	Researcher, Archaeological Assistant	2 months		Completed survey, excavations and reporting	Archaeological Resource Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Sun City Archaeological Site Mapping	Sun City, Planesberg, North West Province, South Africa	2006 2006	Recording of an identified Late Iron Age stone walled settlement through detailed mapping	Mapping	Archaeological Assistant, Mapper	1 month	Sun City	Completed mapping	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Witbank Dam Archaeological Impact Assessment	Witbank, Mpumalanga, South Africa	2007 2007	Archaeological survey for proposed residential development at the Witbank dam	Archaeological Impact Assessment	Archaeological Assistant	1 week		Completed Archaeological Impact Assessment report	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Archaeological Assessment of Modderfontein AH Holdings	Johannesburg, Gauteng, South Africa	2008 2008	Archaeological survey and basic assessment of Modderfontein Holdings	Archaeological Impact Assessment	Archaeologist	1 month		Completed the assessment of 13 properties	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
Heritage Assessment of Rhino Mines	Thabazimbi, Limpopo Province, South Africa	2008 2008	Heritage Assessment for expansion of mining area at Rhino Mines	Heritage Impact Assessment	Archaeologist	2 weeks	Rhino Mines	Completed the assessment	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Cronimet Project	Thabazimbi, Limpopo Province, South Africa	2008 2008	Archaeological survey of Moddergat 389 KQ, Schilpadnest 385 KQ, and Swartkops 369 KQ,	Archaeological Impact Assessment	Archaeologist	1 weeks	Cronimet	Completed field survey and reporting	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com



Eskom Thohoyandou SEA Project	Limpopo Province, South Africa	2008 2008	Heritage Statement defining the cultural landscape of the Limpopo Province to assist in establishing sensitive receptors for the Eskom Thohoyandou SEA Project	Heritage Statement	Archaeologist	2 months	Eskom	Completed Heritage Statement	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
Wenzelrust Excavations	Shoshanguve, Gauteng, South Africa	2009 2009	Contracted by the Heritage Contracts Unit to help facilitate the Phase 2 excavations of a Late Iron Age / historical site identified in Shoshanguve	Excavation and Mapping	Archaeologist	1 week	Heritage Contracts Unit	Completed excavations	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
University of the Witwatersrand Parys LIA Shelter Project	Parys, Free State, South Africa	2009 2009	Mapping of a Late Iron Age rock shelter being studied by the Archaeology Department of the University of the Witwatersrand	Mapping	Archaeologist	1 day	University of the Witwatersrand	Completed mapping of the shelter	University of the Witwatersrand Karim Sadr karim.sadr@wits.ac.za
Transnet NMPP Line	Kwa-Zulu Natal, South Africa	2010 2010	Heritage Survey of the Anglo-Boer War Vaalkrans Battlefield where the servitude of the NMP pipeline	Heritage Impact Assessment	Archaeologist	1 week	Umlando Consultants	Completed survey	Umlando Consultants Gavin Anderson umlando@gmail.com
Archaeological Impact Assessment – Witpoortjie Project	Johannesburg, Gauteng, South Africa	2010 2010	Heritage survey of Witpoortjie 254 IQ, Mindale Ext 7 and Nooitgedacht 534 IQ for residential development project	Archaeological Impact Assessment	Archaeologist	1 week	ARM	Completed survey for the AIA	Archaeological Resources Management (ARM) Prof T.N. Huffman thomas.huffman@wits.ac.za
Der Brochen Archaeological Excavations	Steelpoort, Mpumalanga, South Africa	2010 2010	Phase 2 archaeological excavations of Late Iron Age Site	Archaeological Excavation	Archaeologist	2 weeks	Heritage Contracts Unit	Completed excavations	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
De Brochen and Booyensdal Archaeology Project	Steelpoort, Mpumalanga, South Africa	2010 2010	Mapping of archaeological sites 23, 26, 27, 28a & b on the Anglo Platinum Mines De Brochen and Booyensdal	Mapping	Archaeologist	1 week	Heritage Contracts Unit	Completed Mapping	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
Eskom Thohoyandou Electricity Master Network	Limpopo Province, South Africa	2010 2010	Desktop study to identify heritage sensitivity of the Limpopo Province	Desktop Study	Archaeologist	1 Month	Strategic Environmental Focus	Completed Report	Strategic Environmental Focus (SEF) Vici Napier vici@sefsa.co.za



Bathhako Mine Expansion	North-West Province, South Africa	2010 2010	Mapping of historical sites located within the Bathhako Mine Expansion Area	Mapping	Archaeologist	1 week	Heritage Contracts Unit	Completed Mapping	Heritage Contracts Unit Jaco van der Walt jaco.heritage@gmail.com
Kibali Gold Project Grave Relocation Plan	Oriental Province, Democratic Republic of Congo	2011 2013	Implementation of the Grave Relocation Project for the Randgold Kibali Gold Project	Grave Relocation	Archaeologist	2 years	Randgold Resources	Successful relocation of approximately 3000 graves	Kibali Gold Mine Cyrille Mutombo Cyrille.c.mutombo@kibaligold.com
Kibali Gold Hydro-Power Project	Oriental Province, Democratic Republic of Congo	2012 2014	Assessment of 7 proposed hydro-power stations along the Kibali River	Heritage Impact Assessment	Heritage Consultant	2 years	Randgold Resources	Completed Heritage Impact Assessment	Randgold Resources Charles Wells Charles.wells@randgoldresources.com
Everest North Mining Project	Steelpoort, Mpumalanga, South Africa	2012 2012	Heritage Impact Assessment on the farm Vygenhoek	Heritage Impact Assessment	Heritage Consultant	6 months	Aquarius Resources	Completed Heritage Impact Assessment	Aquarius Resources
Environmental Authorisation for the Gold One Geluksdal TSF and Pipeline	Gauteng, South Africa	2012 2012	Heritage impact Assessment for the proposed TSF and Pipeline of Geluksdal Mine	Heritage Impact Assessment	Heritage Consultant	4 months	Gold One International	Completed Heritage Impact Assessment	Gold One International
Platreef Burial Grounds and Graves Survey	Mokopane, Limpopo Province, South Africa	2012 2012	Survey for Burial Grounds and Graves	Burial Grounds and Graves Management Plan	Heritage Consultant	4 months	Platreef Resources	Project closed by client due to safety risks	Platreef Resources Gerick Mouton
Resgen Boikarabelo Coal Mine	Limpopo Province, South Africa	2012 2012	Archaeological Excavation of identified sites	Archaeological Excavation	Heritage Consultant	4 months	Resources Generation	Completed excavation and reporting, destruction permits approved	Resources Generation Louise Nicolai
Bokoni Platinum Road Watching Brief	Burgersfort, Limpopo Province, South Africa	2012 2012	Watching brief for construction of new road	Watching Brief	Heritage Consultant	1 week	Bokoni Platinum Mine	Completed watching brief, reviewed report	Bokoni Platinum Mines (Pty) Ltd
SEGA Gold Mining Project	Burkina Faso	2012 2013	Socio Economic and Asset Survey	RAP	Social Consultant	3 months	Cluff Gold PLC	Completed field survey and data collection	Cluff Gold PLC



SEGA Gold Mining Project	Burkina Faso	2013 2013	Specialist Review of Heritage Impact Assessment	Reviewer	Heritage Consultant	1 week	Cluff Gold PLC	Reviewed specialist report and made appropriate recommendations	Cluff Gold PLC
Consbrey and Harwar Collieries Project	Breyton, Mpumalanga, South Africa	2013 2013	Heritage Impact Assessment for the proposed Consbrey and Harwar Collieries	Heritage Impact Assessment	Heritage Consultant	2 months	Msobo	Completed Heritage Impact Assessments	Msobo
New Liberty Gold Project	Liberia	2013 2014	Implementation of the Grave Relocation Project for the New Liberty Gold Project	Grave Relocation	Heritage Consultant	On-going	Aureus Mining	Project is on-going	Aureus Mining
Falea Uranium Mine Environmental Assessment	Falea, Mali	2013 2013	Heritage Scoping for the proposed Falea Uranium Mine	Heritage Scoping	Heritage Consultant	2 months	Rockgate Capital	Completed scoping report and recommended further studies	Rockgate Capital
Putu Iron Ore Mine Project	Petroken, Liberia	2013 2014	Heritage impact Assessment for the proposed Putu Iron Ore Mine, road extension and railway line	Heritage Impact Assessment	Heritage Consultant	6 months	Atkins Limited	Completed Heritage Impact Assessment and provided recommendations for further studies	Atkins Limited Irene Bopp Irene.Bopp@atkinsglobal.com
Sasol Twistdraai Project	Secunda, Mpumalanga, South Africa	2013 2014	Notification of intent to Develop and Heritage Statement for the Sasol Twistdraai Expansion	NID	Heritage Consultant	2 months	ERM Southern Africa	Completed NID and Heritage Statement	ERM Southern Africa Alan Cochran Alan.Cochran@erm.com
Daleside Acetylene Gas Production Facility	Gauteng, South Africa	2013 2013	Project Management of the heritage study	NID	Project Manager	3 months	ERM Southern Africa	Project completed	ERM Southern Africa Kasantha Moodley Kasantha.Moodley@erm.com
Nzoro 2 Hydro Power Project	Orientale Province, Democratic Republic of Congo	2014 2014	Social consultation for the Relocation Action Plan component of the Nzoro 2 Hydro Power Station	RAP	Social Consultant	On-going	Randgold Resources	Completed introductory meetings – project on-going	Kibali Gold Mine Cyrille Mutombo Cyrille.c.mutombo@kibaligold.com
Eastern Basin AMD Project	Springs, Gauteng, South Africa	2014 2014	Heritage Impact Assessment for the proposed new sludge storage facility and pipeline	Heritage Impact Assessment	Heritage Consultant	On-going	AECOM	Project is on-going	AECOM
Soweto Cluster Reclamation Project	Soweto, Gauteng, South Africa	2014 2014	Heritage Impact Assessment for reclamation activities associated with the Soweto Cluster Dumps	Heritage Impact Assessment	Heritage Consultant	On-going	ERGO	Project is on-going	ERGO Greg Ovens



Klipspruit South Project	Ogies, Mpumalanga, South Africa	2014 2014	NID and Heritage Statement for the Section 102 Amendment of the Klipspruit Mine EMP	NID	Heritage Consultant	On-going	BHP Billiton	Project is on-going	BHP Billiton
Klipspruit Extension Project	Ogies, Mpumalanga, South Africa	2014 2014	NID and Heritage Statement for the expansion of the Klipspruit Mine	NID	Heritage Consultant	On-going	BHP Billiton	Project is on-going	BHP Billiton



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Notification of Intent to Develop

Authorisation of Sludge Disposal Facility and Pipelines Associated with Treatment of Acid Mine Drainage in the Eastern Basin of the Witwatersrand, Gauteng Province

AEC2588



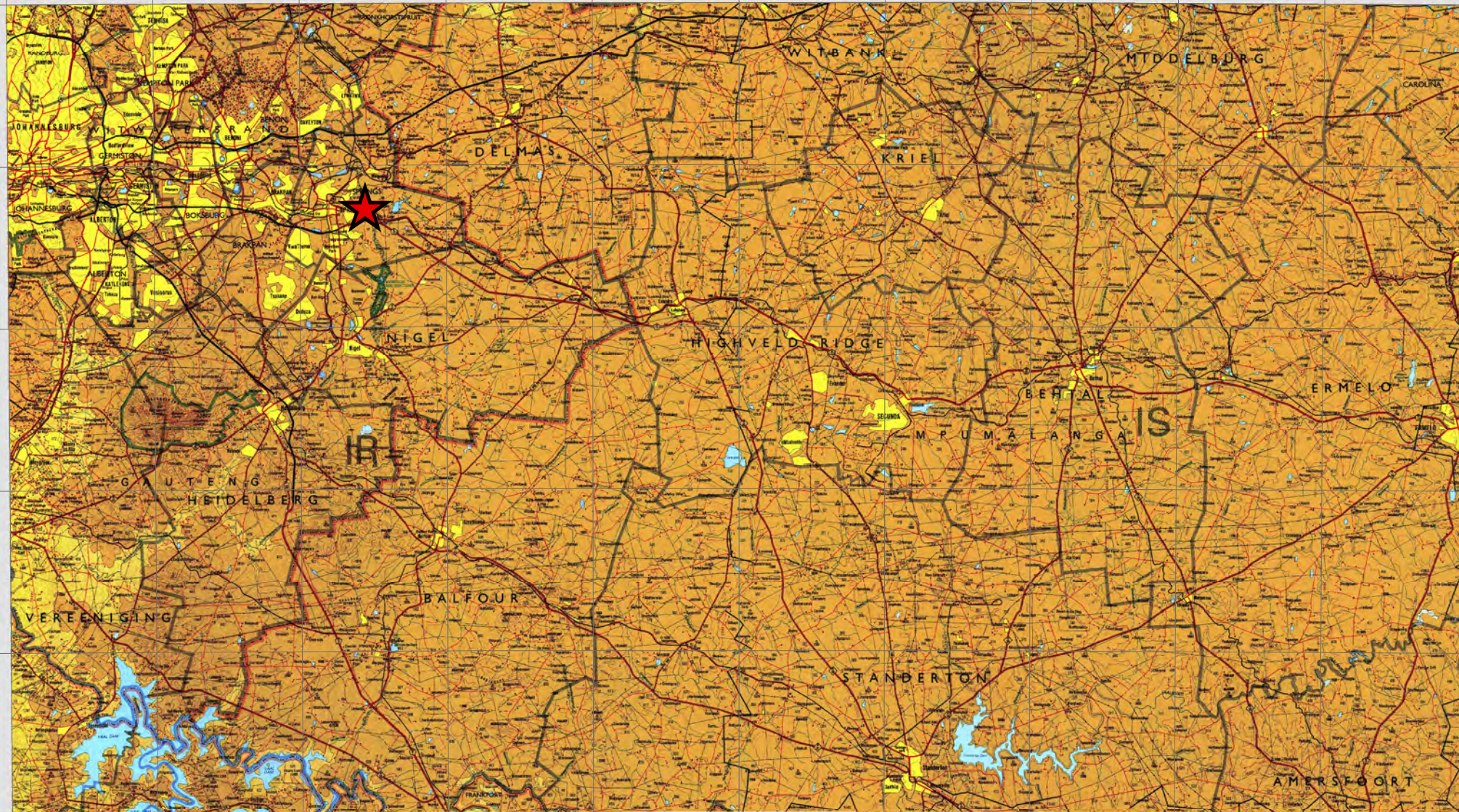
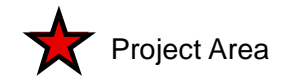
Appendix B: Location and Site Maps

Proposed Sludge Disposal Sites For AMD Management in the Eastern Basin

Regional Setting

1 - 250 000

Legend

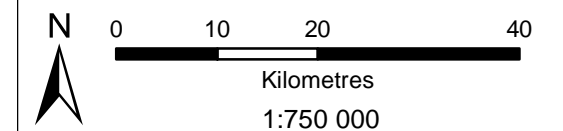


2628 Eastrand



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Datum: Hartebeeshoek 1994 Revision Number: 1
Central Meridian: 29°E Date: 07/03/2014



Proposed Sludge Disposal Sites For AMD Management in the Eastern Basin

Regional Setting
1:50 000

Legend

 Project Area

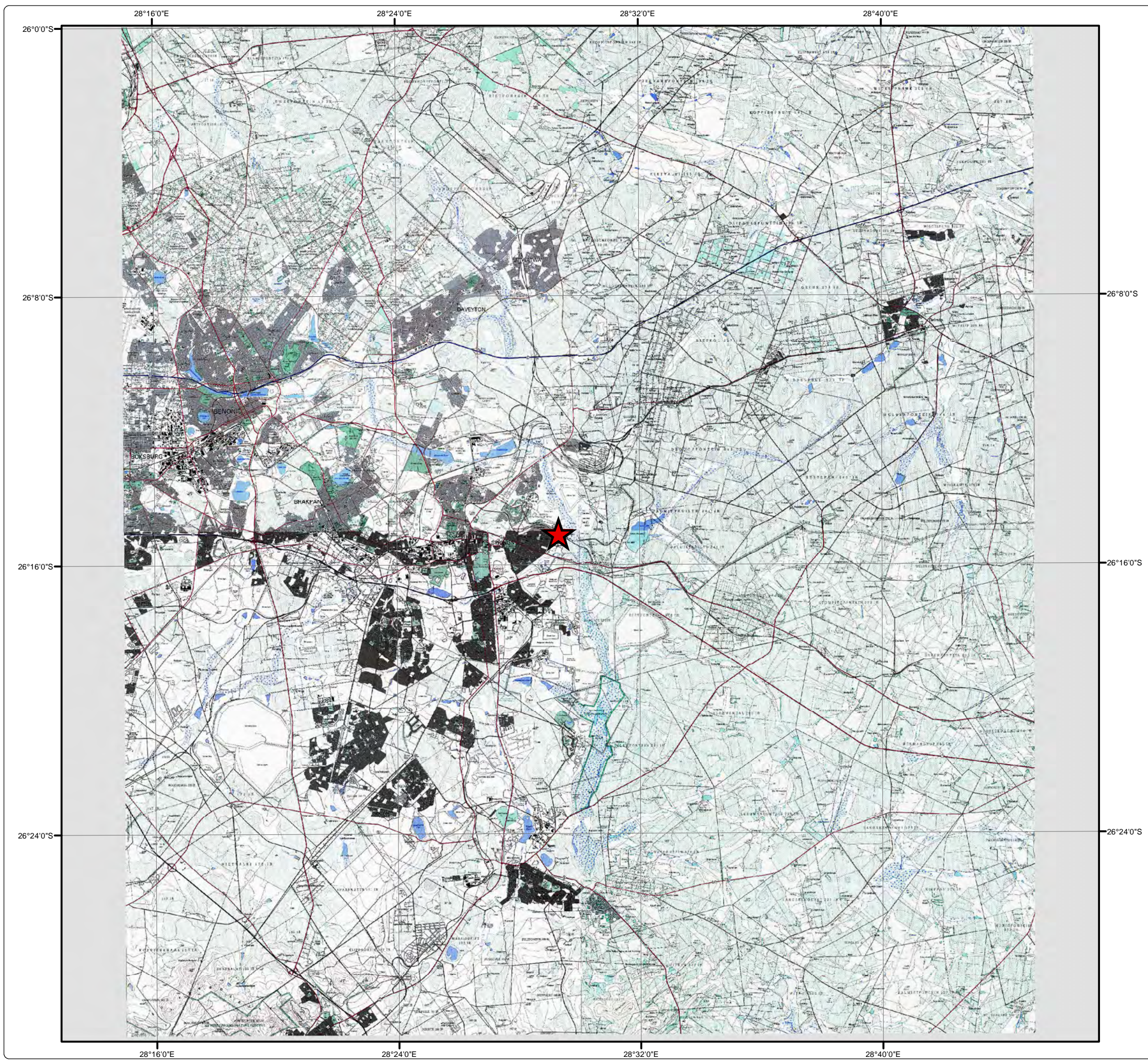
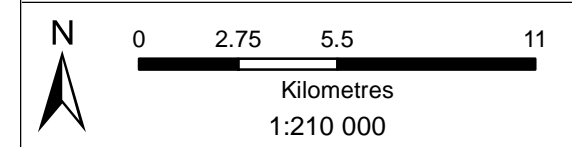
2628BA Delmas
2628BC Endicott
2628AB Benoni
2628AD Springs



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Proposed Sludge Disposal Sites For AMD Management in the Eastern Basin

Regional Setting

1:10 000

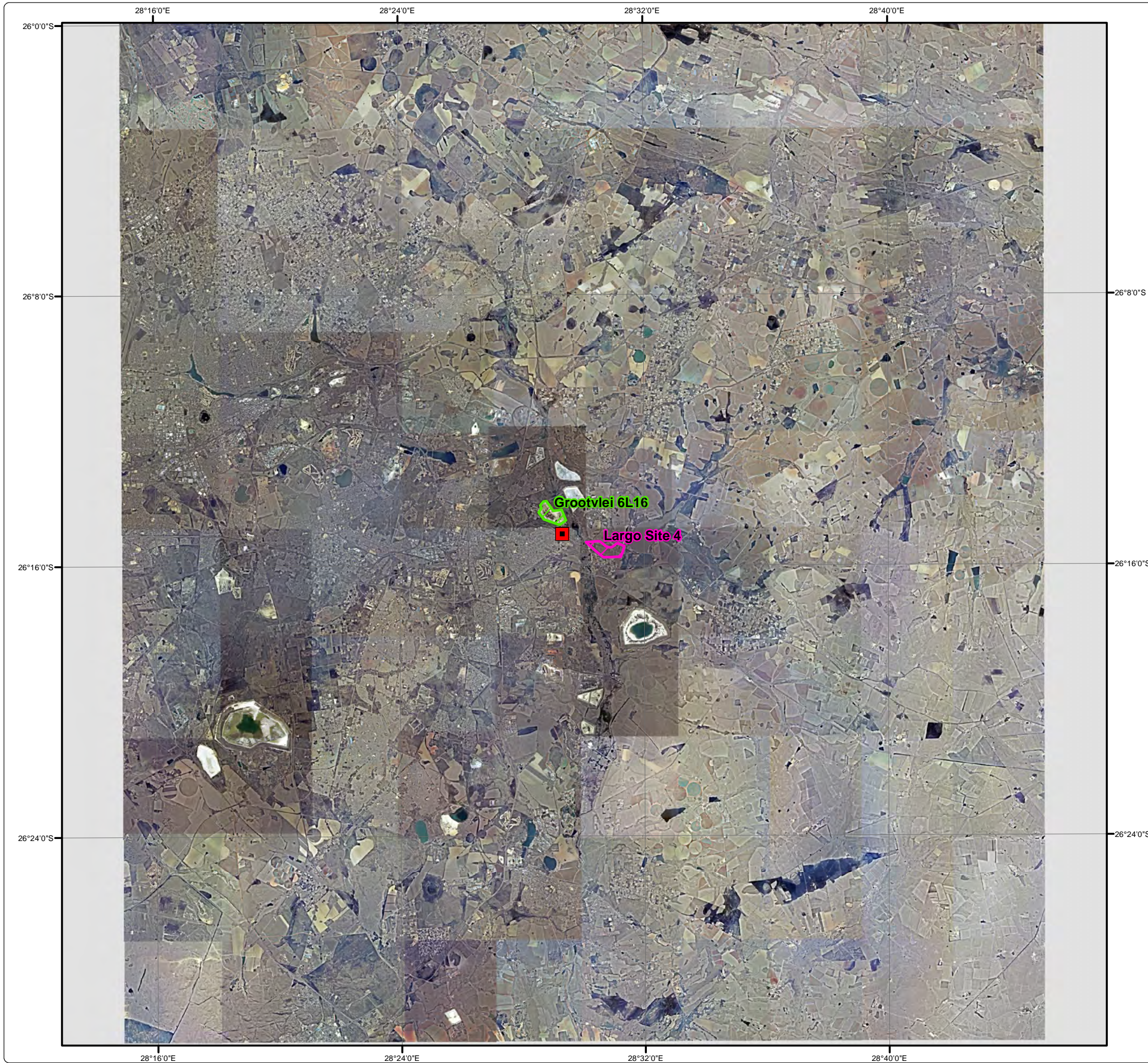
Legend

■ Grootvlei Mine Shaft No 3

Proposed Sites

▨ Grootvlei 6L16

▨ Largo Site 4



2628BA
2628BC
2628AB
2628AD

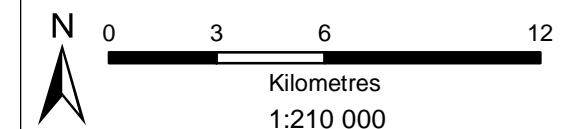


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Revision Number: 1
Date: 07/03/2014



Proposed Sludge Disposal Sites For AMD Management in the Eastern Basin

Regional Geology

Legend

- Grootvlei Mine Shaft No 3
 - Pipeline to Grootvlei 6L16
 - Pipeline to Largo Site 4
- Proposed Sites**
- Grootvlei 6L16
 - Largo Site 4
 - Major Town
 - Other Town
 - Settlement

- Arterial / National Route
- Main Road
- +— Railway Line
- Perennial River
- - - Non-Perennial River
- Dam / Lake
- Non-perennial Pan
- Perennial Pan
- Wetland

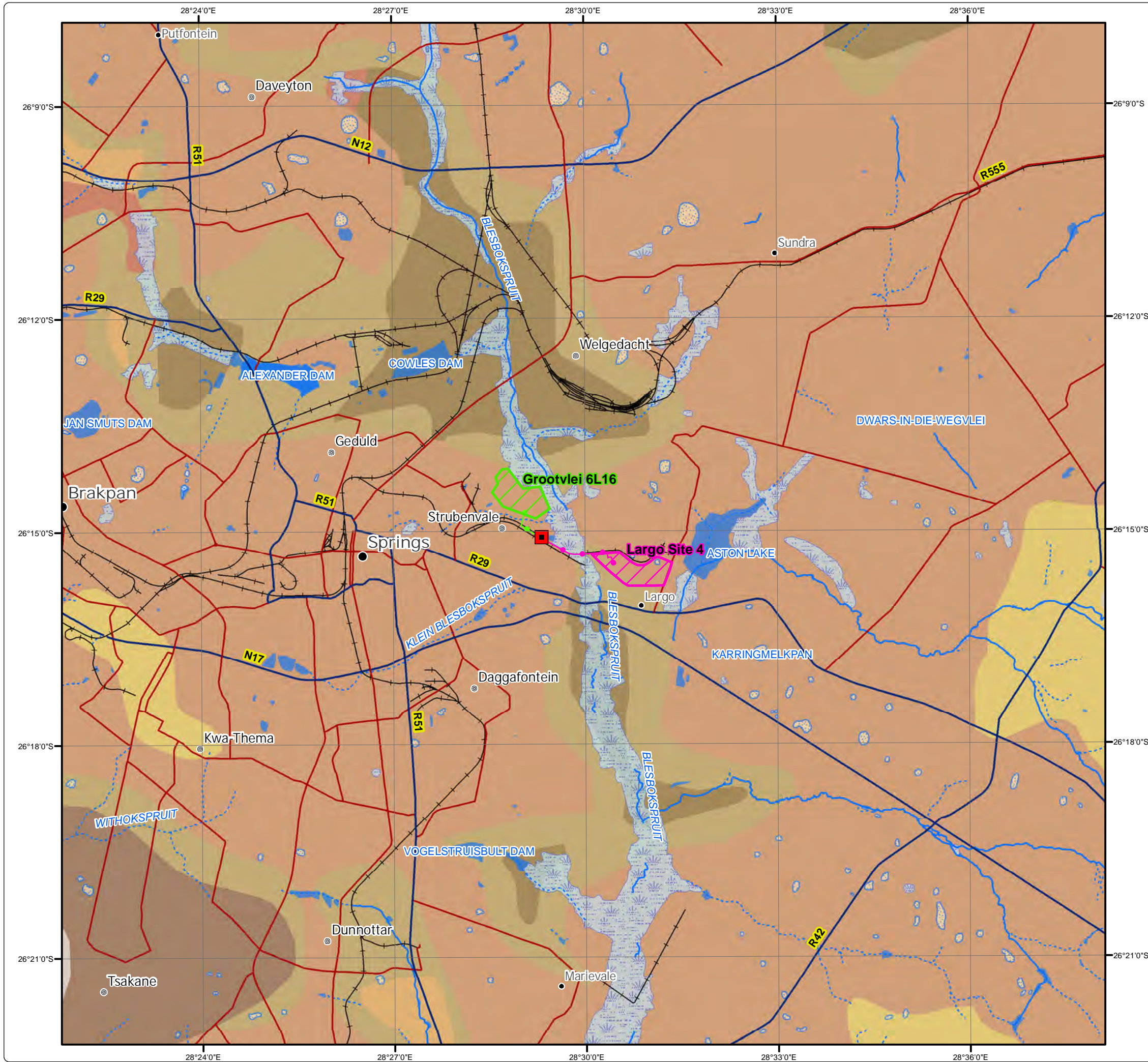
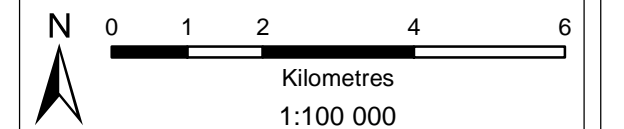
Geology

- Dwyka Grp, Karoo Spgrp
- Johannesburg Sbgrp, Central Rand Grp
- Karoo Dolerite Sui
- Klipriviersberg Grp, Ventersdorp Spgrp
- Madzaringwe Fm, Karoo Spgrp
- Malmani Sbgrp, Chuniespoort Grp
- Turffontein Sbgrp, Central Rand Gr



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 Datum: Hartebeesthoek 1994 Revision Number: 1
 Central Meridian: 29°E Date: 06/01/2014



Proposed Sludge Disposal Sites For AMD Management in the Eastern Basin

Heritage Sites

Legend

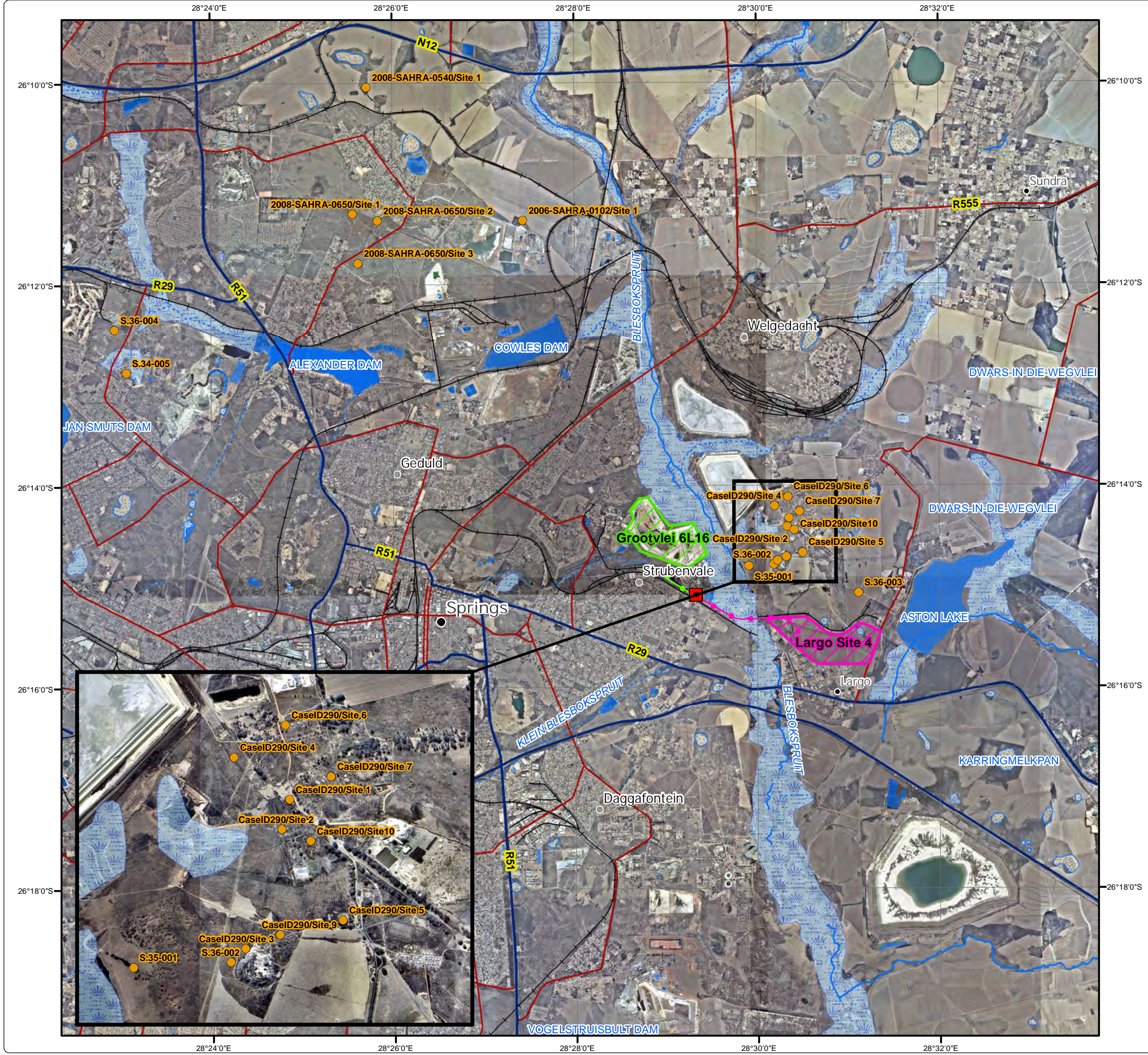
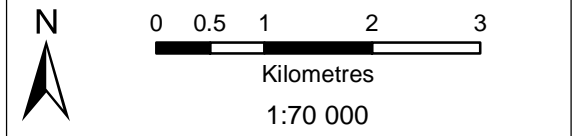
- Grootvlei Mine Shaft No 3
- Pipeline to Grootvlei 6L16
- Pipeline to Largo Site 4
- Grootvlei 6L16
- Largo Site 4
- Heritage Sites
- Major Town
- Other Town
- Settlement
- Arterial / National Route
- Main Road
- +— Railway Line
- Perennial River
- - - Non-Perennial River
- Dam / Lake
- Non-Perennial Pan
- Perennial Pan
- Wetland

Heritage Resources
 The National Archives of South Africa;
 The Genealogical Society of South Africa;
 The University of the Witwatersrand Archaeological Site Database;
 The South African Heritage Information System; and
 The Artefacts Architectural Online Database.



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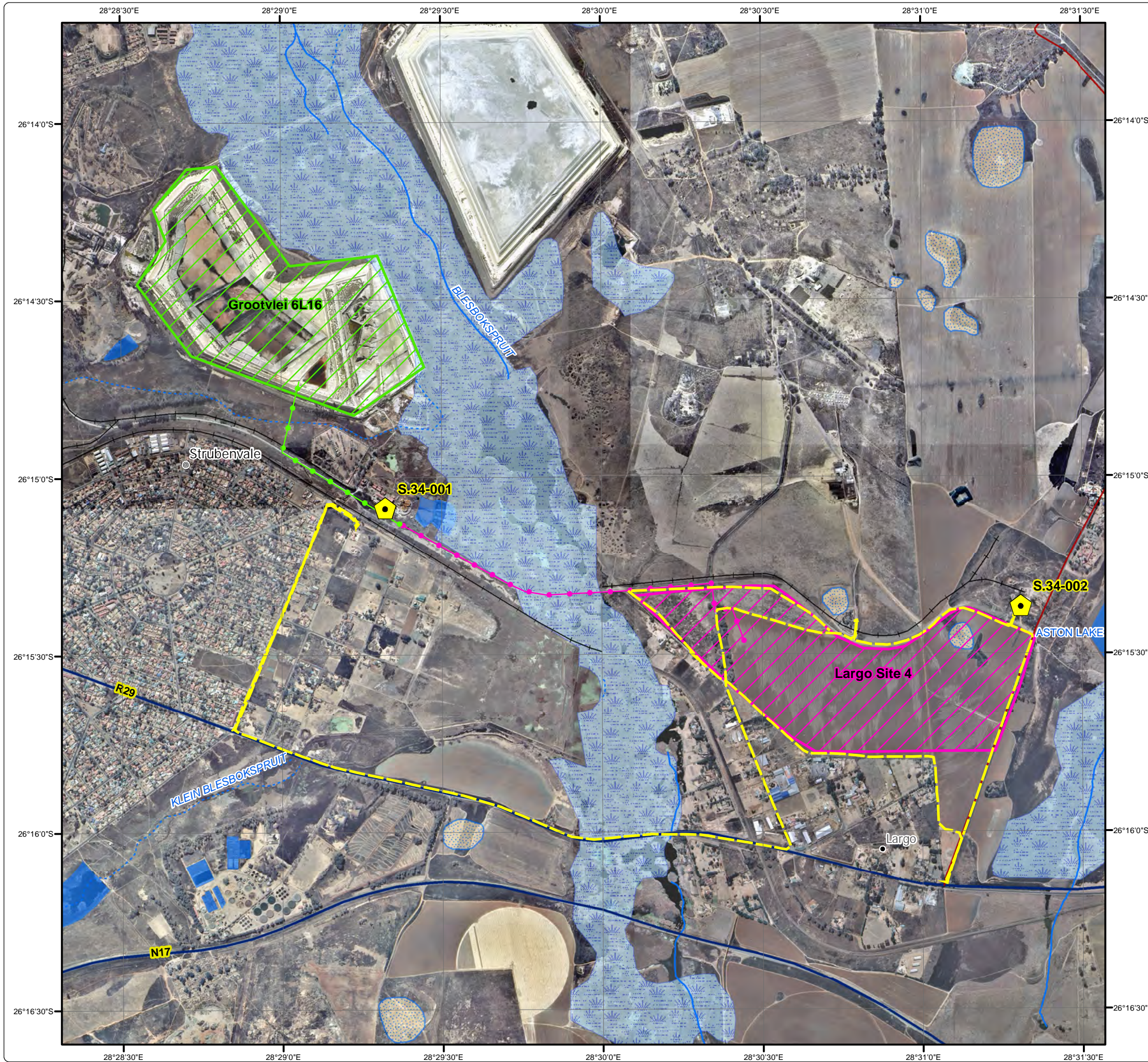


Proposed Sludge Disposal Sites For AMD Management in the Eastern Basin

Heritage Screening Survey

Legend

-  Identified Heritage Resource
-  Heritage Track
-  Pipeline to Grootvlei 6L16
-  Pipeline to Largo Site 4
- Proposed Sites**
-  Grootvlei 6L16
-  Largo Site 4
-  Major Town
-  Other Town
-  Settlement
-  Arterial / National Route
-  Main Road
-  Railway Line
-  Perennial River
-  Non-Perennial River
-  Dam / Lake
-  Non-Perennial Pan
-  Perennial Pan
-  Wetland



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Projection: Transverse Mercator Ref #: idp.AEC2588.201405.034
 Datum: Hartebeesthoek 1994 Revision Number: 1
 Central Meridian: 29°E Date: 09/05/2014

