WATER USE LICENCE APPLICATION

Waterfall Bulk Water Supply Pipeline

Located on Portion 1 of the Farm Waterval 5 IR and Portion 89 and 123 of the Farm Klipfontein 12 IR

WATER USE LICENSE APPLICATION TO THE DEPARTMENT OF WATER AND SANITATION IN TERMS OF SECTION 21 OF NWA (ACT 36 OF 1998) WATER USE AUTHORISATION

Section 21 (c)
Impeding or diverting the flow of water in a watercourse
Section 21 (i)
Altering the bed, banks, course or characteristics of a watercourse

PREPARED BY:

Bokamoso Environmental Consultants & Landscape Architects

Contact Person:

Dashentha Moodley

012 346 3810

dashentha@bokamso.net

PREPARED FOR:

Attacq (Pty) Ltd

Contact Person:

Morne Whitehead

087 845 1136

whitehead@attacq.co.za

AUTHORS

Prepared by Bokamoso Landscape Architects and Environmental Consultants CC

Lizelle Gregory **Director**

Tertiary Education:

- Qualified as Landscape Architect at UP 1991;
- Qualified as Professional Landscape Architect in 1997;
- A Registered Member at The South African Council for the Landscape Architect Profession (SACLAP) with Practise Number: PrLArch97078;
- A Registered Member at the International Association for Impact Assessment Practitioners (IAIA);
- Qualified as an Environmental Auditor in July 2008 and also became a Member of the International Environmental Management Association (IEMAS) in 2008;
- Currently enrolled at the University of Pretoria for a Masters Degree in Wetlands

Work Experience:

- Worked part time at Eco-Consult – 1988-1990;
- Worked part time at Plan Associates as Landscape Architect in training – 1990-1991;
- Worked as Landscape Architect at Environmental Design Partnership (EDP) from 1992 - 1994
- Practised under Lizelle Gregory Landscape Architects from 1994 until 1999;
- Lectured at Part-Time at UP (1999) – Landscape Architecture and TUT (1998- 1999)- Environmental Planning and Plant
- Material Studies;
- Worked as part time Landscape Architect and Environmental Consultant at Plan Associates and managed their environmental division for more than 10 years – 1993 – 2008 (assisted the PWV Consortium with various road planning matters which amongst others included environmental Scans, EIA's, Scoping reports etc.)
- Renamed business as Bokamoso in 2000 and is the only member of Bokamoso Landscape Architects and Environmental Consultants CC;
- More than 23 years' experience in the compilation of Environmental Reports, which amongst others included the compilation of various DFA Regulation 31 Scoping Reports, EIA's for EIA applications in terms of the applicable environmental legislation, Environmental Management Plans, Inputs for Spatial Development Frameworks, DP's, EMF's, EMS Development, Environmental Policy Development, ECO Reports, Environmental Auditing Reports etc. Also included EIA Application on and adjacent to mining land and slimes dams (i.e. Brahm Fisherville, Doornkop)

Dashentha Moodley B Soc Sc(Hons) **Senior WULA and Environmental Consultant**

Tertiary Education:

- University of South Africa: BA (Hons) (cum laude) – Environmental Management
- University of KwaZulu Natal: B Soc Sc- Geography and Environmental Management

Work Experience:

- April 2014 to present: WULA Consultant for Bokamoso Landscape Architects and Environmental Consultants CC
- February 2013 –April 2014: Environmental Officer and Project Manager for the Sustainable Development Management System and Consolidated Environmental and Implementation and Management Plan
- February 2010 – February 2013: Graduate Trainee at the Department of Water and Sanitation

Author	Dashentha Moodley	
Reviewed	Lizelle Gregory	

Executive Summary

Bokamoso Landscape Architects and Environmental Consultants CC was appointed in 2016 by Attacq (Pty) Ltd to compile and submit a Water Use License Application (WULA) on their behalf, for water use activities that need to be authorized in terms of Section 21 of the National Water Act (NWA), 1998 (Act 36 of 1998) for the proposed Waterfall Bulk Water Supply pipeline.

The proposed water distribution pipeline will be constructed along Allandale Road on the southern boundary, inside the building line from the K60/ Allandale Road intersection in an eastern direction to the future Heartland reservoir side that is situated opposite the Lordsview development. The study area is situated in the area of jurisdiction of the City of Johannesburg Metropolitan Municipality, Gauteng Province.
The following properties are affected by the proposed water pipeline namely; A Part of the Remaining Extent of Portion 1 of the Farm Waterval 5 IR, and Portions 83 and 129 of the Farm Klipfontein 12 IR, in Midrand Gauteng. **However, please take note that the specific water use crossings will only be undertaken on Portion 129 of the Farm Klipfontein 12 IR.**

The proposed activities will be within the extent of a watercourse, i.e. the 1: 100 year floodline, or riparian habitat, whichever is the greatest, and or within a 500m radius from the boundary of a wetland. The activities that will trigger Section 21 (c) and (i) water uses due to the water use activities occurring within the extent of a watercourse.

The proposed steel bulk water supply pipeline will be approximately 5 600m in length and will vary in diameter of between 400mm and 900mm.

The applicant intends to construct the development which also aims to include the following main components:

The route of the pipeline is proposed to be from a point in the proposed Waterfall Junction development, close to and on the southern side of Allandale Road, opposite Dane Road, running in a south easterly direction, generally parallel with Allandale Road to Zuurfontein Road, where it links to an existing Rand Water pipeline:

- The proposed pipeline will not exceed 5800 meters in length;
- The proposed depth of the excavation of the trench will not exceed 1, 9m in depth; and
- The width of the servitude in which the pipeline will be implemented will not exceed 4, 0m in width.

The overall aim of the proposed pipeline is to provide bulk water not only to the augment the existing areas, however to also accommodate the future planned townships in the Midrand area, especially on the southern side of Allandale Road.

Table 1: Summary of Water Uses

Ref No	Purpose	Property	Dimensions (m)	Traversing	Points	Latitude	Longitude	Position
				or within 500m				
1	Bulkwater pipe line	Portion 129 of the	400dia=0m	Traversing	1	S26° 02' 40.29"	E28° 08' 59.58"	Start
		farm Klipfontein No.12 IR						
2	Bulkwater pipe line		400dia=500m	Traversing	2	S26° 02' 51.10"	E28° 09' 12.99"	End
2	Bulkwater pipe line		400dia=0m	Traversing	2	S26° 02' 51.10"	E28° 09' 12.99"	Start
		Portion 129 of the						
		farm Klipfontein No.12 IR						
3	Bulkwater pipe line		400dia=152m	Traversing	3	S26° 02' 54.38"	E28° 09' 17.06"	End
3	Bulkwater pipe line	Portion 129 of the	400dia=0m	Traversing	3	S26° 02' 54.38"	E28° 09' 17.06"	Start
		farm Klipfontein No.12 IR						
4	Bulkwater pipe line		450dia=434m	Traversing	4	S26° 03' 03.89"	E28° 09' 28.63"	End
4	Bulkwater pipe line	Portion 129 of the	450dia=0m	Traversing	4	S26° 03' 03.89"	E28° 09' 28.63"	Start
		farm Klipfontein No.12 IR						
5	Bulkwater pipe line		450dia=123m	Traversing	5	S26° 03' 06.44"	E28° 09' 32.01"	End
5	Bulkwater pipe line	Portion 129 of the	450dia=0m	Traversing	5	S26° 03' 06.44"	E28° 09' 32.01"	End
		farm Klipfontein No.12 IR						
6	Bulkwater pipe line	Portion 129 of the	900dia=683m	Traversing	6	S26° 03' 22.46"	E28° 09' 52.07"	End
		farm Klipfontein No.12 IR						

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1. INTRODUCTION

Bokamoso Landscape Architects and Environmental Consultants CC have been appointed by Attacq (Pty) Ltd as the independent Environmental Assessment Practitioner (EAP) to undertake a Water Use License Application (WULA) in terms of the National Water Act (No 36 of 1998) (NWA). In terms of the Section 40 of the NWA, each party proposing water usage, as defined in Section 21 of the Act, must apply to the responsible authority for authorisation before such water use can commence. This document aims to provide the Department of Water and Sanitation (DWS) with the necessary information associated with the proposed project in order to approve the water uses in terms of the NWA related to the proposed development.

The WULA process regulates water use activities which may impact on the country's water resources.

2. WULA PROCESS FOLLOWED

2.1. Pre-Application Consultation

A pre-application consultation meeting was held with relevant official of the Gauteng Department of Water and Sanitation (DWS) on the 28th October 2016.

The pre-application consultation meeting was held to:

- Determine the need to authorise the water use;
- Determine the applicable water use authorisation type;
- To obtain guidance from the Department in relation to the application process to be followed; and
- To obtain relevant documentation required for the application process.

2.2. Information and Technical Report Collation

Relevant information, in accordance with the Departmental guidance provided at the pre-application meeting held, was sourced from the Consulting Engineers, the Client, and Specialists commissioned as a part of the WULA. The information was collated, analysed and relevant sections included in this executive summary as well as the various Departmental Application forms required in support of the Water Use License Application.

2.3. Public Participation Process

The public participation processes commenced during February 2017 and will continue for a period of 60 days upon the release of the Water Use Licence. (***Appendix 8***). The application has been advertised in the Beeld on the 7th February 2017. Site Notices have been placed within the vicinity and along the boundary of the site on the 7th February 2017. Notices were distributed to the local community. Written notification was given to the following authorities and interest groups have also been notified on the 7th February 2017: Department of Water and Sanitation (DWS), Gauteng Department of Agriculture and Rural Development (GDARD), Department of Transport, South Africa Heritage Resource Association (SAHRA) and the City of Johannesburg Metropolitan Municipality.

2.4. Concerns Raised by I&APs

No Comments have been received to date. All comments will be consolidated, responded to and submitted to the Department for review after the completion of the **60 day** comment period.

A detailed list of comments and responses will be supplied to the DWS upon completion of the Comment Period.

2.5. Submission of the Water Use License Applications

Upon completion of the Report, all the required License Application forms, the signed final documentation and all the required appendices will be submitted to the Department inclusive of the confirmation of the paid application fee.

3. PROJECT DESCRIPTION

3.1. EXISTING ACTIVITIES

The property is registered in the name of Witwatersrand Estate Limited in terms of Title Deed T6167/1934. The property is currently zoned as "Agricultural" in terms of the Halfway House and Clayville Town Planning Scheme, 1976, and is otherwise, vacant.

The proposed study site is currently subject to a number of development applications, which constitute mixed use development, residential and commercial related land uses.

Currently, other developments are occurring at Jukskei View in conjunction with existing business and commercial activities on the eastern end of Allandale Road.

On the northern side of Allandale Road, the surrounding area is relatively established with residential uses constituting residential uses of both low density, and medium to high density located along the remainder of Allandale in Klipfontein View.

3.2. PROPOSED ACTIVITIES

The proposed steel bulk water supply pipeline will be approximately 5 600m in length and will vary in diameter of between 400mm and 900mm.

The applicant intends to construct the development which also aims to include the following main components:

- The route of the pipeline is proposed to be from a point in the proposed Waterfall Junction development, close to and on the southern side of Allandale Road, opposite Dane Road, running in a south easterly direction, generally parallel with Allandale Road to Zuurfontein Road, where it links to an existing Rand Water pipeline;
- The proposed pipeline will not exceed 5800 meters in length;
- The proposed depth of the excavation of the trench will not exceed 1, 9m in depth;
- The width of the servitude in which the pipeline will be implemented will not exceed 4, 0m in width

3.3. ALTERNATIVES

Preferred route

The preferred route for the pipeline is as discussed above.

Alternative 1 –

This is a steel bulk water pipeline that will vary in diameter between 300mm and 600mm from the Waterfall Junction development, to the Rand Water connection at the M18 on the northern side of the development.

Alternative 2 –

This is proposed to be a concrete and upvc pipeline. There are four options that propose minor deviations and alterations.

- **Option 1**

The construction of the bulk water from the Rand Water connection (intersection of M38 and M18) within the M39 road reserve (Allandale Road) up tp the proposed Waterfall Junction development.

- **Option 2**

This option comprises the construction of the pipeline that will commence from the Rand Water connection through a series of private properties along Allandale Road up to the proposed Waterfall City development. The pipeline route would run parallel and adjacent to the Allandale Road reserve except over the Heartland Property where it could take a different route, which is to be determined.

- **Option 3**

The pipeline will commence from the Rand Water connection (intersection of M38 and M18) through a series a private properties and industrial area roads, located within the existing properties that are adjacent to Allandale Road.

- **Option 4**

The pipeline will use a temporary connection from the existing Chloorkop 300 diameter line near the Heartland development area. There is existing spare capacity in this line; however, this capacity is earmarked for a section of the Heartland development area.

4. PROPERTY DESCRIPTION

The proposed water distribution pipeline will be constructed along Allandale Road on the southern boundary, inside the building line from the K60/ Allandale Road intersection in an eastern direction to the future Heartland reservoir side that is situated opposite the Lordsview development. The study area is situated in the area of jurisdiction of the City of Johannesburg Metropolitan Municipality, Gauteng Province. ***(Refer to Figure 1 and 2 below and Appendix 5 for the Enlarged Figures).***

The property falls within the Quaternary Drainage Region A21C in the Crocodile (West) and Marico Water Management Area. ***Refer to Figure 3: Quaternary Catchment***.

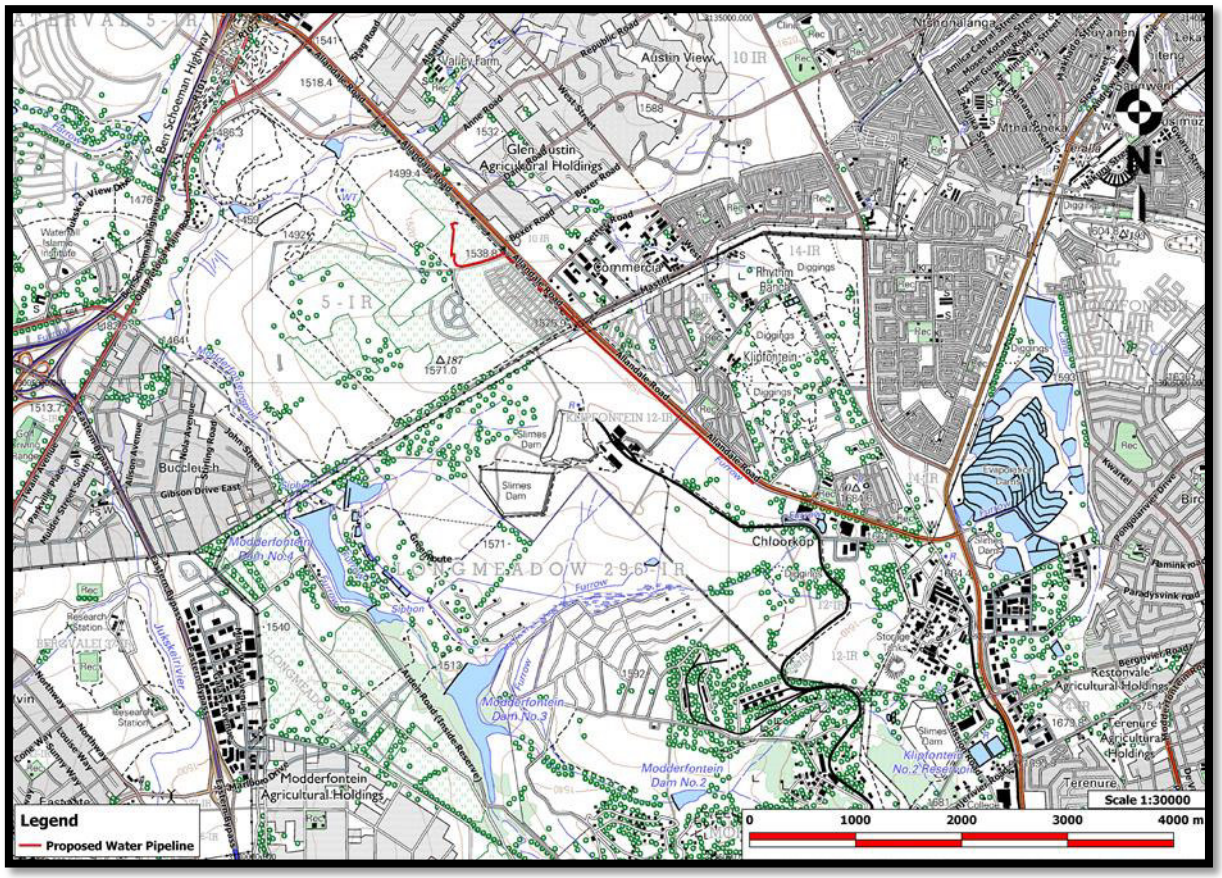


Figure 1: Locality Map

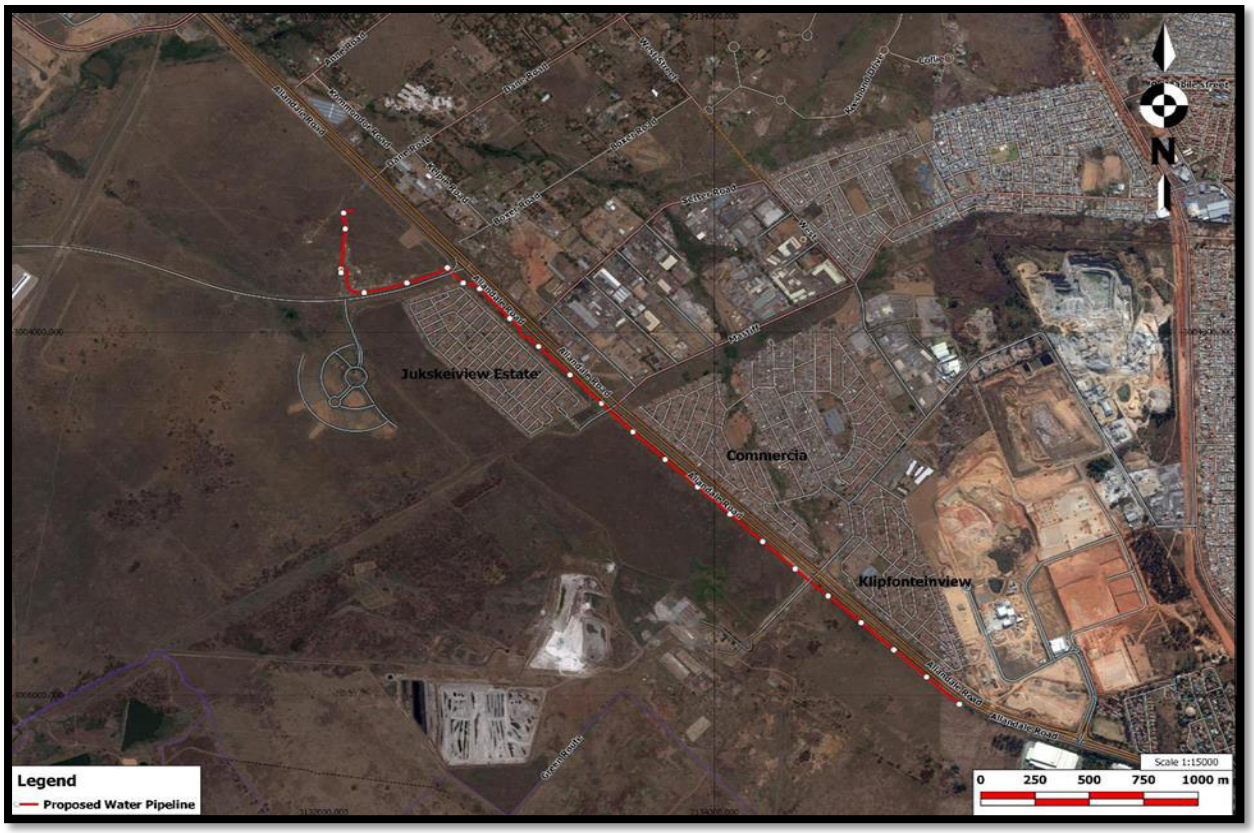


Figure 2: Aerial Map

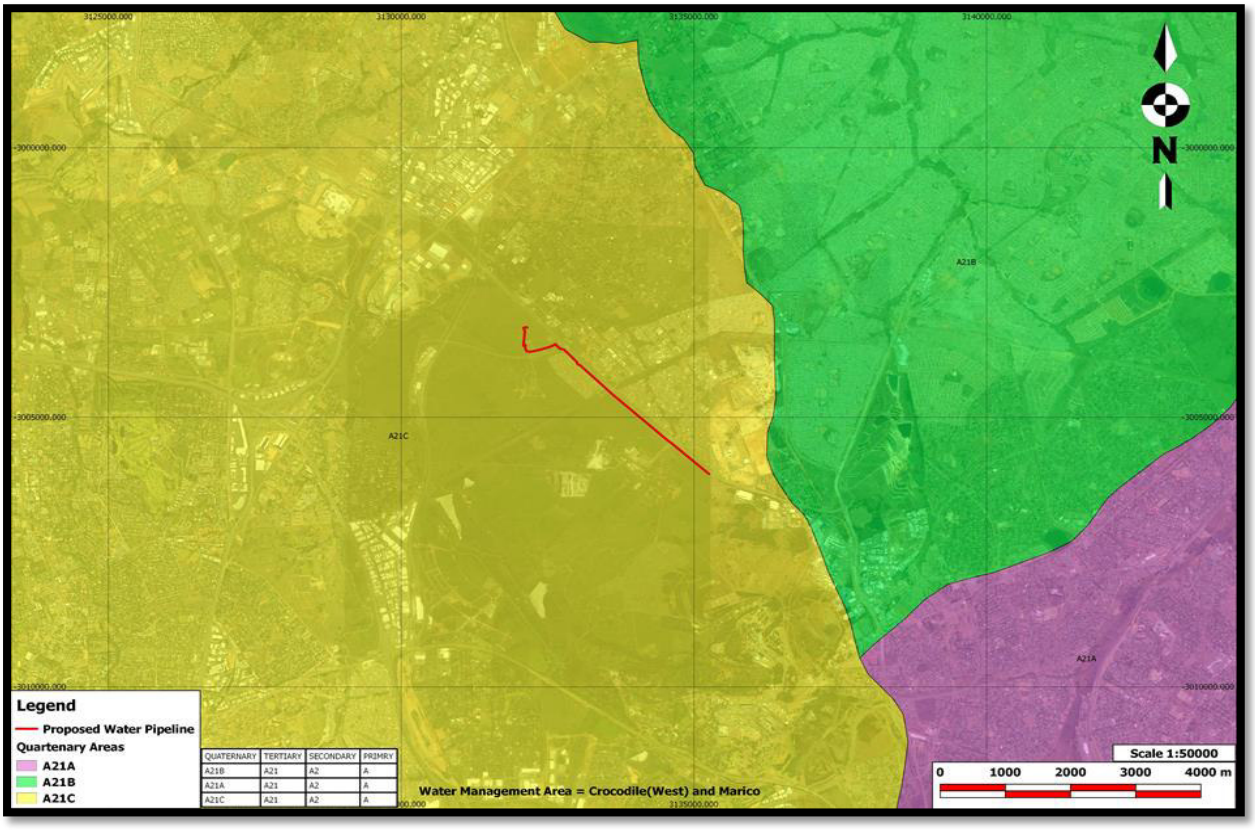


Figure 3: Quaternary Catchment Map

4.1 EXTENT AND OWNERSHIP

Refer to Table 2 below for Property Descriptions and Ownership Details.

The legal entity: The Waterfall Bulk Water Supply Pipeline is represented by Mr Morne Whitehead of Attacq Waterfall Investment Company (Pty) Ltd.

Table 2: Property Descriptions, Ownership and Title Deeds

PROPERTY	AREA (ha)	PROPERTY OWNER	TITLE DEED
A Part of the Remaining Extent of Portion 1 of the Farm Waterval 5 IR	14. 05671	Witwatersrand Estates Ltd	T6167/1934
Portion 83 of the Farm Klipfontein 12 IR	1.1991	Government	T21634/1969
Portion 129 of the Farm Klipfontein 12 IR. ***Affected property on which water use crossings will traverse.***	139. 0667	Zendai Property (Pty) Ltd	T44262/2014

5. WATER USES AND LAWFULNESS

5.1. EXISTING WATER USES

Portion 1 of the Farm Waterval 5 IR

Clidet No 69 (Pty) Ltd has existing water rights for the irrigation of pastures associated with the Department of Water and Sanitation for Portion 1 of the Farm Waterval 5 IR.

Water Use that has been registered for Portion 1 of the Farm Waterval 5 IR
Water Use (No Registration Certificate Number) for the abstraction of 798, 679m³ of water per annum from the Jukskei River situated on Portion 1 of the Farm Waterval 5 IR for irrigation of 49, 7 ha of pastures registered by Clidet No 69 (Pty) Ltd. The lawfulness of the water use is still to be determined.

Water Use that has been registered for Portion 1 of the Farm Waterval 5 IR
Water use (No Registration Certificate Number) for the storage of 158 667m³ of water per annum from the Jukskei River, three (3) dams in the Jukskei River, and twenty-two (22) dams fed by an unknown streams.
As per a consent letter from the Waterfall Management and Operating Company (Pty) Ltd, the Chief Executive Officer (CEO) in his capacity authorizes Bokamoso Environmental Consultants to follow the necessary process and obtain information regarding any existing water uses on the property.
Should the DWS confirm the lawfulness of the water use rights, Clidet No 69 (Pty) Ltd and Waterfall Management and Operating Company (Pty) Ltd are recommended to amend, convert and transfer the ownership rights.

Portion 89 and 123 of the Farm Klipfontein 12 IR
A request has been sent to the DWS to verify the ELU pertaining to the above mentioned properties, and Bokamoso waits for a response.

5.2. LEGISLATIVE REQUIREMENTS

The revised General Authorisation (GA) for Section 21 (c) and (i) water-uses, GN 509 of 2016 published in Government Gazette 40229 on 26 August 2016, was reviewed to establish whether it applies to the proposed water-uses.
In terms of this GA, a Risk Matrix must be completed by a suitably qualified SACNASP professional member in accordance with Appendix A of the GA.

"regulated area of a watercourse" for section 21(c) or (i) of the Act water uses in terms of this Notice means:

(a) The outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;

(b) In the absence of a determined 1 in 100 year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (*subject to compliance to section 144 of the Act*); or

(c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.

3. This General Authorisation does not apply—

(a) to the use of water in terms of section 21(c) or (i) of the Act for the rehabilitation of a wetland as contemplated in General Authorisation 1198 published in Government Gazette 32805 dated 18 December 2009,

(b) to the use of water in terms of section 21(c) or (i) of the Act within the regulated area of a watercourse where the Risk Class is Medium or High as determined by the Risk Matrix (**Appendix A**). This Risk Matrix must be completed by a suitably qualified SACNASP professional member;

(c) in instances where an application must be made for a water use license for the authorisation of any other water use as defined in section 21 of the Act that may be associated with a new activity;

(d) where storage of water results from the impeding or diverting of flow or altering the bed, banks, course or characteristics of a watercourse; and

(e) to any water use in terms of section 21(c) or (i) of the Act associated with construction, installation or maintenance of any sewerage pipelines, pipelines carrying hazardous materials and to raw water and wastewater treatment works.

A complete WULA has been applied for, for the Waterfall Bulk Water Supply Pipeline. However, it will be at the discretion of the DWS to evaluate it as GA or to process it as a full WULA. **Please take note that as per the Wetland Delineation Assessment conducted for this proposed pipeline, a GA has been recommended.**

5.3. PROPOSED USES

Water Use-License Applications (WULAs) to be applied for by Attacq (Pty) Ltd in terms of Section 21 of the National Water Act (NWA), 1998 (Act 36 of 1998) include:

- Section 21 (c) 'Impeding or diverting the flow of water in a watercourse'
- Section 21 (i) 'Altering the bed, banks, course or characteristics of a watercourse

Please take note that the specific water use crossings will only occur on Portion 129 of the Farm Klipfontein 12 IR.

Section 21 (c) water use ' impeding or diverting the flow of water in a watercourse'

"The definition of this water-use is: Causing an obstruction to the flow of water in a watercourse, or diverting some or all of the flow in or from a watercourse. Impeding or diverting flow does not normally cause any loss of water, however it influences the flow regime in a watercourse. Structures that impede or divert the flow can partially or fully extend into a river, re-directing the natural flow. Impeding or diverting the flow may be temporary, for example during construction of a road bridge. It may also be permanent, such as a low water bridge built across a river permanently impeding the flow as it moves under the bridge."

Based on an interpretation of the above definition of a Section 21 (c) water-use as provided in the Department of Water Affairs and Forestry *Water Use Authorisation Application Process External Guideline: Section 21 (c) and (i) Water-Use Authorisation Application Process (Impeding or diverting the flow or water in a watercourse, and/ or altering the bed, banks, course, characteristics of a watercourse),* the Environmental Assessment Practitioner (EAP) is of the opinion that the construction activities listed below, triggers a Section 21 (c) Water-use:

- Construction of the proposed Waterfall Bulk Water Supply pipeline across the drainage depression wetland and associated watercourses.

Section 21 (i) 'altering bed, banks, course or characteristics of a watercourse'

"The definition of this water-use is: Alteration of the water course, including any changes affecting:

• the energy of the watercourse, for example where the straightening of a river generally leads to an increase in energy, which will cause erosion as the system adjusts to the new situation (new equilibrium)

• the morphology of the watercourse (bed, banks, macro-channels), including changes affecting the riparian and instream habitat characteristics, such as sand mining, or canalisation of streams

• the physical characteristics of the water course, such as removal of riparian vegetation, mining of river banks for sand, changes to geohydrology and geology that affect groundwater fed systems such as wetlands and rivers

• the chemical characteristics, for example changes in temperature, pH, or turbidity
etc,
• changes that affect flood dynamics, such as developments occurring below floodlines altering downstream flood patterns

• the biotic components of the water course, such as changes of habitat that may lead to a change in the composition of the biota.

Alteration of the bed and banks is usually needed for construction and infrastructure development near or across a river. Alterations may be minor, such as the construction of culverts for railway bridges or they may be major, for example in urban areas where streams have been lined with concrete to become stormwater channels (canalisation) to handle peak rainfall events."

Based on an interpretation of the above definition of a Section 21 (i) water-use as provided in the Department of Water Affairs and Forestry *Water-Use Authorisation Application Process External Guideline: Section 21 (c) and (i) Water-Use Authorisation Application Process (Impeding or diverting the flow or water in a watercourse, and/ or Altering the bed, banks, course, characteristics of a watercourse),* the EAP is op the opinion that the construction activities listed below, triggers a Section 21 (i) Water-Use.

- Construction of the proposed Waterfall Bulk Water Supply pipeline across the drainage depression wetland and associated watercourses.

Section 21 (c) and (i) Water Use

Point 1 (start point) to Point 2 (end point) on ***Figure 4 below, and to be interpreted in conjunction with Table 1 above, also attached as Appendix 1A*** represents the first wetland and/ or watercourse crossing. This area consists of a drainage depression on the south-western section of the area/ the wetland has been traversed in half due to the construction of Allandale Road and its associated storm water infrastructure.

Point 2 (start point) to Point 3 (end point) on ***Figure 4*** represents the second wetland and/ or watercourse crossing. An evident drainage depression was observed north of the Kynoch site. It is worthy to take note that this feature has undergone the same alteration as the abovementioned wetland from Point 1 to Point 2.

Point 3 (start end) to Point 4 (end point) on ***Figure 4*** represents the third wetland and/ or watercourse crossing. This is also the altered drainage depression that is affected.

Point 4 (start point) to Point 5 (end point) on ***Figure 4*** represents the fourth wetland and/ or watercourse crossing. This is also the altered drainage depression that is affected.

Point 5 (start end) to Point 6 (end point) on ***Figure 4*** represents the fifth wetland and/ or watercourse crossing.

It is worthy to take note that based on the wetland delineation and risk assessment conducted for the study site, the specialist recommends a GA, however, that the specific mitigation measures are implemented as per the report.

Refer to ***Appendix 4 for the Design Drawings and Construction Method Statement*** for each of the water use construction activities listed above triggering a Section 21 (c) and/or (i) water-use.

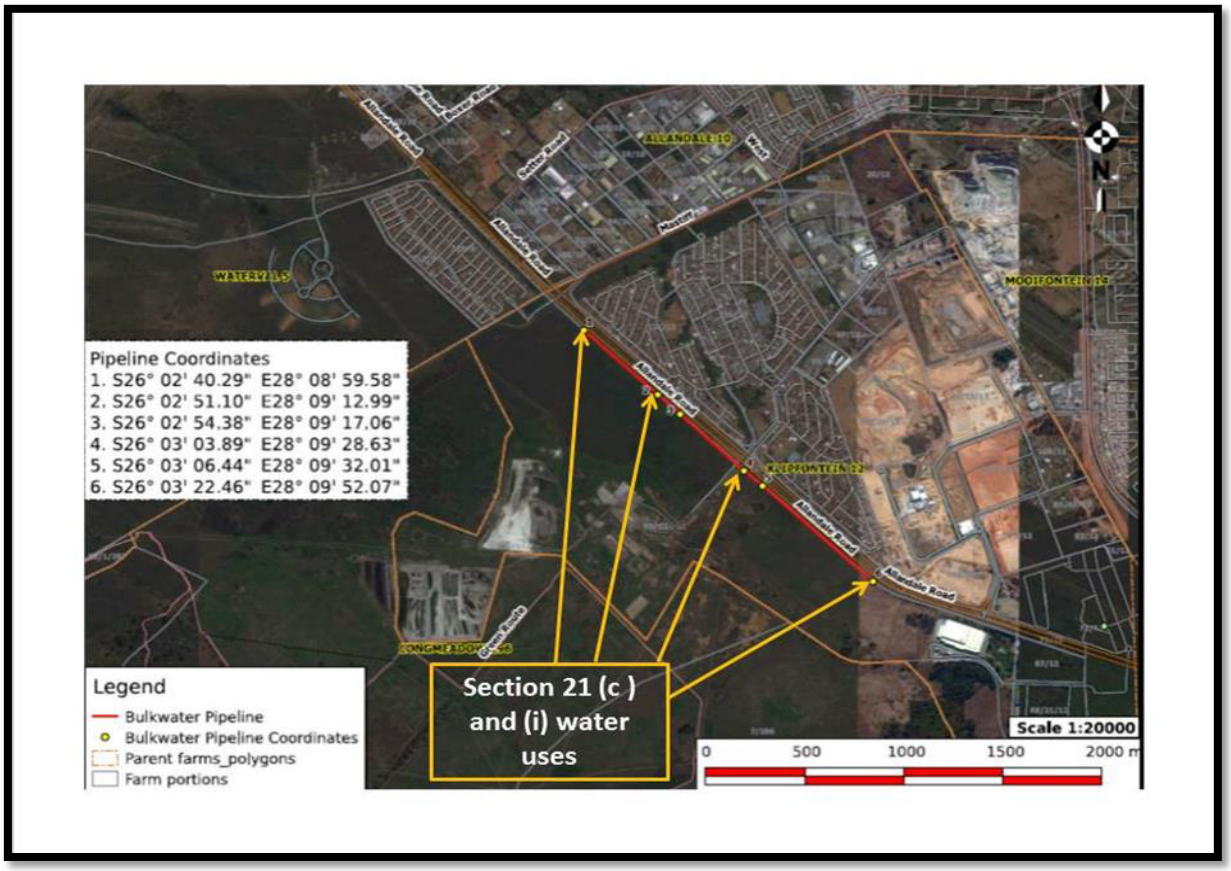


Figure 4: Section 21 (c) and (i) water uses Map

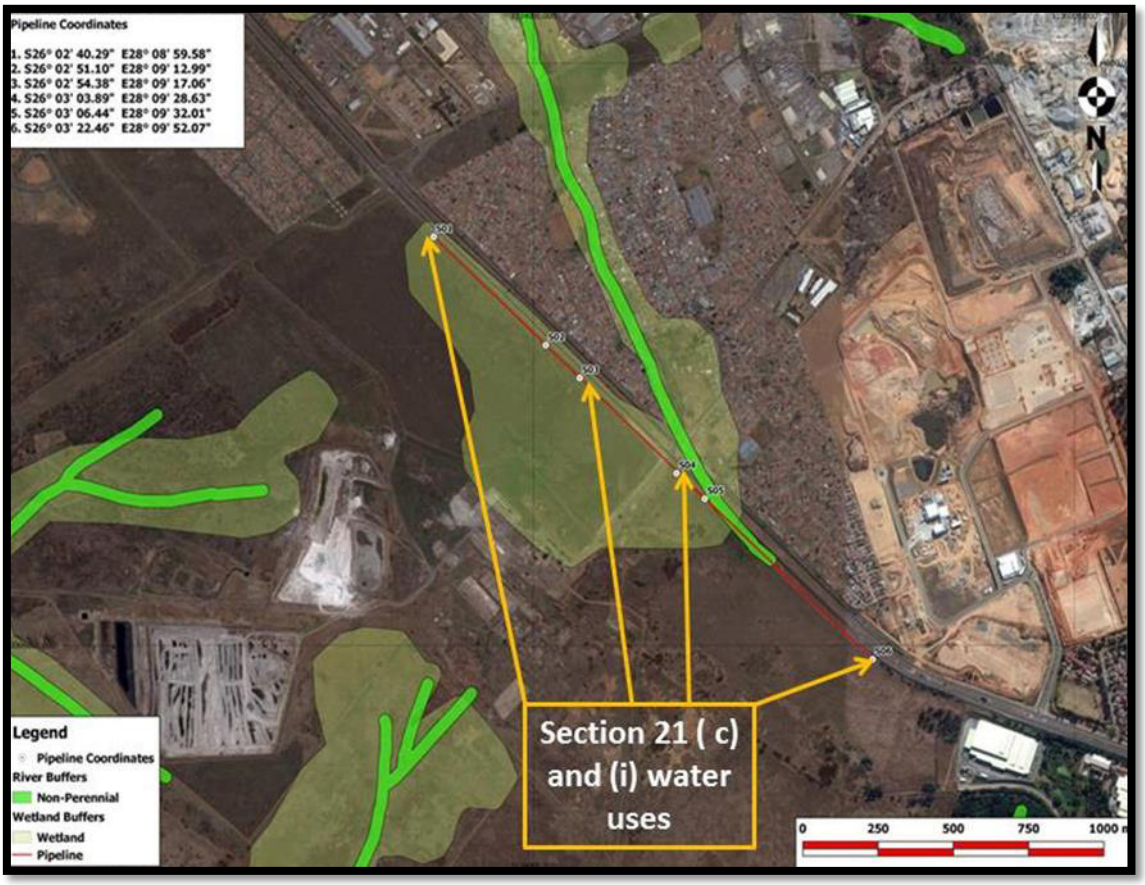


Figure 5: Section 21 (c) and (i) water uses in relation to wetlands Map

6. ENVIRONMENTAL ATTRIBUTES

Below is a discussion regarding the current status of environmental attributes and the importance of each attribute associated with the proposed construction footprint. Sensitive environments associated with each attribute are also discussed.

6.1. GEOLOGY AND GEOGRAPHY

The site is underlain by gneiss migmatite or porphyritic granodiorite of the Halfway House Granite, consisting primarily of gneiss, migmatite and granodiorite.

In terms of the types of soil characteristics that dominate the area; shallow to moderately deep sandy soils with deep soils occurring only in the drainage features. Soils are coarse sandy in texture. The bulk of the soil on the site is underlain by a hard plinthic layer (ferricrete) that acts as an aquaclude under natural conditions.

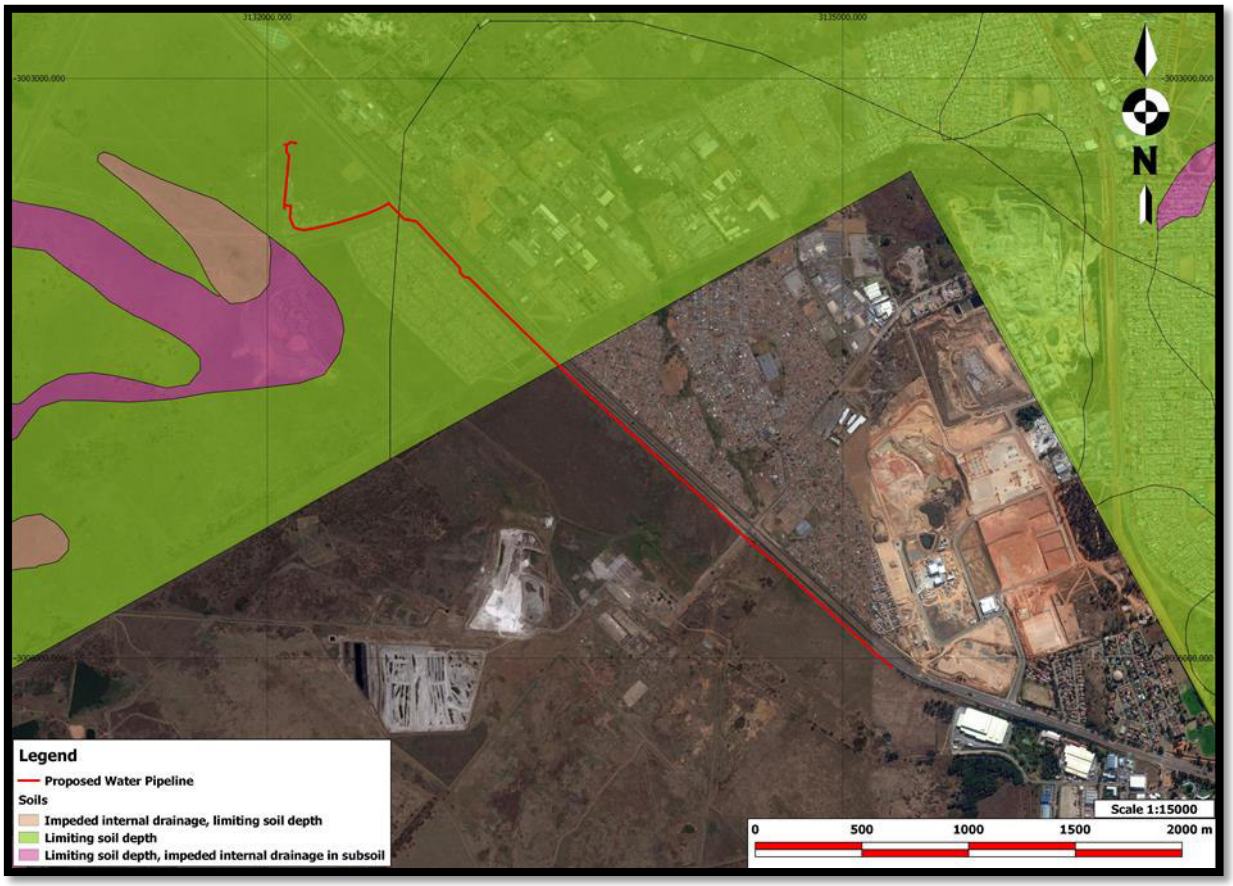


Figure 6: Soil Depth and Drainage

6.2. TOPOGRAPHY

The area in general is undulating with distinct drainage features that surround the site. It is worthy to note that large areas of the site have been built up and sealed through paved areas, roads and roves. According to the wetland delineation report, areas with a water flow paths are related to the wetlands. Overall, this is a function of the topography of the site and is associated with the dominant water flow.

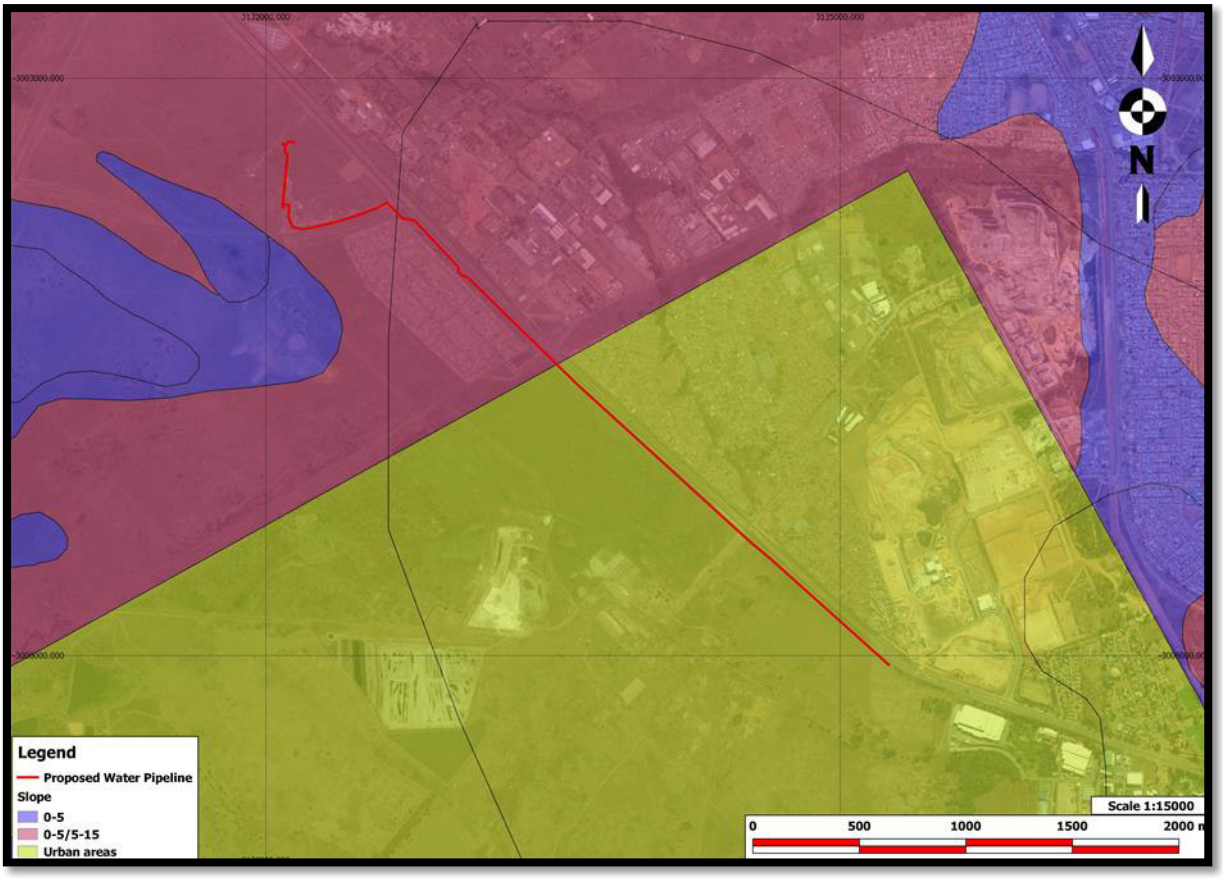


Figure 7: Slope Map

6.3. HYDROLOGY

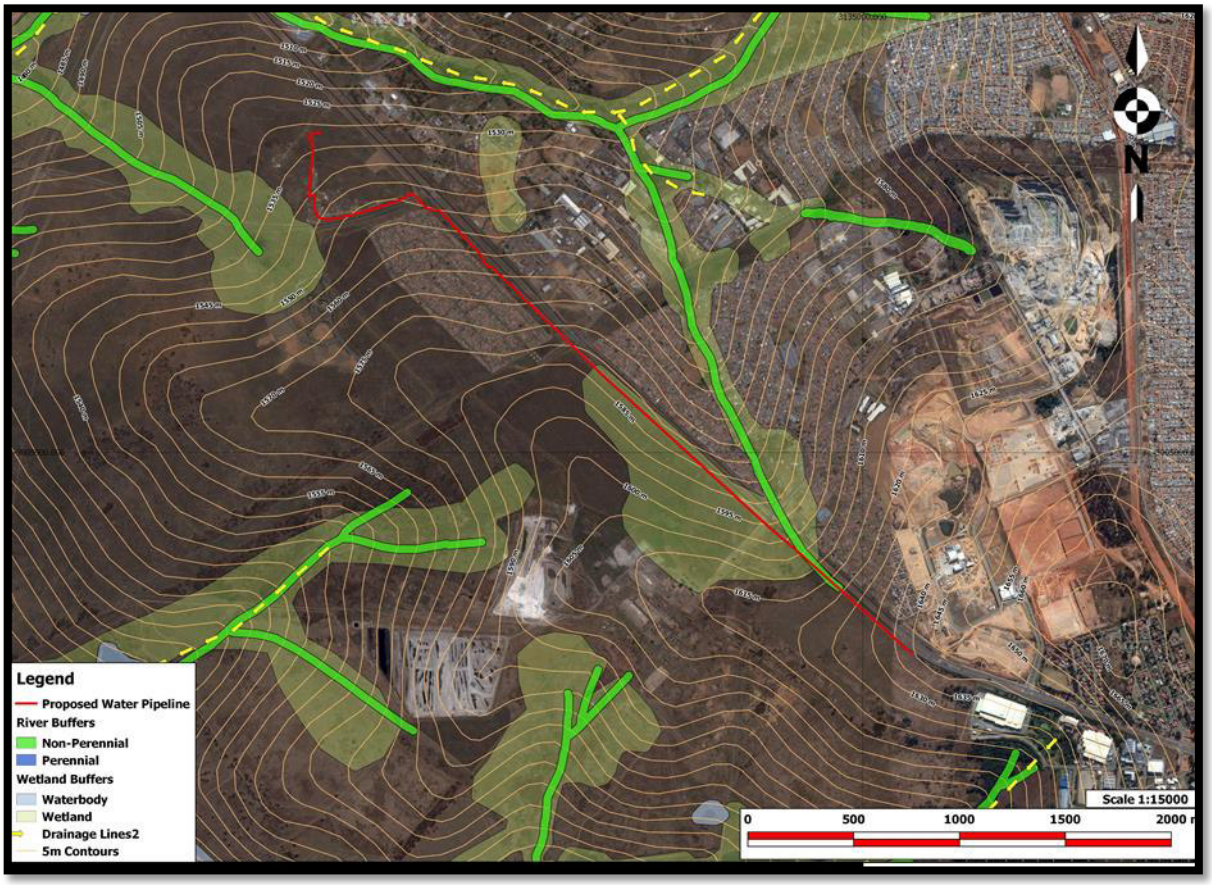


Figure 8: Hydrology

6.3.1. SURFACE HYDROLOGY

The study site overall is affected by the DWS regulated area, i.e. the 1: 100 year floodline, or riparian habitat, whichever is the greatest, and or is within a 500m radius from the boundary of a wetland.

The affected watercourses and wetlands that the proposed pipeline affects is the following:

- The headwaters of a tributary stream of the Modderfonteinspruit south east of the pipeline alignment;
- The headwaters of a tributary stream of the Jukskei River north of the central section of the alignment;
- A concave depression that appears to form the headwaters of a seepage zones feeding the tributary stream of the Jukskei River north of the central area of the alignment;
- The headwaters of a tributary stream of the Jukskei River west of the western part of the alignment;

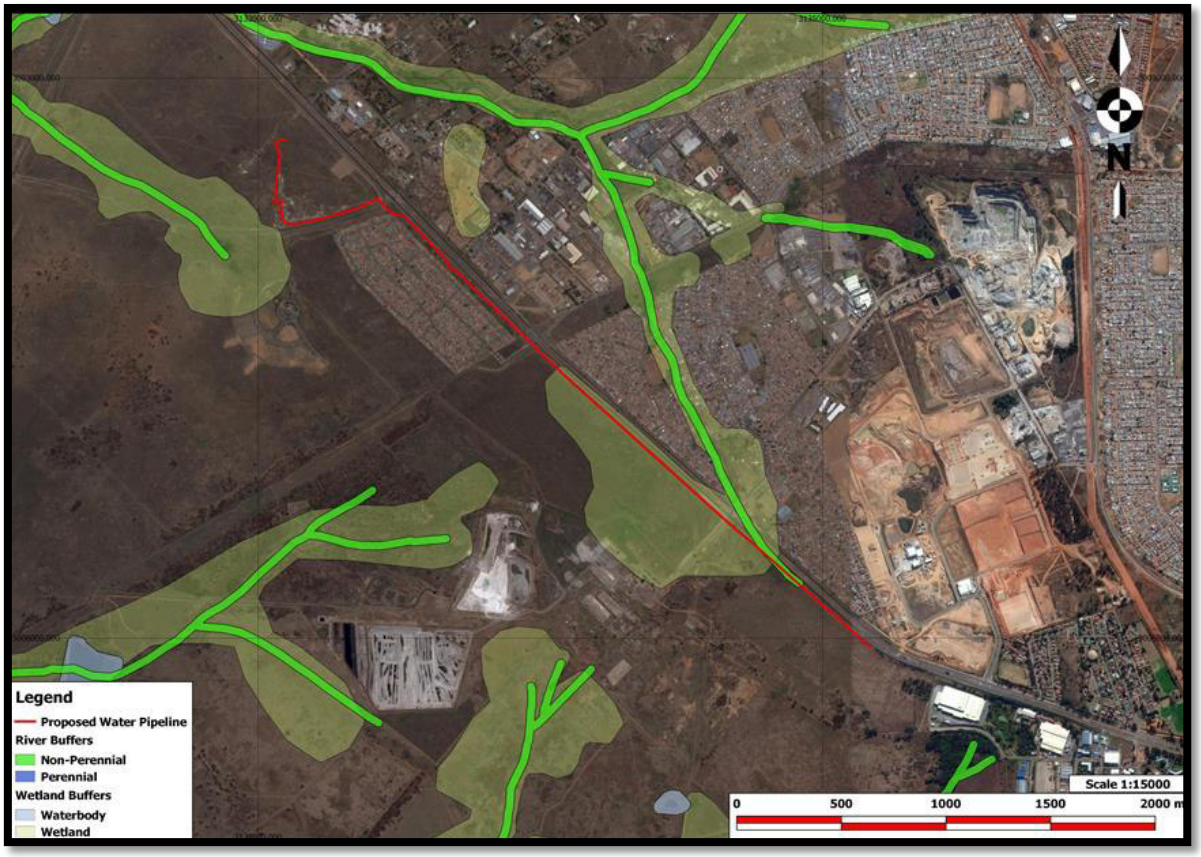


Figure 9: Rivers and Wetlands

6.3.2. SUB-SURFACE HYDROLOGY- GROUNDWATER

Due to the gradient of the site towards the Jukskei River and locally towards the smaller drainage features, percolating groundwater will flow downwards through the upper permeable horizons and follow the gradient to the drainage channels. Wet surface conditions are therefore expected along most of the lower slopes along the edge of the river floodplain and locally in the gulleys.

Local perched groundwater tables will also occur on the lower slopes, especially towards the Jukskei River and along the larger drainage channels. These perched water tables will probably occur within the loose colluvial material and on the transported soil or residual granite or hardpan ferricrete interface on the lower slopes and will typically appear during and towards the end of the rainy season.

The area is drained by a well-developed drainage network around the Jukskei River which is the main drainage channel. A number of earth and concrete dams also occur within the drainage lines and these features already altered the local ground water conditions.

6.4. WATER QUALITY

Historically, the water quality of the affected watercourses and wetlands have already been impacted upon significantly through the construction of Allandale Road which has sequentially led to the alteration of the hydrology through the increase and concentrated storm water run-off. In addition, the historical land use activities on the AECI site that has led to the drastic alteration of the watercourse and its associated seepage wetlands through urban infrastructure developments, storm water run-off structures and long term historical land use changes. Thus, the affected watercourses are allocated a Present Ecological Status (PES) of F.

6.5. FAUNA AND FLORA

Flora

The site can be described as mostly natural with grassland within certain disturbed areas and certain areas have alien vegetation. Such grassland species the Egoli granite grassland dominate the site.

It is worthy to note that two near threatened and three declining plant species were considered to have a medium chance of occurring in the on the site. There is a possibility of a declining plant species; the *Hypoxix hemerocallidea* '', and Orange Data species has been identified on the site.
The abovementioned plant species is declining to harvest for medicinal species.
Should this activity continue, it is advised that this species relocated to a place of conservation and kept under nursery conditions.
As per the recommendations in the Specialist Vegetation Assessment, it is recommended that where grasslands have a high sensitivity, that permission should be obtained from the Gauteng Department of Agriculture and Rural Development (GDARD).

It is also worthy to note that further North West on Allandale Road, ''Site 2'' according to the Wetland Delineation Assessment, displays a pattern of lateral flow of water. The vegetation is dominated by extensive kikuyu grass growth and it appears that there are swales or surface soil disturbances evident immediately upslope of the road.

Any alien invasive species that are declared on the site must be controlled and managed. Refer to the Rehabilitation Plan attached as Annexure for a specific programme that deals with the management of alien invasive species.

Fauna

As per the Specialist Investigation for Fauna, the investigation has concluded that there is a possibility that threatened faunal species such as the threatened reptile (striped harlequin snake), the amphibian (giant bullfrog), and the avifaunal bird (African grass owl-Lesser Kestrel).

It is important to take cognisance of the abovementioned fauna species during the construction and operational phase of the pipeline. Should any species be identified during the construction phase, the relevant authority must be contacted to come and remove the species and relocate them to a place of conservation.

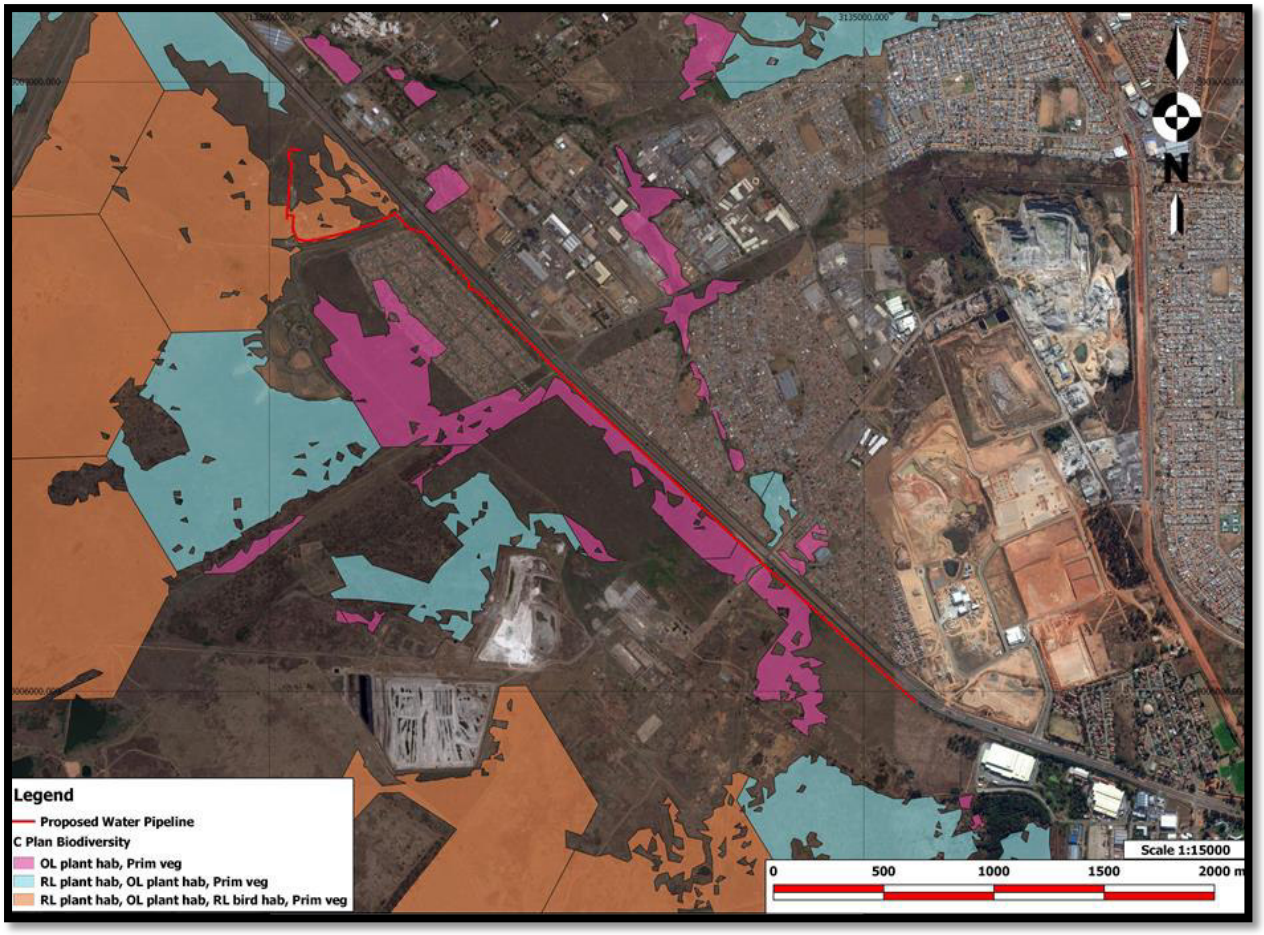


Figure 10: C-Plan Biodiversity

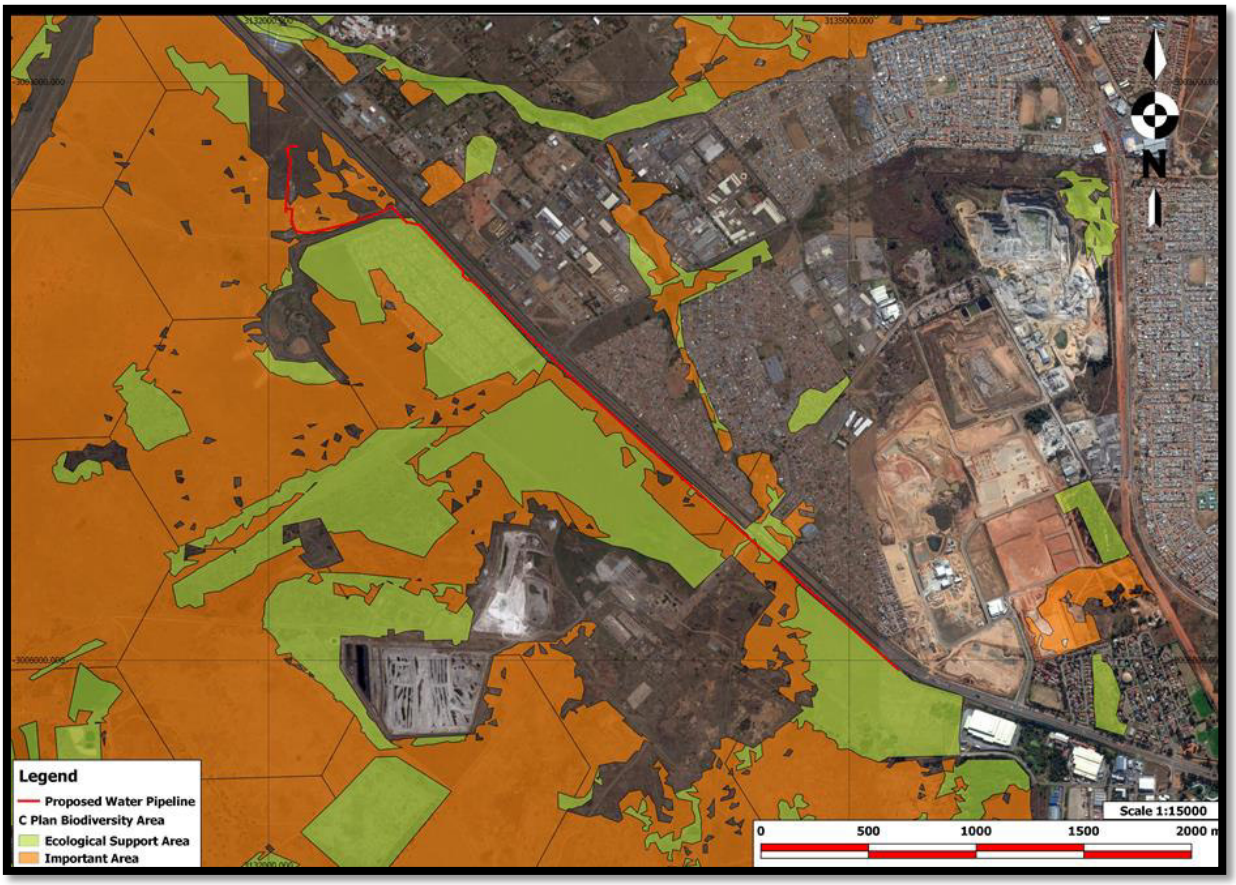


Figure 11: C-Plan Biodiversity Area

6.6. SOCIO - ECONOMIC

The overall aim of the proposed pipeline is to provide bulk water not only to the augment the existing areas, however to also accommodate the future planned townships in the Midrand area, especially on the southern side of Allandale Road.

The construction phase of the development will create many temporary employment opportunities for the local residents of the nearby and surrounding areas. This will promote the transfer of skills which these employees can use in the future.

The proposed bulk water supply pipeline is also addressing the greater needs of the area by addressing the infrastructure need and improving upon service delivery. The bulk water supply will facilitate future developments in the surrounding area, thus increasing the Municipal tax base.

6.7. INFRASTRUCTURE

6.7.1. ROADS

There are no proposed roads that are a part of this activity, however, the proposed pipeline will run along a certain section of Allandale Road and other roads.. The pipeline route will be from a point in the proposed Waterfall Junction development, close to and on the southern side of Allandale Road, opposite Dane Road, running in a south easterly direction, parallel with Allandale Road to Zuurfontein Road.

6.7.2. STORM WATER

The storm water system at the proposed LP 3 commercial development will not link into an existing system however will discharge into the tributary of a main stream that runs from north and south of the town. Storm water currently drains directly into the tributary. Development of the town will result in increased storm water flow, and as a result, attenuation dams will be constructed to reduce the peak outflow from the flood with a recurrent interval of 5 and 25 years, to the same magnitude as before the development.

The major storm flow from the town will run along the roads and the channels and discharge into new attenuation dams that discharge into the tributary that runs to the west of the town. Minor storms (1: 5 year recurrence interval) will flow on the road surface to kerb inlets from where it will be drained by means of interlocking (ogee) jointed concrete pipes to the attenuation dams. This system has been designed in accordance with the Johannesburg Roads Agency.

New floodlines have been calculated for the stream that affects the town. The new set of 1: 50 and 1: 100 year floodlines have been calculated taking into account all future possible township developments in the catchment, however, disregarding the effect of future attenuation dams.

In terms of storm water management, there is existing storm water infrastructure along Allandale Road. It is recommended that there be an establishment of stabilized vegetation cover prior water entering the storm water infrastructure.

6.7.3. WATER

The proposed new pipeline will be constructed along Allandale Road on the southern boundary inside the building line from the K60 or Allandale Road intersection, in an eastern direction to the future Heartland reservoir side that is situated opposite the Lordsview development.

The pipeline will not exceed 5800m in length, and the proposed depth of the excavation of the trench will not exceed 1, 9m in depth. The width of the servitude containing the pipeline will not exceed 4, 0m in width.

Regarding access to the proposed site where the pipeline will be constructed, this can be gained through Allandale Road and other existing roads.

6.7.4. WASTE MANAGEMENT

The proposed activity is for a water pipeline, and the actual construction activities will not produce any waste by product.

The only material that will result as a by-product of construction is soil. Soil will be excavated from the trench and the soil will be replaced during rehabilitation.

General waste that is generated during the construction phase must be disposed of in waste receptacles that will be provided for onsite. It is critical that these receptacles be emptied out on a daily basis, be temporarily stored in a scavenger –proof container and carted off to a registered landfill site, weekly.

6.8. ARCHAEOLOGY AND/OR CULTURAL HISTORY

According to the Heritage Impact Assessment (HIA) that was conducted by Apelser Archaelogical Consulting, the proposed water pipeline does not traverse any sites of significance. It is worthy to take note that the area has been extensively altered and disturbed over the recent historical years through agricultural activities and residential developments. Henceforth, if any historical sites existed on the sites it would have been extensively damaged.

In light of the above, the development can proceed taking into consideration the abovementioned. It is also important to take note that should any cultural or heritage sites or artefacts be uncovered during the construction phase, a heritage specialist must be contacted to come and investigate the matter.

7. WETLAND DELINEATION AND MANAGEMENT

7.1. WETLAND DELINEATION

Terrasoil Science was appointed by the client to undertake the wetland delineation assessment, functionality and risk matrix for the proposed Waterfall Bulk Water Supply Pipeline.

The proposed development's activities will occur within the extent of a watercourse, i.e. the 1: 100 year floodline, or riparian habitat, whichever is the greatest, and/ or within a 500m radius from the boundary of a wetland. Thus, the proposed activities will require a Section 21 (c) and (i) Water Use application. We therefore regarded it as very important to investigate the study area and to confirm whether the possible wetlands identified by the specialist will be affected by the proposed pipeline activities, in such a way that the wetlands' ecological status and integrity will be diminished. The wetlands' may also be interconnected and interrelated to other water resources in the surrounding landscape, and may be interdependent on each other.

The study site was delineated, and the following watercourses and wetlands were identified; the headwaters of a tributary stream of the Modderfonteinspruit south of the eastern part of the alignment, the headwaters of a tributary stream of the Jukskei River, north of the central section of the alignment; a concave depression that is deemed to form the headwaters of a seepage zone feeding the tributary stream of the Jukskei River north of the central section of the alignment; and the headwaters of a tributary stream of the Jukskei River west of the western leg of the alignment.

7.2. WETLAND TYPES AND FUNCTION

According to the Wetland Delineation Assessment, and as discussed above, the headwaters of seepage zone feeds the tributary.

7.3. PES/EIS/REC

The PES of the study site has been allocated a (D) E as the site is already impacted upon due to an existing sewer pipeline, and infrastructure and activities associated with the Waterfall Cemetery. The existing road infrastructure has already caused a drastic influence on the hydrology and the characteristics of the seepage wetlands and watercourse.

7.4. RISK MATRIX

As discussed above under item 5.2, and as per the new regulations; the General Authorisation (GA) in terms of Section 39 of the National Water Act (Act No 36 of 1998), for water uses as defined in Section 21 (c) or (i); it specifies that the wetland specialist needs to conduct a risk assessment and evaluate if the impact of the proposed water use activities will be either low to medium, or medium to high.

7.5. MANAGEMENT AND MITIGATION

- Sediment generation should be counteracted through appropriate management during the construction phase and such mitigation measures should be implemented by the engineer and the site manager;
- The exposed surface area of the pipeline should be protected against erosion especially the sloped areas. This should be done during the operational phase of the pipeline;
- It is recommended that lateral seepage water that accumulates upslope of the compacted fill area of the pipeline trench should be mitigated and managed to permit the overflowing of water over the trench without causing erosion. in addition, the trench should be stabilized with vegetation to protect the soil cover;
- Hydrological attenuation should be conducted along the approved and established storm water infrastructure associated with the various roads.

In light of the recommendations provided by the Wetland Specialist's recommendations, it is advised that the storm water infrastructure along the road must be maintained, and inspected regularly to ensure that any sediment that has accumulated is removed on a

regular basis. This will ensure that sediment is not washed away into the downstream watercourses.

8. RISK/ IMPACT ASSESSMENT/ BEST PRACTICE ASSESSMENT

The table below ***(Table 3. Impacts and mitigation and/ or control measures)*** serves as an assessment of impacts per construction phase, associated with each environmental attribute listed. Environmental concerns were assessed based on their potential impact and significance. Mitigation measures were identified for each potential impact in order to reduce its significance. Responsibility for implementation of each mitigation measure was assigned to a relevant person.

The following management plans were compiled in order to address the potential negative impacts identified, in order to reduce its significance:

- Integrated Water Quality and Quantity Monitoring and Management Plan ***(Refer Appendix 6A);*** *and*
- Rehabilitation Plan including wetland ***(Refer Appendix 6B).***

Table 3: Impact, Mitigation and/ or Control Measures

Design and Planning Phase				
Environmental attribute	***Environmental concern***	***Potential impact & significance***	***Mitigation measure and mechanisms for implementation***	***Responsibility***
Environmental legal compliance	**Environmental damage**	*Environmental damage due to legal non-compliance in terms of rehabilitation and monitoring.*	**Client is to ensure sufficient budgetary provision is made for all aspects related to environmental legal compliance e.g.** appointment of specialists and ECO, implementation of Stormwater Management Plan, IWQQMMP, Rehabilitation Plan including wetland, Alien plant eradication programme etc.	Client
Hydrology and water quantity	**Increased run-off volume and velocity due to mis management of water use activities**	Increased floodline and/ or changes in the hydrology	The client (water-user) must ensure **Stormwater Management Plan is compiled and correctly implemented.** The hydrological impact of the trenching and compaction of the fill material cannot be mitigated but is negligible in the presence of a roadbed that runs along the pipeline corridor. In this regard the hydrological attenuation should be conducted along with the approved and established storm water management infrastructure associated with the Allandale Road.	Client
Wetlands	***Wetland preservation***	Damage to wetlands identified due to siltation or erosion	Client to plan and budget to implement **adequate stormwater mitigation** throughout the site (from start to completion) to prevent large pulses in storm water. Where existing storm water infrastructure is, a vegetation cover should be implemented to supplement erosion prevention. Client to plan and budget to **construct attenuation ponds** throughout the site to prevent sediment runoff and accumulation in the wetland area.	Client
	Negative impact on sensitive habitat and watercourse	Poor installation and protection could result in scouring and siltation of wetlands.	The client (water-user) should **appoint a qualified ECO** to ensure impacts to wetlands are minimal and suitably and effectively rehabilitated.	Client

Water quality	**Erosion and siltation**	Erosion and siltation of wetland due to increased run-off volume and velocity	Client to plan and budget to **construct attenuation ponds** throughout the site to prevent sediment runoff and accumulation in the wetland area. The establishment of earth bunds on the downslope area to trap sediment. Timing of the excavation (if possible) to coincide with the dry season. Compaction of fill material on the surface to increase hardness and resistance to erosion. Identification of preferential flow areas of water on the surface (as a function of local topography) and the establishment of stabilised vegetated or concreted preferential flow areas into the storm water infrastructure. Post development the exposed surface area of the pipeline corridor should be stabilised against erosion on slopes.	Client
	Waste polluting the watercourse	Potential for polluting the watercourse by domestic waste ending up in the affected watercourses and wetlands if not properly managed.	**Waste storage areas** (domestic and hazardous) are to be demarcated within the farm site.	Civil contractor

Design & Planning Phase				
Environmental attribute	***Environmental concern***	***Potential impact & significance***	***Mitigation measure and mechanisms for implementation***	***Responsibility***
Water quality	**Pollution of the river by waste**	Potential for polluting the river by domestic waste or hazardous waste ending up in the river if not appropriately managed.	**Waste storage areas (domestic and hazardous)** are to be demarcated within the camp site. To be catered for in the camp site layout. Camp may not be located within the aquatic buffer zone.	Developer
	Ecological reserve and downstream users	The impedance caused by construction activities could result in the downstream scouring and erosion.	The following measures are to be included into construction contract. Contractor to install reno mattresses **directly downstream to prevent scouring and erosion.**	
	Pollution of ground water and river by contaminated run-off	Potential spills from chemical toilets might contaminate the river.	**Sufficient number of portable ablution facilities** to be catered for in the **budget** at each construction site. Camp site layout including ablution may not be within 100m from the watercourse or within 500m from a wetland.	Civil contractor
		Potential spills from temporary hazardous substance storage areas contaminating the watercourse.	**Sufficient bunded area(s) for hazardous substances storage** is to be catered for as part of the **camp site layout. Bunded areas are to have a capacity of 110% or greater.**	Civil contractor
Soil	**Erosion and loss of topsoil**	Erosion and siltation of wetland and watercourse	A detailed **Rehabilitation Plan** to be compiled to cater for rehabilitation of wetlands where construction activities are to take place.	
		Fertile topsoil can potentially be lost due to poor conservation thereof during construction activities	**Removal and stockpiling of topsoil** to be planned for in the design phase in order conserve fertile topsoil for rehabilitation purposes.	Civil contractor
			A detailed **Rehabilitation Plan** to be compiled to cater for rehabilitation using stockpiled topsoil.	EAP
Flora	**Loss of indigenous vegetation and presence of alien species along the riparian zone**	Alien species along the riparian zone	**Removal of alien vegetation** within the development footprint as well as along riparian zone to be included in the **Rehabilitation Plan.**	Civil contractor
Human and Ecological Health	**Damage to water infrastructure**	Corrosion of the water infrastructure could pollute the watercourses	The developer (water-user) must ensure that a suitably qualified engineer is appointed and **acceptable construction practices are included in the water pipeline design, stormwater management, and rehabilitation,** to ensure stability of structures constructed.	Developer

Pre-construction Phase				
Environmental attribute	***Environmental concern***	***Potential impact & significance***	***Mitigation measure and mechanisms for implementation***	***Responsibility***
Areas of conservation importance	**Conservation of areas of conservation importance**	Destruction of areas of conservation importance e.g. wetlands, and areas that contain any Red or Orange Listed species.	**Infrastructure that could pose an adverse impact should be designed to be located outside the 1:100 year flood line of the watercourse in order to minimise impact on watercourse and associated wetlands.**	Civil contractor/ ECO
Soil	**Erosion and loss of topsoil**	Fertile topsoil can potentially be lost due to poor conservation thereof during construction activities.	**Topsoil to be stripped and stockpiled in a designated area** during pre-construction phase for the purpose of rehabilitation**.**	Civil contractor
			Recommendations related to pre-construction phase activities as documented in the **Rehabilitation Plan** to be implemented.	Civil contractor
Flora	**Alien species along watercourses**	Alien species spreading along the riparian zone	During vegetation clearance any **invasive species** encountered on site and within the watercourse or wetland, should be **removed.**	Civil contractor
Geohydrology and water quality	**Pollution of groundwater and the watercourse by contaminated run-off**	Potential spills from chemical toilets might contaminate the watercourse.	Camp site containing temporary **ablution facilities may not** be located within 100m from a watercourse or withina 500m from the boundary of a wetland.	Civil contractor
		Potential spills from temporary hazardous substance storage areas contaminating the watercourse.	**Sufficient temporary bunded area(s) for hazardous substances storage** is to be catered for at the **camp site. Bunded areas are to have a capacity of 110% or greater.**	Civil contractor
		Potential spills from mobile plant.	**Mobile plant** is to be provided with **drip trays** when parked**.** **Mobile plant** is to be provided with **emergency spill kits** to cater for cleaning up hazardous spills.	Civil contractor
Water quality	**Pollution of watercourse and wetland by domestic waste**	Potential for polluting watercourse with domestic waste or hazardous waste if not properly managed	**Sufficient waste storage areas** (domestic and hazardous) are to be catered for at the **camp site, and construction areas.** **Waste storage areas may not** be located within 100m from a watercourse or within 500m from a wetland.	Civil contractor

Areas of conservation importance	**Conservation of areas of conservation importance**	Destruction of areas of conservation importance	**All areas identified as areas of conservation importance to be demarcated as No-Go areas and managed accordingly.**	Civil contractor/ ECO

Construction Phase				
Environmental attribute	***Environmental concern***	***Potential impact & significance***	***Mitigation measure and mechanisms for implementation***	***Responsibility***
Hydrology and water quantity	**Altering the flow pattern or the volume of water**	Construction activities within the watercourse could potentially alter the flow and volume of water in the affected watercourses	Construction to be planned for the winter season as to minimize the impact on the watercourse.	Developer/ Civil contractor
Geohydrology and surface water quality	**Possibility of polluting groundwater and watercourse by contaminated run-off**	Potential spills from chemical toilets might contaminate the river.	Temporary **ablution facilities must be cleaned out regularly.** Sewage waste is to be disposed of at a registered sewage works. Record of proof of safe disposal to be kept at the site camp.	Civil contractor
		Potential spills from temporary hazardous substance storage areas might contaminate the watercourse or wetland	**Hazardous substances storage** is to be inspected daily for any leaks and spills. Spills to be cleaned up and stored in **designated temporary hazardous waste storage area.**	Civil contractor
		Potential spills from mobile plant.	**Mobile plant** is to be provided with **drip trays** when parked. **Mobile plant** to utilise **emergency spill kits** for cleaning up hazardous spills.	Civil contractor
Soil	**Erosion and loss of topsoil**	Fertile topsoil can potentially be lost due to poor conservation thereof during construction activities.	Recommendations related to construction phase activities as documented in the **Rehabilitation Plan** to be implemented.	Civil contractor/ ECO
Flora	**Alien species within the development footprint**	Alien species along the riparian zone	During construction any **invasive species** encountered on the development site or along the watercourse, should be **removed** and replaced with indigenous vegetation.	Civil contractor/ ECO

Construction Phase				
Environmental attribute	***Environmental concern***	***Potential impact & significance***	***Mitigation measure and mechanisms for implementation***	***Responsibility***
Water quality	**Pollution of watercourse and wetland by domestic waste**	Potential for polluting watercourse with domestic waste or hazardous waste if not properly managed	**Temporary designated domestic waste and hazardous waste storage areas** are to be cleaned out regularly by a certified waste removal company. Domestic waste is to be disposed of at a registered landfill site. Hazardous waste is to be disposed of at an appropriate class h: landfill site.	Civil contractor
Geology and soils	**Damage to topsoil and seed banks**	Potential of damaging topsoil and seed bank contained in it, if heavy mobile plant were to drive over water logged soils following heavy or prolonged precipitation.	**Construction vehicles may not drive over topsoil** stockpiled or over soil outside the development footprint following heavy precipitation or pro-longed precipitation. Development footprint must be clearly demarcated in order to prevent 'off-roading'.	Civil contractor
Wetlands	***Wetland preservation***	**Damage to wetlands identified**	Developer to implement **adequate stormwater mitigation** throughout the construction site (from start to completion) to prevent large pulses in stormwater. Developer to **construct attenuation ponds** and stormwater structures in accordnace with a Stormwater Management Plan to prevent sediment runoff and accumulation in the wetland area.	Developer/ Contractor
	Negative impact on sensitive habitat and watercourse	Poor installation and protection could result in scouring and siltation of wetlands.	**ECO** to ensure impacts to wetlands are minimal and suitably and effectively rehabilitated.	Developer

Construction Phase				
Environmental attribute	***Environmental concern***	***Potential impact & significance***	***Mitigation measure and mechanisms for implementation***	***Responsibility***
Areas of conservation importance	**Conservation of areas of conservation importance**	Destruction of areas of conservation importance e.g. wetlands.	**All "NO-GO" areas are to be managed accordingly and continuously monitored to ensure conformance.** **ECO to monitor that demarcated areas are adhered to.**	Civil contractor/ ECO
Wetlands	**Erosion and siltation**	Poor stormwater management could lead to erosion of and siltation within wetlands.	**Appropriate stormwater mitigation** should be implemented throughout the construction site from the start to the completion in order to counteract stormwater surges. **Traps to contain sediment** to be implemented throughout the site to counteract sediment runoff and sediment accumulation getting washed into the wetland.	Civil contractor/ ECO

Site de-establishment Phase				
Environmental attribute	***Environmental concern***	***Potential impact & significance***	***Mitigation measure and mechanisms for implementation***	***Responsibility***
Soil	**Erosion and loss of topsoil**	Fertile topsoil can potentially be lost due to no rehabilitation	**Reinstate topsoil** at site camp and disturbed areas once de-established, and seed with local seed mix specific to Flora and grass species occurring within the development footprint, **only if natural re-generation does not occur.**	Civil contractor/ ECO
Geohydrology and water quality	**Pollution of groundwater and the watercourse by contaminated run-off**	Potential spills from chemical toilets might contaminate the watercourse.	Temporary **ablution facilities must be cleaned out and removed from the site camp.** Sewage waste is to be disposed of at a registered sewage works. Record of proof of safe disposal to be kept at the site camp.	Civil contractor
		Potential spills from temporary hazardous substance storage areas might contaminate the watercourse.	**Hazardous substances storage** area(s) is (are) to be demolished and hazardous waste disposed at registered hazardous disposal site. Proof of disposal records to be retained.	Civil contractor
		Potential spills from mobile plant.	**Mobile plant** and construction equipment is to be removed from site.	Civil contractor
Water quality	**Pollution of watercourse by domestic waste**	Potential for polluting the watercourse by domestic waste or hazardous waste ending up in the river if not removed	**Temporary designated domestic waste and hazardous waste storage areas** are to be demolished and waste to be removed by a certified waste removal company. Domestic waste is to be disposed of at a registered landfill site. Hazardous waste is to be disposed of at a class h: landfill site.	Civil contractor

Rehabilitation Phase				
Environmental attribute	***Environmental concern***	***Potential impact & significance***	***Mitigation measure and mechanisms for implementation***	***Responsibility***
Hydrology and morphology	**Change in the watercourse morphology, scouring and siltation**	Erosion, siltation, and surface water pollution. Damage to the watercourse morphology.	Contractor to take measures to ensure: **Rehabilitation** of the watercourse, including riparian and in-stream habitat, is sufficiently and effectively undertaken following construction.	Civil contractor/ ECO
Soil	**Loss of topsoil/erosion and siltation**	Fertile topsoil can potentially be lost if rehabilitation does not take place.	Stockpiled topsoil to be utilised for rehabilitation purposes in accordance with the **Rehabilitation Plan.**	Civil contractor
Flora	**Alien species within the development footprint**	Alien species occurring along the riparian zone and where disturbances (construction) have taken place	Any **alien or invasive vegetation** remaining within the pipeline footprint during the rehabilitation phase, especially in areas disturbed and along watercourses shall be **removed.**	Civil contractor
Wetlands	**Damage to sensitive habitat and watercourse**	Poor rehabilitation could result in scouring and siltation of wetlands.	**The ECO** to ensure rehabilitation of watercourse and wetland affected in accordance with **Rehabilitation Plan**.	ECO/ Civil contractor

Operational Phase				
Environmental attribute	***Environmental concern***	***Potential impact & significance***	***Mitigation measure and mechanisms for implementation***	***Responsibility***
Rehabilitation	**Habitat destruction**	Instability and erosion of rehabilitated structures	**Rehabilitated structures must be inspected regularly** for blockages, instabilities, and erosion e.g. road crossing stormwater wetland identified on site. As recommended in the wetland delineation assessment, the pipeline corridor and compacted surface area should be inspected for the first three months after large rainfall event, thereafter, the corridor can be inspected on a yearly basis, at the end of the rainy season.	Developer

9. REHABILITATION

9.1. WATERCOURSES AND WETLANDS

The applicant has made financial provision for rehabilitation as a part of the proposed activities. ***Refer to Appendix 6B for the Rehabilitation Plan.***

9.2. ACTIVITIES ON SITE

The following activities on site must be rehabilitated on site:

- The open trench excavations; and
- Exposed areas along the pipeline route;

10. SECTION 27

Table 4: Section 27 Motivation

Water Use License Application Section 27	
Section 27	**Description**
(a) Existing lawful water uses	As per item 5.1 above.
(b) The need to redress the results of past racial and gender discrimination	Attacq (Pty) Ltd as a company is committed to fair racial and gender practices. The development of this area wills provide employment opportunities to the nearby marginalized communities of Tembisa and Chloorkop. It will furthermore decrease travel time between their residence and retail opportunities.
(c) The efficient and beneficial use of water in the public interest	- As public trustee of the water resources, the Department of Water and Sanitation must ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all users. -The Minister, through the Department, has to ensure that the water is allocated equitably and used beneficially in the public interest, while promoting environmental values. -For the environment, only the water use which is beneficial and in the public interest will be recognized. This "beneficial use in the public interest" is the optimum balance of social, economic and environmental needs.

	Refer to item 7.2 above for the importance of this development.
(d) The socio-economic impact	The approval of this license application will ensure that: • The upgrade of infrastructure and improvement of services in the area; • Job creation; • Positive impacts on the values of the surrounding properties; • Compatibility of the proposed land use with the surrounding land uses; • Need and desirability of the proposed land use; • Economic viability of the proposed land use; • The proposed activities will be in line with the international, national, provincial and local legislation, planning frameworks, guidelines, policies etc; and
(e) Any Catchment Management Strategy applicable to the water resource	- Under Part 2 of the NWA, the Minister is required to use the classification system established in Part 1 of the Act to determine the class and resource quality objectives of all or part of water resources considered to be significant. -The purpose of the resource quality objectives is to establish clear goals relating to the quality of the relevant water resources. -In determining resource quality objectives a balance must be sought between the need to protect and sustain water resources on the one hand and the need to develop and use them on the other. -Provision is made for preliminary determinations of the class and resource quality objectives of water resources before the formal classification system is established. -Once the class of a water resource and the resource quality objectives have been determined they are binding on all authorities and institutions when exercising any power or performing any duty under this Act. To our knowledge the class and resource quality objectives for the Jukskei River has not been developed yet. The DWS is to

	confirm the status.
(f) The likely effect of the water use to be authorised on the water resource and other water users	• Discharge of runoff into the river system will make use of energy dissipating structures to prevent erosion; • Adequate storm water management will be incorporated into the design of the proposed activities, along with the existing storm water, in order to prevent erosion and associated sedimentation of the riparian zones; • Alien vegetation will be controlled along the wetland and riparian features; • The connectivity of the riparian areas will be maintained between the areas upstream and downstream of the proposed activities. As well as to ensure that permanent, seasonal and temporary wetland zones functionality is maintained through the provision of measures ensuring that soil wetting conditions are maintained; • To ensure the ongoing functioning of the river areas in the vicinity of the proposed development; • No incision and canalisation of the wetland system will take place; and • Rehabilitation of the wetland areas will be implemented to ensure continued functionality.
(g) The class and resource quality objectives of the water resource	- Under Part 2 of the NWA, the Minister is required to use the classification system established in Part 1 of the Act to determine the class and resource quality objectives of all or part of water resources considered to be significant. -The purpose of the resource quality objectives is to establish clear goals relating to the quality of the relevant water resources. -In determining resource quality objectives a balance must be sought between the need to protect and sustain water resources on the one hand and the need to develop and use them on the other. -Provision is made for preliminary determinations of the class and resource

	quality objectives of water resources before the formal classification system is established. -Once the class of a water resource and the resource quality objectives have been determined they are binding on all authorities and institutions when exercising any power or performing any duty under this Act. To our knowledge the class and resource quality objectives for the wetland and associated watercourse has not been developed yet. The DWS is to confirm the status. It is recommended that the current ecological state of the resource should be maintained and where possible, improved.
(h) Investments already made and to be made by the water user in respect of the water use in question	Attacq has made large investments in terms of professional fees (consultants', engineers, town planners' etc). The development of the pipeline will be a massive capital expense on the account of the developer. The pipeline will not only serve the property of the developer, but also the development of other nearby land parcels.
(i) The strategic importance of the water use to be authorised	The overall aim of the proposed pipeline is to provide bulk water not only to the augment the existing areas, however to also accommodate the future planned townships in the Midrand area, especially on the southern side of Allandale Road. The construction phase of the development will create many temporary employment opportunities for the local residents of the nearby and surrounding areas. This will promote the transfer of skills which these employees can use in the future. The proposed bulk water supply pipeline is also addressing the greater needs of the area by addressing the infrastructure need and improving upon service delivery. The bulk water supply will facilitate future developments in the surrounding area, thus increasing the Municipal tax base.
(j) The quality of water in the water	**Surface Water Quality**

resource which may be required for the Reserve and for meeting international obligations	Refer to item 5.4 above. **Groundwater quality** As above.
(k) The probable duration of any undertaking for which the water use is to be authorised	As the investment is significant and the development will continue through to the operational phase, it is proposed that the licence be issued for the upper limit period of 40 years.

11. CONCLUSION

The proposed Waterfall Bulk Water Supply will contribute greatly towards bulk water service delivery on the area. In order to give effect to the the proposed water pipeline, water-uses triggered by the proposed pipeline have to be authorised by means of a Water Use Authorisation (WUA).

Potential environmental concerns and asscociated impacts identified together with mitigation measures were addressed under Point 8. of this report Application Report.
A Wetland Assessment Report was compiled and mitigation measures contained in it were incorporated under Point 7. A construction method statement and design drawings were compiled for each of the proposed Section 2 (c) and (i) water-uses and appended to this Application Report as Appendix 5. The method statement provides the most practical and effective steps to minimise the impacts to the watercourse and wetland.
An Integrated Water Quality and Quantity Monitoring and Management Plan and a Rehabilitation Plan has been included in this report as **Appendix 6A and 6B respectively**. These documents have been compiled, in line with the mitigation measures proposed by specialists.

No objections have been received to the proposed development and associated water-uses ***(Refer to Appendix 8 for Public Participation Appendices).***
It is therefore recommended that the GA be granted for the abovementioned project as per the information contained in this Water-Use Licence Application Report.

Based on the above WULA report, the following are the outcomes of the application:

- Based on the specialist reports conducted, there is no negative implication that the water uses will have on the water use activities overall, however, the recommended mitigation measures must be implemented;

- Given that the water pipeline corridor will traverse a number of roads that have already been historically impacted upon in terms of hydrology of the landscape, the impacts that are associated with the upgrading and the construction of the pipeline are therefore considered negligible in comparison with the impacts of the existing roads;

- Adequate storm water management needs to be implemented especially in terms of sediment generation;

- Active alien vegetation is required to be removed, and this can be achieved in conjunction with the rehabilitation plan;

- The construction of the water pipeline will have a low impact as the site is already transformed and degraded, and will not have an adverse impact on flora and fauna;

- Based on the above, as Environmental Consultants, Bokamoso is of the opinion that the WULA should be recommended for approval as long as the recommended mitigation measures are implemented.

12. APPENDICES

Appendix 1	Application
Appendix 1A	License Application Forms
Appendix 1B	Proof of payment of License fee
Appendix 1C	Power of attorney and ID
Appendix 1D	Company Registration
Appendix 1E	Proof of Pre-Consultation
Appendix 2	Basic Assessment Report
Appendix 3	Specialist Reports
Appendix 3A	Wetland Assessment Report
Appendix 3B	Heritage Impact Assessment
Appendix 3C	Specialist Vegetation Report
Appendix 3D	Specialist Fauna Report
Appendix 3E	Geotechnical Assessment
Appendix 4	Design Drawings and Construction Method Statements
Appendix 5	Maps/Photos
Appendix 6	Management Plans
Appendix 6A	IWQQMMP
Appendix 6B	Rehabilitation Plan including wetland
Appendix 7	Property Information
Appendix 7A	Windeed Search
Appendix 7B	Zoning Certificate
Appendix 7C	Title Deed
Appendix 8	Public Participation
Appendix 8A	Site Notice
Appendix 8B	Public Notice
Appendix 8C	Newspaper Advertisements
Appendix 8D	Photographs as Proof
Appendix 8E	Communication with Interested and Affected Parties
Appendix 8F	List of Interested and Affected Parties
Appendix 8G	Comments and Issues Register
Appendix 9	Environmental Authorisations

Appendix 1A to 1E

Is not included due to confidential information

Appendix 2: Basic Assessment Report

IN TOUCH WITH THE AFRICAN LANDSCAPE

SEATON THOMSON & ASSOCIATES

TOURISM DEVELOPMENT, CONSERVATION & ENVIRONMENTAL PLANNING

BASIC ASSESSMENT REPORT IN TERMS OF SECTION 22 (1) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (NO. 107 OF 1998)

PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE

GAUT REF 002/11-12/E0001

SEATON THOMSON & ASSOCIATES

P.O. Box 936, IRENE, 0062 Tel (012) 667-2107 Fax (012) 667-2109 E-mail seaton@yebo.co.za

Gauteng Department of Agriculture and Rural Development (GDARD)

Basic Assessment Report in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2010

List of all organs of state and State Departments where the draft report has been submitted, their full contact details and contact person

Kindly note that:

1. This **Basic Assessment Report** is the standard report required by GDARD in terms of the EIA Regulations, 2010and must be submitted together with the application form.

2. This application form is current as of 2 August 2010. It is the responsibility of the EAP to ascertain whether subsequent versions of the form have been published or produced by the competent authority.

3. **A draft Basic Assessment Rreport must be submitted to all State Departments administering a law relating to a matter likely to be affected by the activity to be undertaken; the submission of such a draft report to such State Departments must be done on the day of submission of the draft report to the competent authority, this Department. (Attach a signed proof of such submission). signed**

4. The report must be typed within the spaces provided in the form. The size of the spaces provided is not necessarily indicative of the amount of information to be provided. The report is in the form of a table that can extend itself as each space is filled with typing.

5. Selected boxes must be indicated by a cross and, when the form is completed electronically, must also be highlighted.

6. An incomplete report may be returned to the applicant for revision.

7. The use of "not applicable" in the report must be done with circumspection because if it is used in respect of material information that is required by the competent authority for assessing the application, it may result in the rejection of the application as provided for in the regulations.

8. Five (5) copies (3 hard copies and 2 CDs-PDF) of the final report and attachments must be handed in at offices of the relevant competent authority, as detailed below.

9. No faxed or e-mailed reports will be accepted. Only hand delivered or posted applications will be accepted.

10. Unless protected by law, and clearly indicated as such, all information filled in on this application will become public information on receipt by the competent authority. The applicant/EAP must provide any interested and affected party with the information contained in this application on request, during any stage of the application process.

DEPARTMENTAL DETAILS

Gauteng Department of Agriculture and Rural Development
Attention: Administrative Unit of the Sustainable Utilisation of the Environment (SUE) Branch
P.O. Box 8769
Johannesburg
2000

Administrative Unit of the Sustainable Utilisation of the Environment (SUE) Branch
18th floor Glen Cairn Building
73 Market Street, Johannesburg

Admin Unit telephone number: (011) 355 1345
Department central telephone number: (011) 355 1900

(For official use only)

File Reference Number:	002/11-12/E0001
Application Number:	
Date Received:	

(i) Submission to State Department (Section 3 above)

(A) Has a draft report for this application been submitted to all State Department administering a law relating to a matter likely to be affected as a result of the activity? **Y**

(B) Is a list of State Departments referred to in section A above been attached to this report, **Y**

if no, state reasons for not attaching the list.

N/A

SECTION A: ACTIVITY INFORMATION

1. ACTIVITY DESCRIPTION

Project title (must be the same name as per application form):

Installation of the Waterfall Junction bulk Water Pipeline

Select the appropriate box

The application is for an upgrade of an existing development		The application is for a new development	X	Other, specify	

Describe the activity and associated infrastructure, which is being applied for, in detail

Background and Introduction

According to the Johannesburg Water, water supply to the proposed Waterfall Junction development will be provided from the Modderhill / Chloorkop Water sub-districts. A major addition to this in terms of the above-mentioned report, will be the implementation of the proposed Heartland reservoir and sub-districts as part of the development of the Heartland property area. The proposed Waterfall Junction development will, according to the report be incorporated into the Heartland reservoir water sub-district.

In the long term the Waterfall Junction development will be supplied from the Heartland Reservoir. Until the reservoir is built to serve the Heartland property area, the Waterfall Junction Development can be served directly from a Rand Water connection at the intersection of the M39 (Allandale Rd) and M18 (Andrew Moph to St) which will ultimately provide supply to the reservoir.

Therefore to provide a supply to the Waterfall Junction development in the short term a pipe needs to be constructed from the intersection of M39 and M18 to the boundary of the site.

The Application

Application is being made for the installation of a major bulk steel water pipeline, varying in diameter between 300mm and 600mm. The route of the line is generally from a point in the proposed Waterfall Junction development, close to and on the southern side of Allandale Road, opposite Dane Road, running in a south easterly direction, generally parallel with Allandale Road, to Zuurfontein Road (M18), where it links into an existing Rand Water Board pipeline. Refer **Appendix A: Waterfall Junction Pipeline Locality** and **Appendix D.01 Waterfall Junction Pipeline Route**

The above is the general route of the pipeline, but various minor deviations of the route are still under review and consideration, based on finalisation of long term plans and development proposals in the area. These are shown on the plan in **Appendix D.01 Waterfall Junction Pipeline Route** and form part of the preferred alternative.

The pipeline will not exceed 5800 meters in length, which ever final alignment is selected. It is proposed that the depth of excavation of the trench will not exceed 1.9 metres in depth. The width of the servitude containing the pipeline will not exceed 4.0 metres in width.

2. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations:

Title of legislation, policy or guideline:	Administering authority:	Promulgation Date:
National Environmental Management Act No. 107 of 1998 as amended.	National & Provincial	27 November 1998
National Water Act	National	1998

3. ALTERNATIVES

Describe the proposal and alternatives that are considered in this application. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity could be accomplished. The determination of whether the site or activity (including different processes etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment
The no-go option must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. **Do not** include the no go option into the alternative table below.

Note: After receipt of this report the competent authority may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

Provide a description of the alternatives considered

No.	**Alternative type**, either alternative: site on property, properties, activity, design, technology, operational or other(provide details of "other")	**Description**
1	**Proposal** - **steel pipe** bulk waterline, varying in diameter between 300mm and 600mm, running generally from the Waterfall Junction development, to the Rand Water connection at the M18 on the southern side of Allandale Road This preferred alternative proposal contains **four options**, all of which fall generally along a route parallel to Allandale Road.	The route of the steel pipeline is generally from a point in the proposed Waterfall Junction development, close to and on the southern side of Allandale Road, opposite Dane Road, running in a south easterly direction, generally parallel with Allandale Road, to Zuurfontein Road (M18), where it links into an existing Rand Water Board pipeline. Refer **Appendix D.01 Waterfall Junction Pipeline Route** The above is the general route of the pipeline, but four options comprising of various minor deviations of the route are still under review and consideration, based on finalisation of long term plans and development proposals in the area. The pipeline will not exceed 5800 meters in length, which ever final alignment is selected. It is proposed that the depth of excavation of the trench will not exceed 1.9 metres in depth. The width of the servitude containing the pipeline will not exceed 4.0 metres in width.

		The following **four options** for minor deviations and alterations in the route form part of the preferred alternative. These are necessary and desirable to include, as the final route alignment cannot be finalised until various planning proposals are resolved in the area. **Option 1** - This option comprises the construction of the bulk water from the RW connection (intersection of M38 and M18) point D, within the M39 road reserve (Allandale Rd) up to the proposed Waterfall Junction development, point A. **Option 2** - This option comprises the construction of the bulk water line from the RW connection (intersection of M38 and M18) through a series of private properties along the Allandale Road up to the proposed Water Fall City development. The pipeline route would run parallel and adjacent to the Allandale Road Reserve except over the Heartland property area where it may take a different route, to be determined (from point B to C). **Option 3** - This option comprises the construction of the bulk water line from the RW connection (intersection of M38 and M18) through a series of private properties and industrial area roads. This route follows existing access roads (formal and informal) located within the existing properties adjacent to Allandale Road. **Option 4** - This option utilises a temporary connection from the existing Chloorkop 300 diameter line near Heartland development area. There is existing spare capacity in this line, however this capacity is earmarked for a section of the Heartland development area.
2	**Alternative 1**- **steel pipe** bulk waterline, varying in diameter between 300mm and 600mm, from the Waterfall Junction development, to the Rand Water connection at the M18 on the **northern side** of Allandale Road.	This alternative would commence at a point on Dane Road, on the **northern side of Allandale Road** and follow the alignment along and parallel to Allandale Road, to connect to the Rand Water pipeline on Zuurfontein Road (M18)
3	**Alternative 2 – concrete and upvc pipe**	This alternative has the same route and alignment as the **Proposal Route and 4 options.** The alternative is the use of concrete and upvc materials as an alternative to steel, as used in the main proposal

NOTE: The numbering in the above table must be consistently applied throughout the application report and process

4. PHYSICAL SIZE OF THE ACTIVITY

Indicate the total physical size (footprint) of the proposal as well as alternatives. Footprints are to include all new infrastructure (roads, services etc), impermeable surfaces and landscaped areas:

Alternative:	**Size of the activity:**
Alternative 1(Proposed activity)	
Alternative 2 (if any)	
Alternative 3 (if any)	

Ha/ m^2

or, for linear activities:

Alternative:	**Length of the activity:**
(Proposed activity):	5 800 metres
Alternative 2 (if any)	5 800 metres
Alternative 3 (if any) – concrete and upvc pipe	5 800 metres

m/km

Indicate the size of the site(s) or servitudes (within which the above footprints will occur):

Alternative:	**Size of the site/servitude:**
Alternative 1(Proposed activity) steel pipeline on **southern** side of Allandale Road **with 4 options** for deviations	±23 200 m²
Alternative 2 (if any) steel pipeline on **northern** side of and parallel to Allandale Road	±23 200m²
Alternative 3 (if any)) pipeline on southern side of Allandale Road with 4 options for deviations, using **concrete and upvc pipe**	±23 200 m²

Ha/m^2

5. SITE ACCESS

Alternative 1 (Proposal) steel pipeline on **southern** side of Allandale Road **with 4 options** for deviations

Does ready access to the site exist, or is access directly from an existing road?	YES **X**	NO
If NO, what is the distance over which a new access road will be built		m

Describe the type of access road planned:

Access to the line is from Allandale Road and other existing roads

Include the position of the access road on the site plan.

Alternative 2 pipeline on **northern** side of and parallel to Allandale Road

Does ready access to the site exist, or is access directly from an existing road?	YES **X**	NO
If NO, what is the distance over which a new access road will be built		m

Describe the type of access road planned:

Access to the line is from Allandale Road and other existing roads

Include the position of the access road on the site plan.

Alternative 3 pipeline on southern side of Allandale Road with 4 options for deviations, using **concrete and upvc pipe**

Does ready access to the site exist, or is access directly from an existing road?	YES **X**	NO
If NO, what is the distance over which a new access road will be built		m

Describe the type of access road planned:

Access to the line is from Allandale Road and other existing roads

Include the position of the access road on the site plan.

PLEASE NOTE: Points 6 to 8 of Section A must be duplicated where relevant for alternatives

Section A 6-8 has been duplicated **0** Number of times

(only complete when applicable)

6. SITE OR ROUTE PLAN

A detailed site or route (for linear activities) plan(s) must be prepared for each alternative site or alternative activity. It must be attached as Appendix A to this document. The site or route plans must indicate the following:

- the scale of the plan, which must be at least a scale of 1:2000 (scale can not be larger than 1:2000 i.e. scale can not be 1:2500 but could where applicable be 1:1500)
- the property boundaries and numbers of all the properties within 50m of the site;
- the current land use as well as the land use zoning of each of the properties adjoining the site or sites;
- the exact position of each element of the application as well as any other structures on the site;
- the position of services, including electricity supply cables (indicate above or underground), water supply pipelines, boreholes, street lights, sewage pipelines, septic tanks, storm water infrastructure and telecommunication infrastructure;
- walls and fencing including details of the height and construction material;
- servitudes indicating the purpose of the servitude;
- sensitive environmental elements on and within 100m of the site or sites including (but not limited thereto):
    - Rivers and wetlands;
    - the 1:100 and 1:50 year flood line;
    - ridges;
    - cultural and historical features;
    - areas with indigenous vegetation (even if it is degraded or infested with alien species);
- for gentle slopes the 1m contour intervals must be indicated on the plan and whenever the slope of the site exceeds 1:10, the 500mm contours must be indicated on the plan; and
- the positions from where photographs of the site were taken.
- Where a watercourse is located on the site at least one cross section of the water course must be included (to allow the 32m position from the bank to be clearly indicated)

7. SITE PHOTOGRAPHS

Colour photographs from the center of the site must be taken in at least the eight major compass directions with a description of each photograph. Photographs must be attached under the appropriate Appendix**.** It should be supplemented with additional photographs of relevant features on the site, where applicable.

8. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided at a scale of 1:200 for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity. To be attached in the appropriate Appendix.

SECTION B: DESCRIPTION OF RECEIVING ENVIRONMENT

Note: Complete Section B for the proposal

Further:

Instructions for completion of Section B for linear activities

1) For linear activities (pipelines etc) it may be necessary to complete Section B for each section of the site that has a significantly different environment.
2) Indicate on a plan(s) the different environments identified
3) Complete Section B for each of the above areas identified
4) Attach to this form in a chronological order
5) Each copy of Section B must clearly indicate the corresponding sections of the route at the top of the next page.

Section B has been duplicated for sections of the route | **0** | times

Instructions for completion of Section B for location/route alternatives

1) For each location/route alternative identified the entire Section B needs to be completed
2) Each alterative location/route needs to be clearly indicated at the top of the next page
3) Attach the above documents in a chronological order

Section B has been duplicated for location/route alternatives | **0** | times
(complete only when appropriate)

Instructions for completion of Section B when both location/route alternatives and linear activities are applicable for the application

Section B is to be completed and attachments order in the following way

- All significantly different environments identified for Alternative 2 is to be completed and attached in a chronological order; then
- all significantly different environments identified for Alternative 3 is to be completed and attached chronological order
- etc

Section B - Section of Route [ ] (complete only when appropriate for above)

Section B – Location/route Alternative No. [ ] (**Preferred Alternativel**)

1. PROPERTY DESCRIPTION

Property description: (Farm name, portion etc.) Various Portions of the Farm Waterval and the Farm Allandale

2. ACTIVITY POSITION

Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in decimal degrees. The degrees should have at least six decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

Alternative:	**Latitude (S):**	**Longitude (E):**
	°	°

In the case of linear activities:

Alternative: See Appendix D

	Latitude (S):	**Longitude (E):**
• Starting point of the activity	-26.032777°	28.137221°
• Middle point of the activity	-26.050277°	28.156944°
• End point of the activity	-26.060555°	28.183888°

For route alternatives that are longer than 500m, please provide co-ordinates taken every 250 meters along the route and attached in the appropriate Appendix: **Appendix D**

Addendum of route alternatives attached [X]

3. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10 **X**	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

4. LOCATION IN LANDSCAPE

Indicate the landform(s) that best describes the site.

Ridgeline	Plateau **X**	Side slope of hill/ridge	Valley **X**	Plain	Undulating plain/low hills **X**	River front

5. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

a) Is the site located on any of the following?

Shallow water table (less than 1.5m deep)	YES **X**	NO
Dolomite, sinkhole or doline areas	YES	NO **X**
Seasonally wet soils (often close to water bodies)	YES **X**	NO
Unstable rocky slopes or steep slopes with loose soil	YES	NO **X**
Dispersive soils (soils that dissolve in water)	YES	NO **X**
Soils with high clay content (clay fraction more than 40%)	YES **X**	NO
Any other unstable soil or geological feature	YES	NO **X**
An area sensitive to erosion	YES	NO **X**

(Information in respect of the above will often be available at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by Geological Survey may also be used).

b) are any caves located on the site(s)	YES	NO X

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S):	**Longitude (E):**
°	°

c) are any caves located within a 300m radius of the site(s)	YES	NO

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S):	**Longitude (E):**
°	°

d) are any sinkholes located within a 300m radius of the site(s)	YES	NO

If yes to above provide location details in terms of latitude and longitude and indicate location on site or route map(s)

Latitude (S):	**Longitude (E):**
°	°

If any of the answers to the above are "YES" or "unsure", specialist input may be requested by the Department

6. AGRICULTURE

Does the site have high potential agricultural soils as contemplated in the Gauteng Agricultural Potential Atlas (GAPA)?	YES	NO X

Please note: The Department may request specialist input/studies depending on the nature of the soil type and location of the site

7. GROUNDCOVER

To be noted that the location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Indicate the types of groundcover present on the site and include the estimated percentage found on site

Natural veld - good condition % =	Natural veld with scattered aliens % =	Natural veld with heavy alien infestation % = 50	Veld dominated by alien species % = 40	Landscaped (vegetation) % =
Sport field % =	Cultivated land % =	Paved surface (hard landscaping) % =	Building or other structure % =10	Bare soil % =

Please note: The Department may request specialist input/studies depending on the nature of the groundcover and potential impact(s) of the proposed activity/ies.

Are there any rare or endangered flora or fauna species (including red list species) present on the site	YES	NO X

If YES, specify and explain:

Are there any rare or endangered flora or fauna species (including red list species) present within a 200m (if within urban edge, May 2002) or within 600m (if outside the urban edge, May 2002) radius of the site	YES	NO X

If YES, specify and explain:

Are their any special or sensitive habitats or other natural features present on the site?	YES X	NO

If YES, specify and explain:

the pipeline runs across some wetland areas

Was a specialist consulted to assist with completing this section	YES X	NO

If yes complete specialist details

Name of the specialist:	Allan Batchelor		
Qualification(s) of the specialist:	B.Sc Biological Sciences, MSc Zoology, SA Council for Natural Scientific Professions (400092/06)		
Postal address:	PO Box 72295, Lynwood Ridge		
Postal code:	0040		
Telephone:	012 349 2699	Cell:	0827890718
E-mail:	allanb@wetsc.co.za	Fax:	012 349 2993

Are any further specialist studies recommended by the specialist?	YES	NO **X**
If YES, specify:		
If YES, is such a report(s) attached?	YES	NO

If YES list the specialist reports attached below

Wetland Delineation and Assessment Waterfall Junction Pipeline, Wetland Consulting Services, June 2011

Signature of specialist:  Date: May 2011

Please note; If more than one specialist was consulted to assist with the filling in of this section then this table must be appropriately duplicated

8. LAND USE CHARACTER OF SURROUNDING AREA

Using the associated number of the relevant current land use or prominent feature from the table below, fill in the position of these land-uses in the vacant blocks below which represent a 500m radius around the site

1. Vacant land	2. River, stream, wetland	3. Nature conservation area	4. Public open space	5. Koppie or ridge
6. Dam or reservoir	7. Agriculture	8. Low density residential	9. Medium to high density residential	10. Informal residential
11. Old age home	12. Retail	13. Offices	14. Commercial & warehousing	15. Light industrial
16. Heavy industrial[AN]	17. Hospitality facility	18. Church	19. Education facilities	20. Sport facilities
21. Golf course/polo fields	22. Airport[N]	23. Train station or shunting yard[N]	24. Railway line[N]	25. Major road (4 lanes or more)[N]
26. Sewage treatment plant[A]	27. Landfill or waste treatment site[A]	28. Historical building	29. Graveyard	30. Archeological site
31. Open cast mine	32. Underground mine	33.Spoil heap or slimes dam[A]	34. Small Holdings	
Other land uses (describe):				

Waterfall Junction Water Line Land Use Grid

	1	1,25	25,34				
	1		25,34				
	9		25,34				
	1		14,25				
	1		14,25				
	1		9,25				
	1		9,25				
	1		9,25,31	9,25	1,9,25	1,25	
	1					25,31	
	14	14,15	14,15	14,15	14,15	25,31	

Note: Each block represents and area of 500m x 500m

Note: More than one (1) Land-use may be indicated in a block

Please note: The Department may request specialist input/studies depending on the nature of the land use character of the area and potential impact(s) of the proposed activity/ies. Specialist reports that look at health & air quality and noise impacts may be required for any feature above and in particular those features marked with an "A" and with an "N" respectively.

Have specialist reports been attached	YES **X**	NO

If yes indicate the type of reports below

Wetland Delineation and Assessment Waterfall Junction Pipeline, Wetland Consulting Services, June 2011

9. SOCIO-ECONOMIC CONTEXT

Describe the existing social and economic characteristics of the area and the community condition as baseline information to assess the potential social, economic and community impacts.

The pipeline is to be routed generally along the southern side of Allandale Road. This area of land is currently the subject of a number of development applications, which will comprise of mixed use developments, ie residential, business and commercial uses. At the present time, most of this land is vacant, although some residential development is currently being established at Jukskei View and there are existing business and commercial activities on the eastern end of Allandale Road, close to its intersection with Zuurfontein Road (M18).

On the northern side of Allandale Road, the area is well established with residential uses, comprising of both low density, agricultural residential on the western end of Allandale Road and also medium to high density residential development along the remainder of Allandale Road in Klipfontein View

The pipeline is aimed at providing bulk water not only to supplement existing areas, but also to accommodate the planned township expansion programme on the southern side of Allandale Rods.

The line is part of the City of Joburg's (Joburg Water's) wider network planning for the provision of service infrastructure to this area.

10. CULTURAL/HISTORICAL FEATURES

Please be advised that if section 38 of the National Heritage Resources Act 25 of 1999 is applicable to your proposal or alterantives, then you are requested to furnish this Department with written comment from the South African Heritage Resource Agency (SAHRA) – Attach comment in appropriate annexure

38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as-

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site-

- *(i) exceeding 5 000 m2 in extent; or*
- *(ii) involving three or more existing erven or subdivisions thereof; or*
- *(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
- *(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;*

(d) the re-zoning of a site exceeding 10 000 m2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Are there any signs of culturally (aesthetic, social, spiritual, environmental) or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including archaeological or palaeontological sites, on or close (within 20m) to the site?	YES	NO **X**

If YES, explain:

If uncertain, the Department may request that specialist input be provided to establish whether there is such a feature(s) present on or close to the site.

Briefly explain the findings of the specialist if one was already appointed:

Will any building or structure older than 60 years be affected in any way?	YES	NO **X**
Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)? If yes, please attached the comments from SAHRA in the appropriate Appendix	YES	NO

SECTION C: PUBLIC PARTICIPATION

1. ADVERTISEMENT

The Environmental Assessment Practitioner must follow any relevant guidelines adopted by the competent authority in respect of public participation and must at least –

1(a) Fix a notice in a conspicuous place, on the property where it is intended to undertake the activity which states that an application will be submitted to the competent authority in terms of these regulations and which provides information on the proposed nature and location of the activity, where further information on the proposed activity can be obtained and the manner in which representations on the application may be made.

1(b) inform landowners and occupiers of adjacent land of the applicant's intention to submit an application to the competent authority

1(c) inform landowners and occupiers of land within 100 metres of the boundary of the property where it is proposed to undertake the activity and whom may be directly affected by the proposed activity of the applicant's intention to submit an application to the competent authority;

1(d) inform the ward councillor and any organisation that represents the community in the area of the applicant's intention to submit an application to the competent authority;

1(e) inform the municipality which has jurisdiction over the area in which the proposed activity will be undertaken of the applicant's intention to submit an application to the competent authority; and

1(f) inform any organ of state that may have jurisdiction over any aspect of the activity of the applicant's intention to submit an application to the competent authority; and

1(g) place a notice in one local newspaper and any *Gazette* that is published specifically for the purpose of providing notice to the public of applications made in terms of these regulations.

2. LOCAL AUTHORITY PARTICIPATION

Local authorities are key interested and affected parties in each application and no decision on any application will be made before the relevant local authority is provided with the opportunity to give input. The planning and the environmental sections of the local authority must be informed of the application at least 30 (thirty) calendar days before the submission of the application.

Has any comment been received from the local authority?	YES	NO
	X	

If "YES", briefly describe the comment below (also attach any correspondence to and from the local authority to this application):

Parties have registered and requested additional information. Refer **Appendix E.6 Comments and Responses Report**

If "NO" briefly explain why no comments have been received

N/a

3. CONSULTATION WITH OTHER STAKEHOLDERS

Any stakeholder that has a direct interest in the site or property, such as servitude holders and service providers, should be informed of the application at least 30 (thirty) calendar days before the submission of the application and be provided with the opportunity to comment.

Has any comment been received from stakeholders?	YES	NO
	X	

If "YES", briefly describe the feedback below (also attach copies of any correspondence to and from the stakeholders to this application):

Comments received from stakeholders are contained in **Appendix E.6 Comments and Responses Report**

If "NO" briefly explain why no comments have been received

N/a

4. GENERAL PUBLIC PARTICIPATION REQUIREMENTS

The Environmental Assessment Practitioner must ensure that the public participation is adequate and must determine whether a public meeting or any other additional measure is appropriate or not based on the particular nature of each case. Special attention should be given to the involvement of local community structures such as Ward Committees and ratepayers associations. Please note that public concerns that emerge at a later stage that should have been addressed may cause the competent authority to withdraw any authorisation it may have issued if it becomes apparent that the public participation process was inadequate.

The practitioner must record all comments and respond to each comment of the public / interested and affected party before the application is submitted. The comments and responses must be captured in a Comments and Responses Report as prescribed in the regulations and be attached to this application.

5. APPENDICES FOR PUBLIC PARTICIPATION

All public participation information is to be attached in the appropriate Appendix. The information in this Appendix is to be ordered as detailed below

Appendix 1 – Proof of site notice
Appendix 2 – written notices issued to those persons detailed in 1(b) to 1(f) above
Appendix 3 – Proof of newspaper advertisements
Appendix 4 –Communications to and from persons detailed in Point 2 and 3 above
Appendix 5 – minutes of any public and or stakeholder meetings
Appendix 6 - Comments and Responses Report
Appendix 7 –Comments from I&APs on Basic Assessment (BA) Report
Appendix 8 –Comments from I&APs on amendments to the BA report
Appendix 9 – Copy of the register of I&APs
Appendix 10 – Comments from I&APs on the application
Appendix 11 - Other

SECTION D: RESOURCE USE AND PROCESS DETAILS

Note: Section D is to be completed for the proposal

Instructions for completion of Section D for alternatives

1) For each alternative under investigation, where such alternatives will have different resource and process details (e.g. technology alternative), the entire Section D needs to be completed
4) Each alterative needs to be clearly indicated in the box below
5) Attach the above documents in a chronological order

Section D has been duplicated for alternatives (complete only when appropriate) | **0** | times

Section D Alternative No. | "insert alternative number" | (complete only when appropriate for above)

1. WASTE, EFFLUENT, AND EMISSION MANAGEMENT

Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase? YES | NO **X**

If yes, what estimated quantity will be produced per month? m^3

How will the construction solid waste be disposed of (describe)?

Not applicable. The land will be excavated for the pipeline and the soil replaced

Where will the construction solid waste be disposed of (describe)?

Not applicable. The land will be excavated for the pipeline and the soil replaced

Will the activity produce solid waste during its operational phase? YES | NO **X**

If yes, what estimated quantity will be produced per month? m^3

How will the solid waste be disposed of (describe)?

Not applicable – the activity is a water pipeline and will not produce waste

Has the municipality or relevant service provider confirmed that sufficient air space exists for treating/disposing of the solid waste to be generated by this activity? YES | NO **X**

Where will the solid waste be disposed if it does not feed into a municipal waste stream (describe)?

Not applicable – the activity is a water pipeline

Note: If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the relevant legislation? YES | NO **X**

If yes, inform the competent authority and request a change to an application for scoping and EIA.

Is the activity that is being applied for a solid waste handling or treatment facility? YES | NO **X**

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Describe the measures, if any, that will be taken to ensure the optimal reuse or recycling of materials:

Not applicable – the activity is the installation of a water pipeline

Liquid effluent (other than domestic sewage)

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system? YES | NO **X**

If yes, what estimated quantity will be produced per month? m^3

If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the liquid effluent to be generated by this activity(ies)? YES | NO **X**

Will the activity produce any effluent that will be treated and/or disposed of on site? Yes | NO

If yes, what estimated quantity will be produced per month? m^3

If yes describe the nature of the effluent and how it will be disposed.

Not applicable – the activity is the installation of a water pipeline

Note that if effluent is to be treated or disposed on site the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA

Will the activity produce effluent that will be treated and/or disposed of at another facility? YES | NO **X**

If yes, provide the particulars of the facility:

Facility name:			
Contact person:			
Postal address:			
Postal code:			
Telephone:		Cell:	
E-mail:		Fax:	

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

Not applicable – the activity is the construction of a water pipeline

Liquid effluent (domestic sewage)

Will the activity produce domestic effluent that will be disposed of in a municipal sewage system?	YES	NO **X**
If yes, what estimated quantity will be produced per month?	m^3	
If yes, has the municipality confirmed that sufficient capacity exist for treating / disposing of the domestic effluent to be generated by this activity(ies)?	YES	NO
Will the activity produce any effluent that will be treated and/or disposed of on site?	YES	NO

If yes describe how it will be treated and disposed off.

Not applicable – the activity is the construction of a water pipeline

Emissions into the atmosphere

Will the activity release emissions into the atmosphere?	YES	NO **X**
If yes, is it controlled by any legislation of any sphere of government?	YES	NO

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.
If no, describe the emissions in terms of type and concentration:

Not applicable – the activity is the construction of a water pipeline

2. WATER USE

Indicate the source(s) of water that will be used for the activity

municipal	Directly from water board	groundwater	river, stream, dam or lake	other	the activity will not use water
X					

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate the volume that will be extracted per month: liters

If Yes, please attach proof of assurance of water supply, e.g. yield of borehole, in the appropriate Appendix

Does the activity require a water use permit from the Department of Water Affairs and Forestry?	YES **X**	NO

If yes, list the permits required

Water Use License – this can only be applied for once an ROD is issued, as GDARDs decision forms a component of the Water Use License application

If yes, have you applied for the water use permit(s)?	YES	NO **X**
If yes, have you received approval(s)? (attached in appropriate appendix)	YES	NO

3. POWER SUPPLY

Please indicate the source of power supply eg. Municipality / Eskom / Renewable energy source

Not applicable – the activity is a water pipeline

If power supply is not available, where will power be sourced from?

Not applicable – the activity is the construction of a water pipeline

4. ENERGY EFFICIENCY

Describe the design measures, if any, that have been taken to ensure that the activity is energy efficient:

Not applicable – the activity is the construction of a water pipeline

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

Not applicable – the activity is the construction of a water pipeline

SECTION E: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2006, and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts.

1. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

Summarise the issues raised by interested and affected parties.

None

Summary of response from the practitioner to the issues raised by the interested and affected parties
(A full response must be provided in the Comments and Response Report that must be attached to this report):

Refer **Appendix E.6 Comments and Responses Report**

2. IMPACTS THAT MAY RESULT FROM THE CONSTRUCTION AND OPERATIONAL PHASE

Briefly describe the methodology utilised in the rating of significance of impacts

The methodology used to rate the significance of impacts was conducted according to a synthesis of criteria. Refer to Appendix I for detailed description of This criteria for assessing the significance of impacts is as follows:
The EXTENT of the project in terms of physical and spatial size of the impact.
The DURATION of the project in terms of the lifetime of the impact; this was measured in the context of the lifetime of the proposed base of the project.
The INTENSITY of the project in terms of the impact having a very destructive effect of the environment or benign.
The PROBABILITY of the project evaluated in terms of the likelihood of the impacts actually occurring.
Using these criteria, the significance was determined for each potential impact discussed. (Refer Appendix I)
SIGNIFICANCE is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. **REFER APPENDIX I**

Briefly describe and compare the potential impacts (as appropriate), significance rating of impacts, proposed mitigation and significance rating of impacts after mitigation that are likely to occur as a result of the construction phase for the various alternatives of the proposed development. This must include an assessment of the significance of all impacts.

Alternative 1 (Proposal) steel pipeline on **southern** side of Allandale Road **with 4 options** for deviations

Potential impacts:	**Significance rating of impacts:**	**Proposed mitigation:**	**Significance rating of impacts after mitigation:**
Physical Impacts			
Pollution during construction	Low	Adequate arrangements shall be made with the relevant local authority and responsible organizations for the collection of waste and/or building rubble during construction phase. The contractor involved in the management of the construction, needs to encourage an ethic of a pollution free and clean environment along the area of construction and ensure all litter, rubble, etc is removed.	Low

Visual Impact	Low	Once the length of the line is rehabilitated, it will not be visible and will not have a negative visual impact on the site.	Low
Bio-Physical Impacts			
Impact on flora, resulting in loss of habitat and diversity	Low	The specialist survey has indicated that the majority of the land that the line follows has been previously disturbed from informal roads and tracks, infrastructure, agricultural & cultivation activities, sand mining, invasion of exotics, buildings, leveling and general human activities. Although Egoli Granite Grassland is present, it has been highly disturbed & transformed The specialist wetland survey indicates that all the wetlands have been impacted on to greater and lesser extents by agriculture, habitat fragmentation, alien vegetation, roads, sand mining, etc resulting in an assessment of the wetlands being largely modified (PES category D) with losses in natural habitat, biota, and basic ecosystem functions being extensive. No pristine wetlands were found to occur within the study area and they are considered to have a low/ marginal ecological importance and sensitivity	Low
Impact on fauna, resulting in loss of diversity	Low	Considerable transformation of the area is evident through past cultivation and present urban development which has left the remaining habitat in a highly degraded state. Human presence within, and adjacent to, the study area is high. The area is degraded and there is uncontrolled movement of people along the proposed line, thus the significance of fauna is low.	Low
Impact on hydrological functioning	Low	Where the proposed pipeline crosses wetlands along the route, wetland vegetation will be destroyed within the direct trench excavation as well as within the construction servitude. Given the disturbed nature of the wetlands and the fact that they are mostly characterised by secondary	Low

		vegetation, this impact is not considered to be of great significance. However, the removal and disturbance of the wetland vegetation will provide further opportunity for invasion by alien and weedy species, leading to further degradation of the wetland habitat. Removal of vegetation will also expose the wetland soils to erosion. This impact is expected to be Definite, Short-term, restricted to Site, and Moderate, leading to an impact of Moderate environmental significance. No heavy machinery should be permitted outside the demarcated construction servitude No materials or soil should be stockpiled outside the demarcated servitude Where soils have been compacted or where vehicle tracks or rills have created preferential flow paths, the construction servitude should be ripped, scarified and landscaped to the natural landscape profile and re-vegetated with suitable indigenous grass species	
Impact on wetland crossings	Low	The specialist report notes that the pipeline will intercept any perched water table, but wetlands along the proposed pipeline route are crossed immediately downslope by Allandale Road, reducing the significance of the decreased flows; The line could create a preferential flow path in the subsurface, potentially leading to diversion of flows and piping resulting in erosion; Any impacts can be reduced with pipelines crossing the wetlands perpendicular to the flow, where possible. Material with low hydrological conductivity (a Bentonite mix is recommended), in the form of trench breakers should be packed around the pipe	Low
Dust/air pollution	Low	Stock piles of soil must be kept	Low

		covered or have a suitable dust palliative applied, such as water or commercial dust suppressants, to prevent wind borne pollution Soil loads in transit must be kept covered, to prevent wind borne pollution A suitable dust palliative should be applied if dust arises above acceptable levels, either water or commercial dust suppressants, to prevent wind borne pollution	
Social Impacts			
Service delivery to the end user	High (Positive)	Improve the quality and standard of service delivery, specifically water to the end user and therefore improve the amenity of the residential activities in the area.	High (Positive)
Impact on existing business operations	Medium	Disturbance, dust and pollution during construction in the adjoining roads, impact on traffic. Signage and deviations needed to address these short term impacts	Medium
Use of labour intensive methods in construction	High (Positive)	The construction of the line using steel piping is labour intensive, therefore uplifting the local community through job creation throughout the construction phase.	High (Positive)
Economic Impacts			
Use of labour intensive methods in construction	High (Positive)	The use of local labour in the construction of the line will have a direct positive economic impact on families living in the surrounding areas.	High (Positive)
Added value to undeveloped land in the area	High (Positive)	The availability of bulk water supplies adds value to vacant land, freeing up its opportunity for development	High (Positive)

Alternative 2: pipeline on **northern** side of and parallel to Allandale Road

Potential impacts:	**Significance rating of impacts:**	**Proposed mitigation:**	**Significance rating of impacts after mitigation:**
Physical Impacts			
Pollution during construction	Medium	Adequate arrangements shall be made with the relevant local authority and responsible organizations for the collection of	Medium

		waste and/or building rubble during construction phase. The contractor involved in the management of the construction, needs to encourage an ethic of a pollution free and clean environment along the area of construction and ensure all litter, rubble, etc is removed.	
Visual Impact	Low	Once the length of the line is rehabilitated, it will not be visible and will not have a negative visual impact on the site.	Low
Width of servitude	High	The spatial requirement for the installation of the line may not be sufficient in this position, rendering the alternative unviable.	High
Bio-Physical Impacts			
Impact on flora, resulting in loss of habitat and diversity	Low	As this route of the line is along the northern side of Allandale Road, this route is characterized by existing residential uses. There is minimal to no environment remaining, therefore, impact on flora and habitat is negligible Parts of the route are affected by wet areas, but these are remnant areas, located between Allandale Road and the residential areas and have no connectivity with wet areas further to the south.	Low
Impact on fauna, resulting in loss of diversity	Low	As this route of the line is along the northern side of Allandale Road, this route is characterized by existing residential uses. No faunal species occur here and impact on habitat is therefore low	Low
Impact on hydrological functioning	Low	Parts of the route are affected by wet areas, but these are remnant areas, located between Allandale Road and the residential areas and have no connectivity with wet areas further to the south.	Low
Impact on wetland crossings	Low	Any impacts can be reduced with pipelines crossing the wetlands perpendicular to the flow, where possible. Material with low hydrological conductivity (a Bentonite mix is recommended), in the form of trench breakers	Low
Dust/air pollution	Low	Stock piles of soil must be kept covered or have a suitable dust	Low

		palliative applied, such as water or commercial dust suppressants, to prevent wind borne pollution	
Social Impacts			
Service delivery to the end user	High (Positive)	Improve the quality and standard of service delivery, specifically water to the end user and therefore improve the amenity of the residential activities in the area.	High (Positive)
Impact on existing residential properties	High	Disturbance, dust and pollution during construction in the adjoining roads, impact on traffic. Possible impacts on private properties. Signage and deviations needed to address these short term impacts	High
Use of labour intensive methods in construction	High (Positive)	The construction of the line using steel piping is labour intensive, therefore uplifting the local community through job creation throughout the construction phase.	High (Positive)
Economic Impacts			
Use of labour intensive methods in construction	High (Positive)	The use of local labour in the construction of the line will have a direct positive economic impact on families living in the surrounding areas.	High (Positive)
Impact on residents property	High (negative)	Will have economic impacts in terms of repairs and maintenance to private properties	High (negative)

Alternative 3: pipeline on southern side of Allandale Road with 4 options for deviations, using **concrete and upvc pipe**

Potential impacts:	**Significance rating of impacts:**	**Proposed mitigation:**	**Significance rating of impacts after mitigation:**
Physical Impacts	nil	The engineers have advised that the use of upvc or concrete materials for the pipe is impractical and illogical due to the size of the pipes (300mm-600mm). It will not be safe not adequate to accommodate the expected flows and volumes. This alternative therefore, is not viable	High (negative)
Biological Impacts	Nil		High (negative)
Social Impacts	Nil		High (negative)
Economic Impacts	Nil		High (negative)

List any specialist reports that were used to fill in the above tables. Such reports are to be attached in the appropriate Appendix.

Wetland Delineation and Assessment Waterfall Junction Pipeline, Wetland Consulting

Services, June 2011

3. IMPACTS THAT MAY RESULT FROM THE DECOMISSIONING AND CLOSURE PHASE

Briefly describe and compare the potential impacts (as appropriate), significance rating of impacts, proposed mitigation and significance rating of impacts after mitigation that are likely to occur as a result of the decommissioning and closure phase for the various alternatives of the proposed development. This must include an assessment of the significance of all impacts.

Alternative 1 (Proposal) steel pipeline on **southern** side of Allandale Road **with 4 options** for deviations

Potential impacts:	**Significance rating of impacts:**	**Proposed mitigation:**	**Significance rating of impacts after mitigation:**
Physical	Low	This project has an extended lifespan period, and it is determined that decommissioning of the project will never happen. Due to this, no possible mitigation can at this stage be tabled, due to many environmental changes that will take place over time, which will subsequently render any mitigation discussed, void.	Low
Bio-physical	Low	This project has an extended lifespan period, and it is determined that decommissioning of the project will never happen. Due to this, no possible mitigation can at this stage be tabled, due to many environmental changes that will take place over time, which will subsequently render any mitigation discussed, void.	Low
Social	Low	This project has an extended lifespan period, and it is determined that decommissioning of the project will never happen. Due to this, no possible mitigation can at this stage be tabled, due to many environmental changes that will take place over time, which will subsequently render any mitigation discussed, void.	Low
Economic	Low	This project has an extended lifespan period, and it is determined that decommissioning of the project will never happen. Due to this, no possible mitigation can at this stage be tabled, due to many environmental changes that will take place over time, which will subsequently render any mitigation discussed, void.	Low

Alternative 2 pipeline on **northern** side of and parallel to Allandale Road

Potential impacts:	**Significance rating of impacts:**	**Proposed mitigation:**	**Significance rating of impacts after mitigation:**
Physical	Low	This project has an extended lifespan period, and it is determined that decommissioning of the project will never happen. Due to this, no possible mitigation can at this stage be tabled, due to many environmental changes that will take place over time, which will subsequently render any mitigation discussed, void.	Low
Bio-physical	Low	This project has an extended lifespan period, and it is determined that decommissioning of the project will never happen. Due to this, no possible mitigation can at this stage be tabled, due to many environmental changes that will take place over time, which will subsequently render any mitigation discussed, void.	Low

Social	Low	This project has an extended lifespan period, and it is determined that decommissioning of the project will never happen. Due to this, no possible mitigation can at this stage be tabled, due to many environmental changes that will take place over time, which will subsequently render any mitigation discussed, void.	Low
Economic	Low	This project has an extended lifespan period, and it is determined that decommissioning of the project will never happen. Due to this, no possible mitigation can at this stage be tabled, due to many environmental changes that will take place over time, which will subsequently render any mitigation discussed, void.	Low

Alternative 3. pipeline on southern side of Allandale Road with 4 options for deviations, using **concrete and upvc pipe**

Potential impacts:	**Significance rating of impacts:**	**Proposed mitigation:**	**Significance rating of impacts after mitigation:**
Physical , Bio-physical, Social and Economic	Low	This alternative is not feasible or viable due to safety and practical considerations and will not be considered, therefore, decommissioning is not forseen	Nil

List any specialist reports that were used to fill in the above tables. Such reports are to be attached in the appropriate Appendix.

Wetland Delineation and Assessment Waterfall Junction Pipeline, Wetland Consulting Services, June 2011

4. CUMULATIVE IMPACTS

Describe potential impacts that, on their own may not be significant, but is significant when added to the impact of other activities or existing impacts in the environment. Substantiate response:

The Waterfall Junction bulk water line is proposed as part of the city wide regional bulk water supply network and therefore the installation of this section of piping will have a limited negative impact during construction and a very positive impact during operational phase, as it contributes to water needs in the area and to the expansion of much needed service infrastructure generally.

At a local scale the study area comprises of degraded and highly disturbed habitat, which includes limited wetland areas, which the specialists have determined is already hugely impacted and transformed. The fauna status is also poor due to massive habitat transformation. The loss of transformed or degraded habitat associated with the water pipeline will most likely result in a low, short term impact on the habitat During construction activities, wherever possible, work should be restricted to one area at a time. This will give any remaining smaller birds, mammals, reptiles and amphibians an opportunity to move into undisturbed areas close to their natural habitat. Any animals unearthed during construction activities should ideally be released in appropriate habitat away from the development. No activities should occur outside the proposed pipeline servitude.

As the installation requirements include the digging of trenches and the pipe is below ground level, rehabilitation of the land can result in almost no disturbance and there will be no visual or physical impacts in the long term.

The construction of the proposed water line will however have positive impacts, as there is an investment in service infrastructure and an increase in capacity for the end user and proposed developments. Other positive impact during operational phase include job creation during the construction phase

5. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that sums up the impact that the proposal and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

Alternative 1 (Proposal) steel pipeline on **southern** side of Allandale Road **with 4 options** for deviations

	Summary of Assessment of Impacts			
Element	**Type/ nature**	**Duration**	**Likelihood/ probability**	**Significance after Mitigation**
Physical	Pollution during construction	Long	Probable	Low
	Visual Impact	Long	Improbable	Low
Bio-physical	Impact on flora	Long	Probable	Low
	Impact on flora	Long	Probable	Low
	Impact on hydrological functioning	Long	Probable	Low
	Impact on wetland crossings	Long	Probable	Low
	Dust pollution	Long	Probable	Low
Social	Service delivery	Long	Probable	High (Positive)
	Labour intensive opportunity	Long	Probable	High (Positive)
Economic	Labour intensive opportunity	Long	Probable	High (Positive)
	Added value to land	Long	Probable	High (Positive)

Alternative 2 pipeline on **northern** side of and parallel to Allandale Road

	Summary of Assessment of Impacts			
Element	**Type/ nature**	**Duration**	**Likelihood/ probability**	**Significance after Mitigation**
Physical	Pollution during construction	Long	Probable	Medium
	Visual Impact	Long	Improbable	Low
	Width of servitude	Long	improbable	High
Bio-physical	Impact on flora	Long	Probable	Low
	Impact on fauna	Long	Probable	Low
	Impact on hydrological functioning	Long	Probable	Low
	Dust pollution	Long	Probable	Low
Social	Service delivery	Long	Probable	High (Positive)
	Impact on existing residences	Long	Probable	High (Negative)
	Labour intensive opportunity	Long	Probable	High (Positive)
Economic	Labour intensive opportunity	Long	Probable	High (Positive)
	Impact on residents property	Long	Probable	High (Negative)

Alternative 3 pipeline on southern side of Allandale Road with 4 options for deviations, using **concrete and upvc pipe**

	Summary of Assessment of Impacts			
Element	**Type/ nature**	**Duration**	**Likelihood/ probability**	**Significance after Mitigation**
Physical Bio-physical Social Economic	The engineers have advised that the use of upvc or concrete materials for the pipe is impractical and illogical due to the size of the pipes (700mm-900mm). It will not be safe nor adequate to accommodate the expected flows and volumes. This alternative therefore, is not viable			

No- Go Alternative

	Summary of Assessment of Impacts			
Element	**Type/ nature**	**Duration**	**Likelihood/ probability**	**Significance after Mitigation**
Physical	Pollution during construction	Long	improbable	nil
	Visual Impact	Long	Improbable	nil

Bio-physical	Impact on flora	Long	Improbable	Nil
	Impact on fauna	Long	improbable	Nil
	Impact on hydrological functioning	Long	improbable	nil
	Dust pollution	Long	improbable	nil
Social	Service delivery	Long	Probable	High (negative)
	Labour intensive opportunity	Long	Probable	High (negative)
	Impact to land owners	Long	improbable	nil
Economic	Labour intensive opportunity	Long	Probable	High (negative)
	Impact on residents property	Long	improbable	nil

6. IMPACT SUMMARY OF PREFERRED PROPOSAL

Identify preferred proposal

The preferred alternative route is identified as the preferred option, on the basis of the following

1. The line commences generally from a point in the proposed Waterfall Junction development, close to and on the **southern** side of Allandale Road, opposite Dane Road, running in a south easterly direction, generally parallel with Allandale Road, to Zuurfontein Road (M18), where it links into an existing Rand Water Board pipeline

2. This is the **general** route of the pipeline, but various minor deviations of the route are still under review and consideration, based on finalisation of long term plans and development proposals in the area. These are, however, still aligned along the main route and deviate by no more than ± 200 metres to ±300 metres from the "base" route and they form part of the preferred alternative, until planning is finalised.

3. The assessment has identified wetland areas to be traversed, which are the only marginal sensitive systems in the area, as the wetland specialists have noted that the area is generally disturbed, altered and transformed.

4. The line is aligned with wider bulk water network planning for the area by Joburg Water.

Having assessed the significance of impacts of the proposal and various alternatives, please provide an overall summary and reasons for selecting the preferred project proposal.

There are a number of negative impacts associated with the environment and communities as well as positive social and economic impacts.

Alternatives
Alternative 1, the preferred alternative, has been assessed and mitigated to have the least significant impacts to the proposed site and the communities of the surrounding area of Klipfontein View. Impacts from Alternative 2 are considered to be greater, especially to this community, as private properties will be affected by noise, dust, pollution, security and damage to these properties. There is also the problem that there is possibly inadequate space available for the servitude area. Alternative 3 which is for an alternative **material** has been determined to be impractical and illogical for the nature of the volumes and flows of the water and has severe risks and hazards.

Environmental Impact
The impact of the alignment on the wetlands in the area will have a low environmental impact as the specialist has determined that the wetlands are in a poor and degraded status through which the route is aligned, and can anyway be easily rehabilitated once the line is installed underground. There is considerable evidence of human activities, sand mining, cultivation, roads and tracks and other infrastructure. There would be no long term impacts with the line as it is to be underground and the surface can be rehabilitated. Recommendations have been made with regards the wetland crossing which will ensure the wetlands are protected, which has been more fully covered in the EMP and Method Statement for construction.. The building of the line has a low impact as the site is transformed and degraded and therefore will not adversely affect the habitat for fauna and flora.

Social / Community Impacts
The construction of the sewer line will have long term positive impacts to the community and wider area in the long term, as it will contribute to service infrastructure in an area allocated for new development and where a number of such developments have been approved and are in the process of construction. Additionally, the line forms part of the wider bulk water network planning for Joburg Water and, therefore, this application serves to accommodate a phase in the planning. There will be short term impacts during construction including noise and traffic, but these will terminate once construction is complete.

Economic Impacts
The construction of the proposed water line will have positive impacts not only to the communities, but economically, as there is an investment in service infrastructure and an increase in capacity for the end user and proposed developments. Other positive impact during operational phase include job creation during the construction phase

No Go Alternative
Should the construction and installation of the line not proceed, there will clearly be no impacts of any nature on the environment, albeit the environment is already disturbed, as this status quo will remain. However, the impacts of not proceeding with the project will have wider, long term negative impacts on the provision of services (obviously of water) to both the existing communities in the area, as well as for the proposed new developments, both already approved and those currently in the planning phases. The lack of the line will also be contrary to the wider network planning of Joburg Water, as the line is one of the phases of their longer term network planning

Conclusion
In conclusion, the construction of the water line has more positive than negative impacts. It is therefore the opinion of the EAP that this will be a significant improvement to the area and that the negative impacts can be mitigated sufficiently to ensure minimal negative effects to the environment.

7. RECOMMENDATION OF PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the Environmental Assessment Practitioner).	YES	NO
	X	

If "NO", indicate the aspects that should be assessed further as part of a Scoping and EIA process before a decision can be made (list the aspects that require further assessment):

If "YES", please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the competent authority in respect of the application:

All possible mitigation measures for both construction and operation phases of the project have been fully discussed in the EMP which attached to this report as Appendix H

8. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

If the EAP answers yes to Point 7 above then an EMP is to be attached to this report as an Appendix

EMP attached	**X**

SECTION F: APPENDIXES

The following appendixes must be attached as appropriate:

It is required that if more than one item is enclosed that a table of contents is included in the appendix

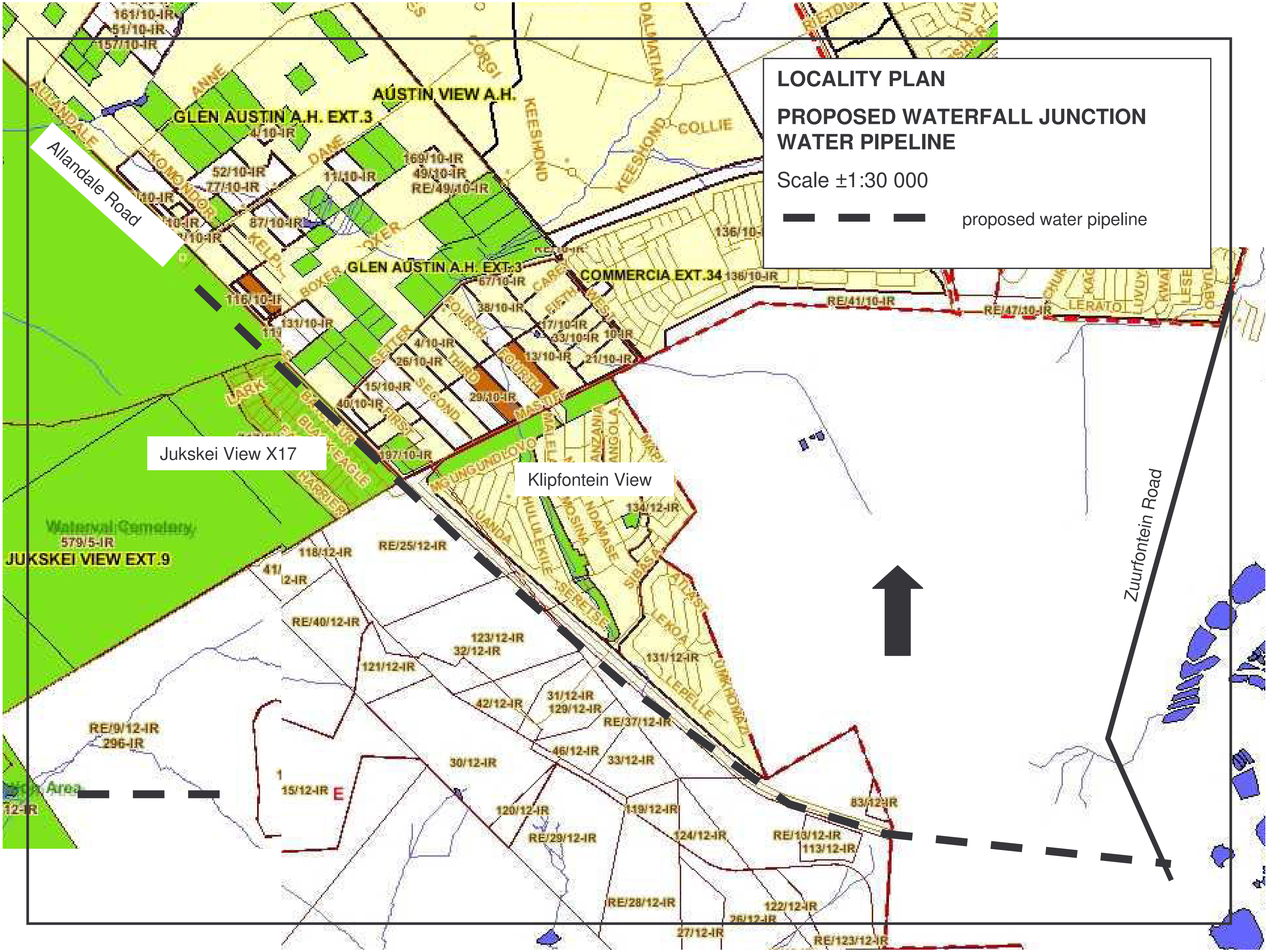
Appendix A: Site plan(s)
Appendix B: Photographs
Appendix C: Facility illustration(s)
Appendix D: Route position information
Appendix E: Public participation information

- Appendix E.1 – Proof of site notice
- Appendix E.2 – Written notices issued to Identified I&AP
- Appendix E.3 – Proof of newspaper advertisements
- Appendix E.4 –Communications with I&APs
- Appendix E.5 – Minutes of any public and or stakeholder meetings
- Appendix E.6 - Comments and Responses Report
- Appendix E.7 –Comments from I&APs on Basic Assessment (BA) Report
- Appendix E.8 –Comments from I&APs on amendments to the BA report
- Appendix E.9 – Copy of the register of I&APs
- Appendix E.10 – Comments from I&APs on the application
- Appendix E.11 – Other

Appendix F Water use license(s), SAHRA information, service letters from municipalities, water supply information
Appendix G: Specialist reports
Appendix H: EMP
Appendix I: Other information

APPENDIX A

LOCALITY AND ROUTE PLAN


LOCALITY PLAN
PROPOSED WATERFALL JUNCTION WATER PIPELINE
Scale ±1:30 000
proposed water pipeline
Allandale Road
Jukskei View X17
Klipfontein View
Zuurfontein Road
AUSTIN VIEW A.H.
GLEN AUSTIN A.H. EXT.3
COMMERCIA EXT.34
Waterval Cemetery
JUKSKEI VIEW EXT.9

SKETCHPLAN

REMAINDER OF PORTION 1

WATERVAL No.5-IR

COORDINATE SYSTEM = WGS 29

N

ON ORIGINAL

0 5 10 15 20 25 30 40MM

LEGEND

- OPTION 1 ROUTE:
- OPTION 2 ROUTE:
- OPTION 3 ROUTE:
- OPTION 4 ROUTE:
- RAND WATER LINE:

No	Date	Details	Chd	Appd

Revisions

Client

ARCUS GIBB ENGINEERING & SCIENCE

Approved By

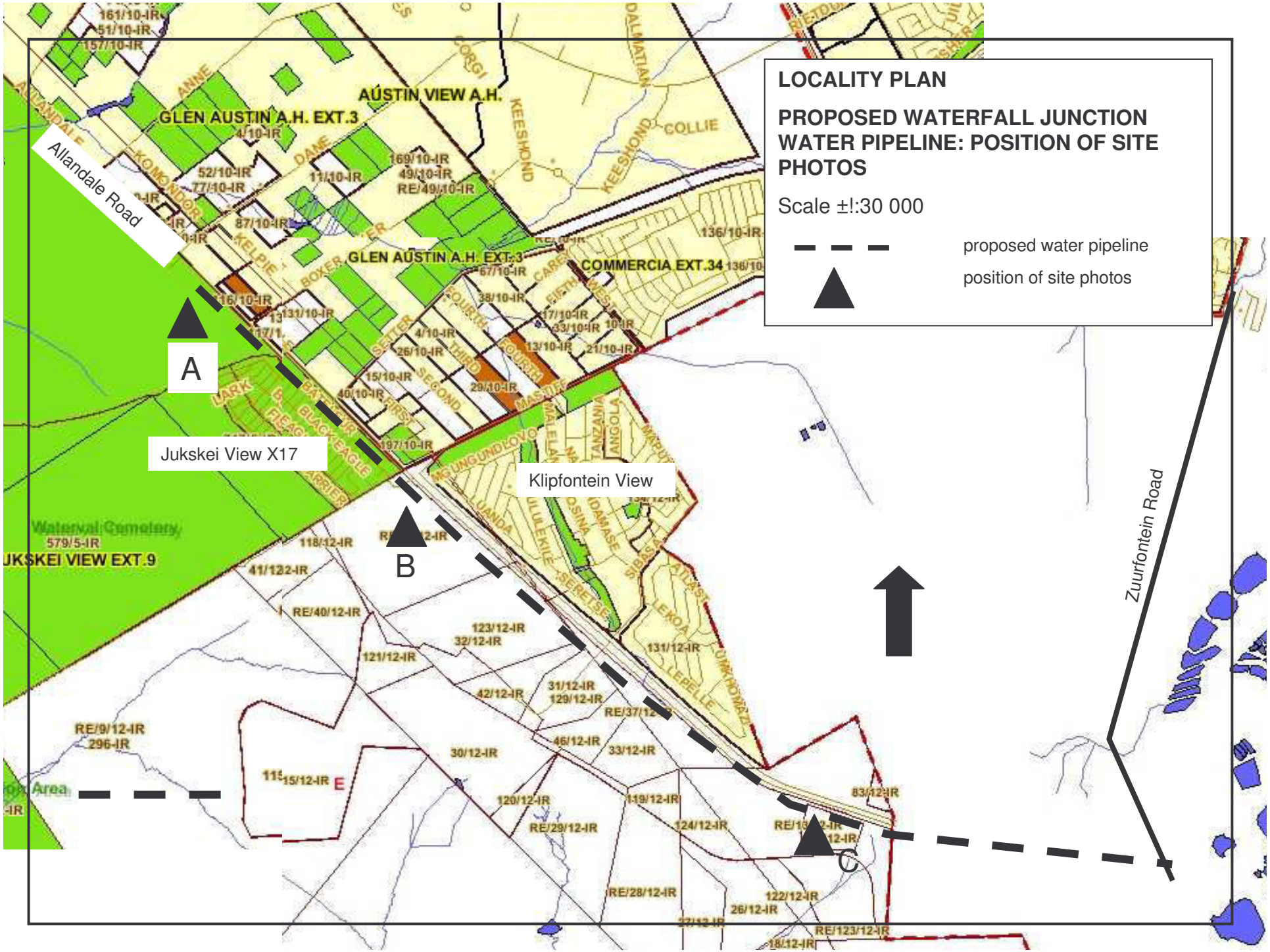
Drawn By	Designed By	Reviewed By

Project: WATERFALL

Description: LOCALITY PLAN

Scale	Date
N.T.S.	05/2011

Project No	Org. No	Rev
J30096	LOC	A


LOCALITY PLAN
PROPOSED WATERFALL JUNCTION WATER PIPELINE: POSITION OF SITE PHOTOS
Scale ±!:30 000
proposed water pipeline
position of site photos
Allandale Road
Jukskei View X17
Klipfontein View
Zuurfontein Road
A
B
C
E
AUSTIN VIEW A.H.
GLEN AUSTIN A.H. EXT.3
COMMERCIA EXT.34
JUKSKEI VIEW EXT.9
Waterval Cemetery
579/5-IR

APPENDIX B

PHOTOGRAPHS

North

The photo above was taken from approximate center of the site, looking in a northerly direction.

North East

The photo above was taken from approximate center of the site, looking in a north easterly direction.

East

The photo above was taken from approximate center of the site, looking in a easterly direction.

South East

The photo above was taken from approximate center of the site, looking in a south easterly direction.

South

The photo above was taken from approximate center of the site, looking in a southerly direction.

South West

The photo above was taken from approximate center of the site, looking in a south westerly direction.

West

The photo above was taken from approximate center of the site, looking in a westerly direction.

North West

The photo above was taken from approximate center of the site, looking in a north westerly direction.

North

The photo above was taken from approximate center of the site, looking in a northerly direction.

North East

The photo above was taken from approximate center of the site, looking in a north easterly direction.

East

The photo above was taken from approximate center of the site, looking in a easterly direction.

South East

The photo above was taken from approximate center of the site, looking in a south easterly direction.

South

The photo above was taken from approximate center of the site, looking in a southerly direction.

South West

The photo above was taken from approximate center of the site, looking in a south westerly direction.

West

The photo above was taken from approximate center of the site, looking in a westerly direction.

North West

The photo above was taken from approximate center of the site, looking in a north westerly direction.

North

The photo above was taken from approximate center of the site, looking in a northerly direction.

North East

The photo above was taken from approximate center of the site, looking in a north easterly direction.

East

The photo above was taken from approximate center of the site, looking in a easterly direction.

South East

The photo above was taken from approximate center of the site, looking in a south easterly direction.

South

The photo above was taken from approximate center of the site, looking in a southerly direction.

South West

The photo above was taken from approximate center of the site, looking in a south westerly direction.

West

The photo above was taken from approximate center of the site, looking in a westerly direction.

North West

The photo above was taken from approximate center of the site, looking in a north westerly direction.

APPENDIX C

FACILITY ILLUSTRATION(S)

Not applicable to this application

APPENDIX D

ROUTE POSITION INFORMATION

Preferred Alternative Co-ordinates

Position	Latitude (S)	Longitude (E)
A	-26.032777	28.137221
B	-26.034444	28.138888
C	-26.03611	28.140555
D	-26.037777	28.142221
E	-26.039444	28.060555
F	-26.04111	28.145833
G	-26.042777	28.147499
H	-26.044166	28.149444
I	-26.045833	28.151388
J	-26.047221	28.153333
K	-26.04861	28.155
L	-26.050277	28.156944
M	-26.051666	28.158888
N	-26.053333	28.160833
O	-26.054722	28.1625
P	-26.056388	28.164444
Q	-26.057222	28.166943
R	-26.057777	28.169166
S	-26.058611	28.171666
T	-26.059444	28.173888
U	-26.06	28.176388
V	-26.060833	28.178888
W	-26.061111	28.181388
X	-26.060555	28.183888

Plan showing Preferred Route Alignment Position Appendix D.01

Plan showing Position of Co-ordinated Points in Appendix D.02

D.01 Waterfall Junction Pipeline Route

ON ORIGINAL

0 5 10 15 20 30 40MM

LEGEND

OPTION 1 ROUTE:
OPTION 2 ROUTE:
OPTION 3 ROUTE:
OPTION 4 ROUTE:
RAND WATER LINE:

NOTES

- 3/4m SERVITUDE TO BE CONFIRMED WITH JHB WATER.
- FOR ALL PIPE LINES: MINIMUM COVER WILL BE 1,2m.

No	Date	Details	Chd	Appd

Revisions

Client

ARCUS GIBB ENGINEERING & SCIENCE

Approved By

Drawn By	Designed By	Reviewed By

Project

WATERFALL

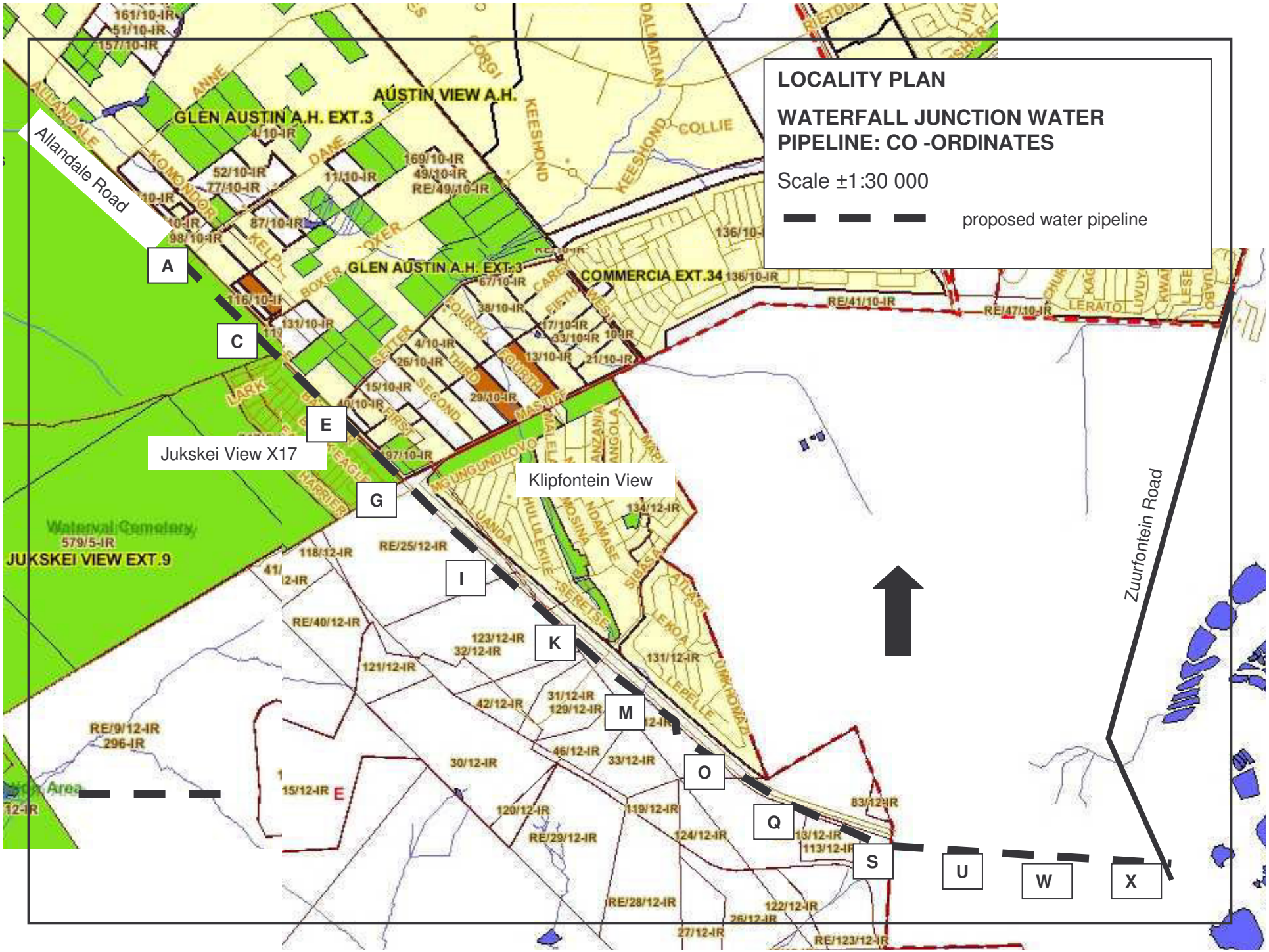
Description

PROPOSED BULK WATER LINE OPTIONS

Scale	Date
N.T.S.	05/2011

Project No	Drg. No	Rev
J30096	LOC	A

D.02 Waterfall Junction Route Co-Ordinate Plan

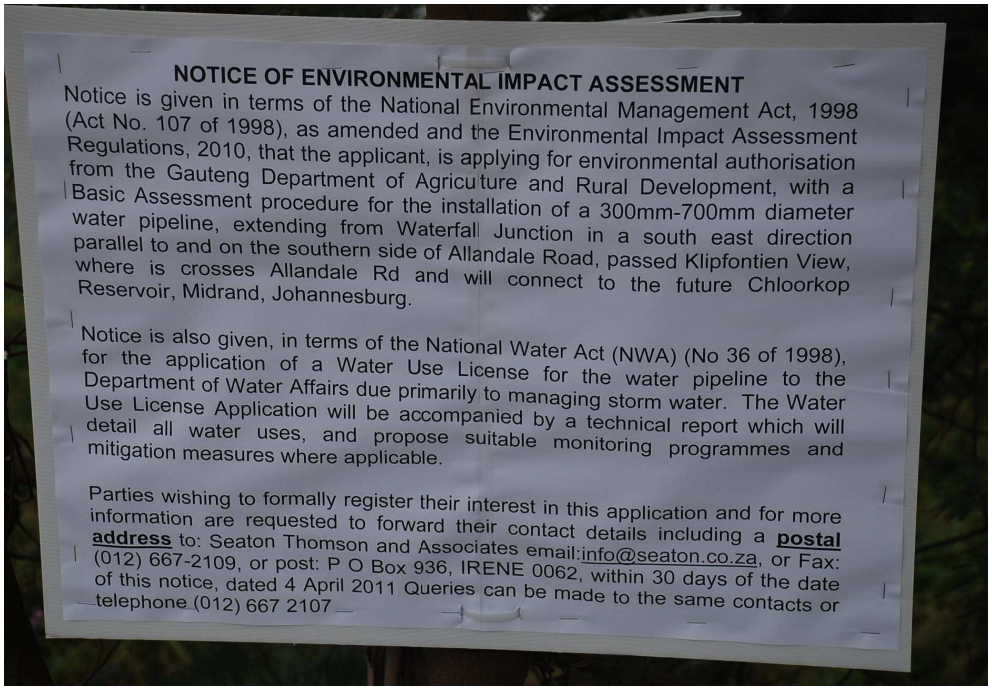

LOCALITY PLAN
WATERFALL JUNCTION WATER PIPELINE: CO -ORDINATES
Scale ±1:30 000
proposed water pipeline
Allandale Road
Jukskei View X17
Klipfontein View
Zuurfontein Road
AUSTIN VIEW A.H.
GLEN AUSTIN A.H. EXT.3
GLEN AUSTIN A.H. EXT.3
COMMERCIA EXT.34
JUKSKEI VIEW EXT.9
A
C
E
G
I
K
M
O
Q
S
U
W
X

APPENDIX E

PUBLIC PARTICIPATION INFORMATION

APPENDIX E.1

PROOF OF SITE NOTICE



NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT

Notice is given in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010, that the applicant, is applying for environmental authorisation from the Gauteng Department of Agriculture and Rural Development, with a Basic Assessment procedure for the installation of a 300mm-700mm diameter water pipeline, extending from Waterfall Junction in a south east direction parallel to and on the southern side of Allandale Road, passed Klipfontien View, where is crosses Allandale Rd and will connect to the future Chloorkop Reservoir, Midrand, Johannesburg.

Notice is also given, in terms of the National Water Act (NWA) (No 36 of 1998), for the application of a Water Use License for the water pipeline to the Department of Water Affairs due primarily to managing storm water. The Water Use License Application will be accompanied by a technical report which will detail all water uses, and propose suitable monitoring programmes and mitigation measures where applicable.

Parties wishing to formally register their interest in this application and for more information are requested to forward their contact details including a **postal address** to: Seaton Thomson and Associates email:info@seaton.co.za, or Fax: (012) 667-2109, or post: P O Box 936, IRENE 0062, within 30 days of the date of this notice, dated 4 April 2011 Queries can be made to the same contacts or telephone (012) 667 2107


ALLANDALEWEG
M39 Kyalami


ALLANDALEWEG
M39 Kyalami
NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT
Notice is given in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010, that the applicant, is applying for environmental authorisation from the Gauteng Department of Agriculture and Rural Development, with a Basic Assessment procedure for the installation of a 300mm-700mm diameter water pipeline, extending from Waterfall Junction in a south east direction parallel to and on the southern side of Allandale Road, passed Klipfontein View, where is crosses Allandale Rd and will connect to the future Chloorkop Reservoir, Midrand, Johannesburg.
Notice is also given, in terms of the National Water Act (NWA) (No 36 of 1998), for the application of a Water Use License for the water pipeline to the Department of Water Affairs due primarily to managing storm water. The Water Use License Application will be accompanied by a technical report which will detail all water uses and propose suitable monitoring programmes and mitigation measures where applicable.
Parties wishing to formally register their interest in this application and for more information are requested to forward their contact details including a postal address to: Seaton Thomson and Associates email:info@seaton.co.za, or Fax: (012) 667-2109, or post: P O Box 806, IRENE 0062, within 30 days of the date of this notice, dated 4 April 2011 Queries can be made to the same contacts or telephone (012) 667 2107

APPENDIX E.2

WRITTEN NOTICES ISSUED TO IDENTIFIED I&AP'S

SEATON THOMSON & ASSOCIATES

4 April 2011

Dear Interested and Affected Party

APPLICATION FOR AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) FOR THE PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE

Introduction and Proposed Activity
Notice is given in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010, that the applicant is applying for **environmental authorisation** from the relevant authority for the installation of a new water pipeline in the area of Allandale Road, as shown on **Plan 1: Locality Plan**

Description of the Project
It is the intention of the applicant to install a main water pipeline that varies in diameter between 300mm and 900 mm, which will extend from the proposed Waterfall Junction development (on the southern side of Halfway House), close to the south east corner of the intersection of Allandale Road and the Old Johannesburg Road and which will run in a south easterly direction, parallel to Allandale Road. The pipeline extends just passed Klipfontein View and will cross Allandale Road to terminate at the point where it will connect to the Chloorkop Reservoir. **Refer attached Locality Plan**.

Water Use Licence
Notice is also given, in terms of the National Water Act (NWA) (No 36 of 1998), for the application of a Water Use License for the water pipeline to the Department of Water Affairs due primarily to managing storm water. The Water Use License Application will be accompanied by a technical report which will detail all water uses, and propose suitable monitoring programmes and mitigation measures where applicable.

Parties wishing to formally register their interest and for more information on this application are requested to forward their contact details to: Seaton Thomson and Associates via email info@seaton.co.za, or fax (012) 667-2109, or post to PO Box 936, Irene, 0062. Queries can be made to the same contacts or telephone (012) 667 2107, within **30 days** of the date of this notice, ie on or before **3 May 2011**

Yours sincerely
SEATON THOMSON AND ASSOCIATES

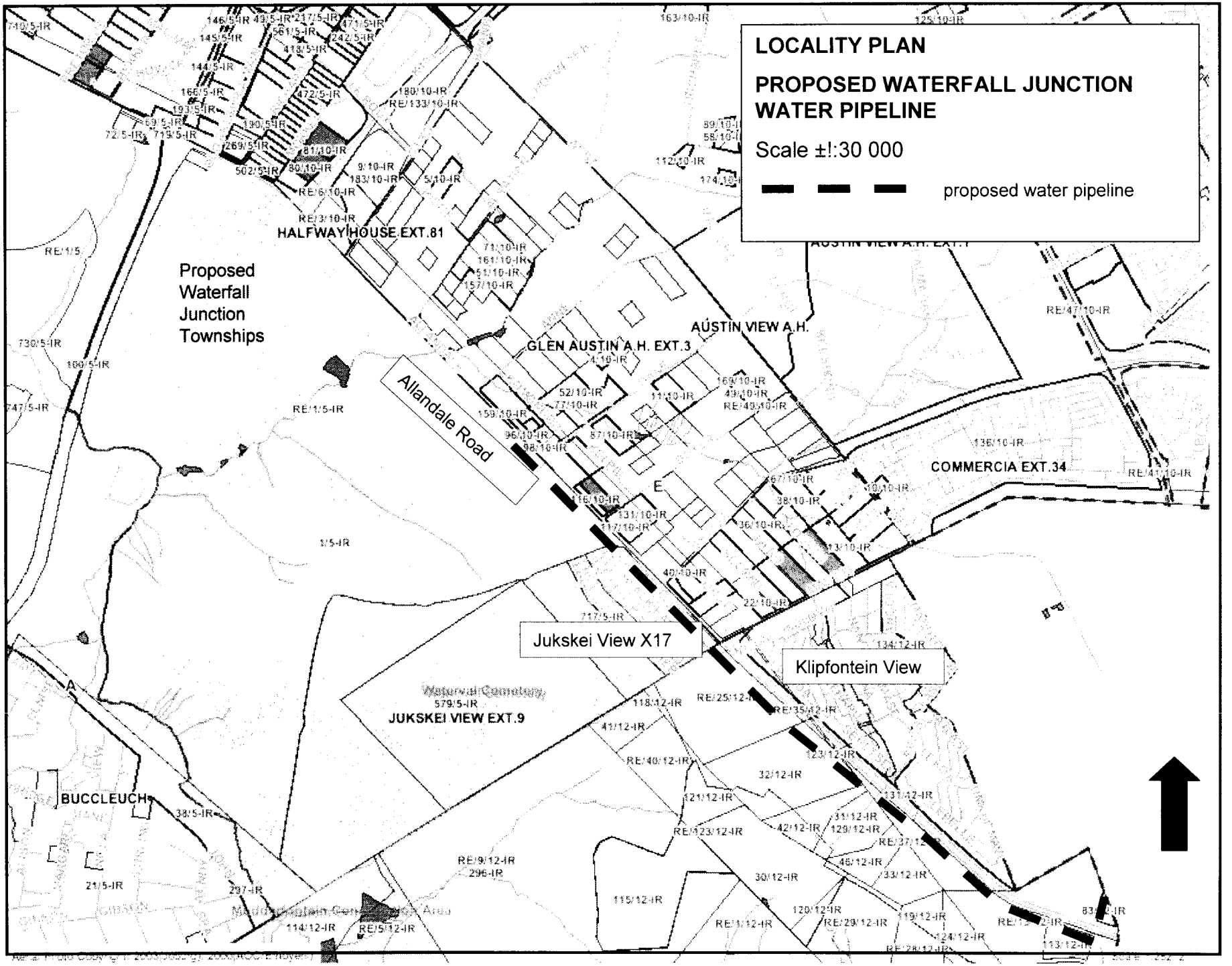
JUDY JOHNSTON

TOURISM DEVELOPMENT, CONSERVATION & ENVIRONMENTAL PLANNING www.seaton.co.za

Gauteng Office
Tel.: +27 (0)12 667 2107 • Fax: +27 (0)12 667 2109
Cell: Judy Johnston +27 (0)82 920 6115

63 St Anne's Lane, Irene, Centurion
P O Box 936 Irene 0062, South Africa
e-mail: seaton@yebo.co.za

Members: J H Johnston B.Sc TRP(SA) • G S Thomson IMM • Company Reg. No. CK 95/02499/23


LOCALITY PLAN
PROPOSED WATERFALL JUNCTION WATER PIPELINE
Scale ±!:30 000
proposed water pipeline
Proposed Waterfall Junction Townships
HALFWAY HOUSE EXT.81
GLEN AUSTIN A.H. EXT.3
AUSTIN VIEW A.H.
COMMERCIA EXT.34
Allandale Road
Jukskei View X17
Klipfontein View
JUKSKEI VIEW EXT.9
BUCCLEUCH

MM Molkewa
28 14th Avene
ALEXANDRA
2090

C Ndlovu
Postnet Suite 332
ISANDO
1600

NM Madlabane
PO Box 1049
JOHANNESBURG
2000

SA Malope
14 1st Street
ALEXANDRA
2090

SL Letsatsi
2 Delmia Court
Long Street
KEMPTON PARK
1619

L Kentse
PO Box 2210
RANDBURG
2125

M Pienaar
PO Box 1471
SAXONWOLD
2132

JM Mdhluli
House 683
HOSPITAL VIEW
1632

XC Mdwara
44 Erigan Street
ENNERDALE
1830

N Ngwenya
22 Hadfield Road
BEREA
2198

MM Molokwane
PO Box 315
BETHANIE
0270

MM Mofokeng
P/Bag X6
GALLO MANOR
2052

NE Dhlamini
PO Box 13045
NORKEM PARK
1631

J Tshili
PO Box 320
HALFWAY HOUSE
1685

MB Letsika
PO Box 1616
JOHANNESBURG
2000

T Tyeku
3 Muller Street
BELLEVUE EAST
2198

JM Mohlomi
156 10th Avenue
ALEXANDRA
2090

MG Macheke
1865 Luanda St
WITBANK EXT 2
1034

LS Suteka
PO Box 4252
KEMPTON PARK
1620

JS Phalane
PO Box 915
MBIBANE
0449

PP Zulu
PO Box 3729
HALFWAY HOUSE
1685

NL Selepe
PO Box 1294
ALBERTON
1450

GB Paradzai
15 Barnato
5 Catherine Street
BEREA
2198

ME Malebatja
PO Box 608
ALEXANDRA
2014

MP Sinthumule
PO Box 1003
HALFWAY HOUSE
1685

SJ Tlaka
135 Luanda Street
ALLANDALE
1685

PA Lethuba
PO Box 1151
GALLO MANOR
2052

E Baloyi
105 Karoldene Flats
8 Katherine Street
BEREA
2198

JN Duma
PO Box 1832
MARLBORO
2063

KN Mashala
PO Box 7906
BAKONE
0746

BJ Hlongwane
1880 Luana Street
KLIPFONTEIN
1682

S Magwava
1879 Klipfontein View
MIDRAND
1682

NC Malaka
10 Rosewood
102 Dunbar Street
BELLEVUE
2198

CG Kaka
165 Temong Street
TEMBISA
1632

MS Ratsoma
PO Box 713
PARKLANDS
2121

KE Selwane
PO Box 502
ISANDO
1600

HB Khumalo
PO Box 1685
WELTEVREDEN PARK
1715

WT Rachidi
1873 Luanda Street
KLIPFONTEIN VIEW
1459

SN Nhlapo
PO Box 61809
MARSHALLTOWN
2107

A Bayat Dircector
Nu Way Housing Development
PO Box 650
RANDBURG
2125

DN Mhlongo
PO Box 622
WEIRDA PARK
0149

V Khoza
PO Box 1869
KLIPFONTEIN VIEW
1637

A Mazingisa
PO Box 481
BERGVLEI
2012

D Msimanga
1867 Luanda Street
KLIPFONTEIN VIEW
1459

LE Mosikili
PO Box 13156
WITSIESHOEK
9870

NJ Mashala
PO Box 4347
HALFWAY HOUSE
1685

MK Makroti
P/Bag X1
FOCHEVILLE
2515

HIGHVELD PARK
2011 -03- 31
1
0157

NP Mbonani
PO Box 41312
CRAIGHALL
2024

Waterfall Inn

LS Ledwaba
PO Box 3261
POTGIETERSRUS
0600

KA Lentsoe
PO Box 490
GALLO MANOR
2052

MG Moropa
PO Box 2326
EBONY PARK
1690

LSM Makhubela
1859 Luanda St
KLIPFONTEIN VIEW
1459

FW Sithebe
1858 Luanda St
KLIPFONTEIN VIEW
1034

P Skosana
PO Box 1196
SANDTON
2146

MN Mashinini
1606 Zimbabwe St
ALEXANDRA
2090

SS Ntshangase
PO Box 407
PONGOLA
3170

Manager Estate Department
Ekurhuleni Metropolitan Council
PO Box 25
EDENVALE
1610

RKTapala
PO Box 1685
HALFWAY HOUSE
1685

NS Nkonzo
PO Box 12022
THE TRAMSHED
0126

S Louw
159 22nd Avenue
ALEXANDRA
2090

KNG Tsebe
9 Dewald Street
BIRCHLEIGH NORTH
1618

GSB Nhlapo
PO Box 38
TEMBISA
1628

N Dube
PO Box 25888
EAST RAND
1462

AG Kgoroba
PO Box 2534
HALFWAY GARDENS
1685

MM Modikwane
144 Mogorosi Street
DOBSONVILLE
1863

KP Seageng
PO Box 383
GA-RANKUWA
0221

MT Raphulu
PO Box 5750
HALFWAY HOUSE
1685

FC Dlamini
1611 Mbali Street
DIEPKLOOF ZONE 1
1682

CT Mosome
PO Box 1598
MOGWASE
0314

LB Ntsoko
PO Box 205
ISANDO
1600

JMM Makhafola
949 Mawethu Street
KLIPFONTEIN VIEW
1682

HIGHVELD PARK
2011 -03- 31
1
0157

JM Sipheko
958 Molotlesi St
MAPETLA
1818

Waterfall Lane

KB Meso
PO Box 1832
HALFWAY HOUSE
1685

BP Kunene
200 Emoyeni Street
TEMBISA
1362

I Radebe
PO Boix 11445
VORNA VALLEY
1686

NV Madikwa
PO Box 1840
RIVONIA
2128

GAC Mametse
4649 Section O
MAMELODI WEST
MIDRAND
0122

GB Motlotsi
PO Box 27789
YEOVILLE
2143

MB Mamabolo
PO Box 7749
HALFWAY HOUSE
1685

ML Molefe
958 Mawethu St
KLIPFONTEIN VIEW
1459

TJ Mnisi
PO Box 1459
TEMBISA
1628

TS Mjiyako
PO Box 263
AMSTERDAM
2375

KM Diangwane
PO Box 17278
BAKONE
0746

MP Kgwete
PO Box 1454
SIBUYILE
1216

PR Ngoepe
PO Box 14013
LYTTELTON
0140

B Mabaso
P/Bag X236
PRETORIA
0001

RJ Hlatshwayo
49 Jiyane Section
TEMBISA
1632

MT Munyai
PO Box 25
EDENVALE
1610

MR Maila
PO Box 1021
HALFWAY HOUSE
1685

C Taljaard Director
Sarkingvis Property Investments
PO Box 1569
MEYERTON
1960

O Mariko
24 Wildepruim St
ESTER PARK
1619

GT Ngwenya
12 Matale Street
SAULSVILLE
0125

WM Moela
67 Poppy Street
PRIMROSE
1401

MH Makaleng
PO Box 558
KEMPTON PARK
1620

CH Sehole
PO Box 497
SKILPADFONTEIN
0431

HIGHVELD PARK
2011 -05- 31
0157

BS Nkosi
PO Box 1295
HALFWAY HOUSE
1685

Waterfall Cnr

AE Adamjee Director
Gray Letter Investments CC
PO Box 1057
BRAMLEY
2018

L Ferreira
PO Box 28989
SANDRINGHAM
2131

MC Ferreira
PO Box 28990
SANDRINGHAM
2132

A Coetsee Director
Wiehahn Properties
PO Box 2799
CAPE TOWN
8000

A Diakatos Director
SAE Properties
PO Box 2473
PRETORIA
0001

CH Nobre Director
Cerbon Properties
PO Box 2725
BEDFORDVIEW
2008

P Londero
PO Box 886
HALFWAY HOUSE
1685

VS Imerman Director
Pamin Property Share Block
P/ Bag X10046
SANDTON
2146

SD Badenhorst Director
Inyanga Trading 211
PO Box 3008
HALFWAY HOUSE
1685

PJ Behrmann Director
Storeaway Pty Ltd
P/Bag X02
HIGHLANDS NORTH
2037

EJ Wiehahn Director
Range Road Construction
PO Box 1550
CAPE TOWN
8000

HG Franke Director
Cancun Trading No 90
PO Box 3913
CAPE TOWN
8000

L Potts Director
Heartland Properties (Pty) Ltd
PO Box 500
MODDERFONTEIN
1645

Minister
Apostilic Faith Mission of SA
PO Box 26365
HOUT BAY
7872

APPENDIX E.3

PROOF OF NEWSPAPER ADVERTISEMENTS

0816 Court Order/

Lekoba MT & MM
ABBREVIATED SUMMONS
IN THE MAGISTATES COURT FOR THE REGION OF NORTH-WEST, HELD ATM-MABATHO, Case No: DM129 /11.
In the matter between:
MODISAGAOREKWE THOMAS LEKOBA Applicant
and
MMAPULA MARTHA LEKOBA Respondent.
To: MMAPULA MARTHA LEKOBA (Defendant), a female whose occupation is unknown, and whose present whereabouts are unknown.
Take notice that by summons issued by this court, you have been called upon to give notice within (1) one month after publication hereof to the Registrar Molopo Regional, Private Bag X2045, Mmabatho, 2745 and to the Plaintiff/Applicant of your intention to defend (if any) in the action wherein MODISAGAOREKWE THOMAS LEKOBA (Plaintiff), a male claims:-
1) That a Decree of Divorce be granted on the grounds of an irretrievable breakdown between the parties.
2) Such and/or alternative relief.
Take further notice that if you fail to give such notice, judgment may be granted against you without further notice to you.
Dated at Mmabatho on this 03rd day of March 2011.
Registrar.

ZW088850

0852 Official Notices/

Waterfall Junction
NOTICE OF ENVIRONMENTAL IMPACT ASSESSMENT

Notice is given in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010, that the that applicant is applying for environmental authorisation from the Gauteng Department of Agriculture, and Rural Development, with a Basic Assessment procedure, for the installation of a 300mm - 700mm diameter water, pipeline, extending from Waterfall Junction in a South East direction parallel to and on the southern side of Allandale Road, passed Klipfontein View, where it crosses Allandale Rd and will connect to the future Chloorkop Reservoir, Midrand, Johannesburg.
Notice is also given, in terms of the National Water Act (NWA) (No. 36 of 1998) for the application of a Water Use Licence for the water pipeline to the Department of Water Affairs due primarily to managing storm- water. The Water Use Licence Application will be accompanied by a technical report which will detail all water uses, and propose suitable monitoring programmes and mitigation measures where applicable.
Parties wishing to formally register their interest in this application and for more information are requested to forward their contact details incuding a postal address to: **SEATON THOMSON AND ASSOCIATES, email: info @seaton.co.za, or Fax (012) 667-2109 or post P O Box 936, IRENE 0062,** within 30 days of the date of this notice. Queries can be made to the same contacts or telephone (012) 667-2107.

ZW088767

0856 Sale in Execution - East & West Rand

Costann Investments (Pty) Ltd/Hancock JD & Others
NOTICE OF SALE IN EXECUTION
IN THE MAGISTRATE'S COURT FOR THE DISTRICT OF ALBERTON, HELD AT ALBERTON, Case No: 7955 /2010.
In the matter between:-
COSTANN INVESTMENTS (PTY) LIMITED Execution Creditor
and
JUSTIN DOUG HANCOCK 1st Execution Debtor, DAMIAN MARSHALL KROG 2nd Execution Debtor, DANIELLE ANNE HANCOCK 3rd Execution Debtor.
In pursuance of a Judgmennt in the Magistrate's Court and Writ of Execution dated the 19th January 2011 the following goods will be sold on the 20th April 2011 at 11h00 at 18-2nd Avenue, Alberton North, Alberton to the highest bidder:
For cash only: 1 x 6 pce Lounge Suite, 2 x Chairs, 1 x Desk, 1 x Fan, 1 x Counter, 1 x Fridge, 1 x Sterilizer, 1 x Coffee Table, 3 x Drawer Units, 1 x Mirror, 1 x Bookshelf, 1 x Plastic Drawer, 2 x Tatto Chairs, 1 x Bicycle.
Dated at Johannesburg on this 31st day of March 2011.
CHRISTELIS & ARTEMIDES, Execution Creditor's Attorneys, Ref: Mr Artemides/DH/C4179. c /o DRACATOS ATTORNEYS, 6 Helston Street, New Redurth, Alberton, Telephone: (011) 907-2820, Ref: GN Dracatos /AT/T1714/CT4178.

ZW088802

0868 Sale in Execution - Miscellaneous/

FRB/Manzini TC
SALE IN EXECUTION
IN THE HIGH COURT OF SOUTH-AFRICA, (NORTH GAUTENG HIGH COURT, PRETORIA), CASE NUMBER: 66570/2010.
In the matter between:-
FIRSTRAND BANK LIMITED Judgment Creditor
and
MANZINI, TSAKANE CONSTANCE Judgement Debtor.
A sale in execution will be held, without a reserve price, by the SHERIFF CULLINAN on 14 APRIL 2011 at 10h00 of the following property.
ERF 2182 MAHUBE VALLEY EXTENSION 1 TOWNSHIP REGISTRATION DIVISION J.R.PROVINCE OF GAUTENG, MEASURING: 280 SQUARE METRES.
HELD BY DEED OF TRANSFER NO T142387/2007.
STREET ADDRESS: 16 ARCHBISHOP D TUTU STREET, MAHUBE VALLEY EXTENSION 1, PRETORIA, GAUTENG.
PLACE OF SALE: The sale will take place at Shop No. 1 Fourway Shopping Centre, Cullinan.
IMPROVEMENTS: The property has been improved with the following, although no guarantee is given in this regard. Dwelling consisting of: 1 Lounge, 1 Dining Room, 1 Kitchen, 2 Bedrooms, 2 Bathrooms, 2 Toilets and 1 Garage. Zoned for residential purposes.
CONDITIONS OF SALE: The Conditions of Sale will lie for inspection at the offices of the Sheriff-Cullinan, where they may be inspected during normal office hours.
PETZER, DU TOIT & RAMULIFHO, Attorneys for Judgement Creditor, REF: JJ STRAUSS/MAT2629, TEL: (012) 342-9895, FAX: (012) 342-9933.

ZW088803

0884 TOWN PLANNING /AMENDMENT SCHEMES/

Kempton Park Erf 2580
KEMPTON PARK TOWN PLANNING SCHEME 1978

Proposed erection and/or use of buildings and/or use of land for the purpose of a place of amusement (S limited payout machines). **Erf : 2580 Kempton Park Township.** Street Address: 53 Pretoria Road, Kempton Park.
Notice is hereby given in terms of Section 13 read with Section 21 of the abovementioned scheme that the undersigned intends to apply to the Kempton Park CCC for its consent to the erections and/or use of buildings and/or use of the abovementioned land for the abovementioned purposes.
Particulars and plans, if any, in respect of this application may be inspected during office hours at the undermentioned address.
Any person having any objection to the approval of this application must lodge such objection, together with grounds therefore, with the Area Manager: City Development Department, P.O. Box 13, Kempton Park, 1620, and the undersigned, in writing, not later than **25 April 2011.**
Name and Street Address: DH PROJECT PLANNING, 7 Ivy Street, Brackenhurst. Postal Address: PO Box 145027, Bracken Gardens, 1452.

AD034898

Randburg, Fontainebleau Erf 666
SANDTON RANDBURG, ROODEPOORT AND HALFWAY HOUSE TOWN PLANNING SCHEMES

Proposed erection /establishment of Second Dwelling.
Notice is hereby given, in terms of Clause 16 of the abovementioned Scheme, that I/we the undersigned, intend to apply to the City of Johannesburg for consent for the abovementioned use on Erf 666 situated at 133 River Street, Fontainebleau, Randburg.
Particulars of this application may be inspected during normal office hours at Department of Development Planning, Transportation and Environment, Room 8100, 8th Floor, A-Block, Metropolitan Centre, Braamfontein.
Any person having any objection to the approval of this application shall lodge such objection, in wting, together with grounds thereof, to the Executive Director: Development Planning, Transporation and Environment, Johannesburg, Room 8100, 8th Floor, A-Block, Meetropolitan Centre, 158 Loveday Street, Braamfontein, and the undersigned by not later than 25 April 2011.
Applicant: PJ Mitchell, Authorised Agent: D Brims, PO Box 2441, Northwold, 2155, Erf 666, Fontainebleau, Randburg, 2194.

AD035019

Selcourt Erf 3370
SPRINGS AMENDMENT SCHEME 345/96

Notice of Draft Amendment Scheme in term of Section 18 and 28(1)(a) of the Town Planning and Townships Ordinance, 1986. read with Section 55 of the said Ordinance.
I, Johann Marthinus Bekker, being the authorized agent of the owner of **Erf 3370, Selcourt,** hereby give notice in terms of Section 18 and 28(1)(a) of the Town Planning and Townships Ordinance, 1986 (Ordidnance 15 of 1986) that a draft amendment scheme to be known as Springs Amendment Scheme 345/96 has been prepared. The amendment scheme purports the rezoning of Erf 3370, Selcourt, situated at the intersection of Phoenix Road and Rhokana Avenue, from "Public Road" to "Residential 2" with a density of 40 units per hectare for the development of forty 2- and 3-bedroom residential units with a height of 2 Storeys.
The draft scheme will lie for inspection during normal office hours at the Area Manager: Development Planning, Room 401, Civic Centre, South Main Reef Road, Springs for a period of 28 days from **30 March 2011.**
Objections to or representations in respect of the application must be lodged with or made in writing to the Area Manager, Development Planning at above mentioned address or PO Box 45, Springs, 1560 within a period of 28 days from **30 March 2011.**
Address of Agent: **457 Nieuwenhuyzen Street, Elardus Park, 0181. Tel: 012 345 2166.**

AD035040

Notice in respect of a licence application in terms of the Petroleum Products Act, 1977 (Act No. 120 of 1977).

This notice serves to inform parties that may be interested or affected that AFRICAN COMPASS TRADING 603 CC hereinafter referred to as "the applicant", has submitted an application for a WHOLESALE licence, application number D/2011/03/23/001.

12 Nagtegaal Street, Bromhof, Johannesburg

The purpose of the application is for the applicant ot be granted a licence to undertake petroleum wholesale activities as detailed in the application. Arrangements for viewing the application documentation can be made by contacting the Controller of Petroleum Products by:
Telephone: (012) 444-4444; or Fax: (012) 341-4228, or E-mail: petroleum.controller@energy.gov.za

Any objections to the issuing of a licence in respect of this application, which **must clearly quote the application above**, must be lodged with the Controller of Petroleum Products within period of twenty (20) working days from the date of publication of this notice. Such objections must be lodged at the following physical or postal address.

Physical Address:
The Controller of Petroleum Products, Department of Energy, 70 Meintjies Street, Sunnyside, Pretoria, 0002.

Postal Address:
The Controller of Petroleum Products, Department of Energy, Private Bag X19, Arcadia, 0007.

APPENDIX E.4

COMMUNICATIONS TO AND FROM INTERESTED AND AFFECTED PARTIES

12 August 2011

Deputy Director: Water Quality - Crocodile (West) and Marico
Department of Water Affairs
Private Bag X995
PRETORIA 0001
Attention: Justice Maluleke

FINAL BASIC ASSESSMENT REPORT:

APPLICATION FOR AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) FOR THE PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE

Further to your status as a stakeholder in the above application, we would like to advise you that the **FINAL Basic Assessment Report** is now for your review and the submission of any further comments or concerns. A copy is enclosed herewith for your information and reference.

Should you wish to make any further comments on this final report, interested and affected parties must submit comments as follows

(1) directly to the Department GDARD, and (2) a copy to Environmental Assessment Practitioner

1. Comments submitted directly to:
   Gauteng Department of Agriculture and Rural Development
   18th Floor Glencairn Building, Eloff Street, Johannesburg or fax (011) 355 1860
   Gaut reference 002/11-12/E0001

2. A copy of your comments must be sent to:
   Seaton Thomson and Associates
   E-mail seaton@yebo.co.za, or
   Fax: (012) 667 2109, or
   Post: PO Box 936, Irene, 0062.

Comments at indicated in (1) and (2) must be submitted **within 21 days of the date** of this notice, i.e. by the **2 September 2011**.

Should you have any queries please contact the writer.

Yours sincerely
SEATON THOMSON & ASSOCIATES

JUDY JOHNSTON

Received By	
Name	
Signature	
Date	

Deliver to: Butogo Building East, 15th Floor, 285 Schoeman Street (Cnr van der Walt), Pretoria

12 August 2011

City of Johannesburg
Environmental Management Department
8th Floor Traduna House
118 Jorissen Street, Braamfontein
Attention: Mashudu Ratshitanga

FINAL BASIC ASSESSMENT REPORT:

APPLICATION FOR AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) FOR THE PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE

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3. Comments submitted directly to:
   Gauteng Department of Agriculture and Rural Development
   18th Floor Glencairn Building, Eloff Street, Johannesburg or fax (011) 355 1860
   Gaut reference 002/11-12/E0001

4. A copy of your comments must be sent to:
   Seaton Thomson and Associates
   E-mail seaton@yebo.co.za, or
   Fax: (012) 667 2109, or
   Post: PO Box 936, Irene, 0062.

Comments at indicated in (1) and (2) must be submitted **within 21 days of the date** of this notice, i.e. by the **2 September 2011**.

Should you have any queries please contact the writer.

Yours sincerely
SEATON THOMSON & ASSOCIATES

JUDY JOHNSTON

Received By	
Name	
Signature	
Date	

12 August 2011

Mr V. Nesengani
Ekurhuleni Environmental Department
PO Box 25
Edenvale
1610

FINAL BASIC ASSESSMENT REPORT:

APPLICATION FOR AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) FOR THE PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE

Further to your status as a stakeholder in the above application, we would like to advise you that the **FINAL Basic Assessment Report** is now for your review and the submission of any further comments or concerns. A copy is enclosed herewith for your information and reference.

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(1) directly to the Department GDARD, and (2) a copy to Environmental Assessment Practitioner

5. Comments submitted directly to:
   Gauteng Department of Agriculture and Rural Development
   18th Floor Glencairn Building, Eloff Street, Johannesburg or fax (011) 355 1860
   Gaut reference 002/11-12/E0001

6. A copy of your comments must be sent to:
   Seaton Thomson and Associates
   E-mail seaton@yebo.co.za, or
   Fax: (012) 667 2109, or
   Post: PO Box 936, Irene, 0062.

Comments at indicated in (1) and (2) must be submitted **within 21 days of the date** of this notice, i.e. by the **2 September 2011**.

Should you have any queries please contact the writer.

Yours sincerely
SEATON THOMSON & ASSOCIATES

JUDY JOHNSTON

Received By	
Name	
Signature	
Date	

SEATON THOMSON & ASSOCIATES

12 August 2011

Heartland Properties
PO Box 500
MODDERFONTEIN
1645
Attention: Mr Charl van Niekerk

FINAL BASIC ASSESSMENT REPORT:

APPLICATION FOR AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) FOR THE PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE

Further to your status as a stakeholder in the above application, we would like to advise you that the **FINAL Basic Assessment Report** is now for your review and the submission of any further comments or concerns. A copy of the draft report is available on line and to download a copy of the report and the various Appendices log into

Web: www.seaton.co.za/admin
Username: waterfal
Password: water822

Should you wish to make any further comments on this final report, interested and affected parties must submit comments as follows

(1) directly to the Department GDARD, and (2) a copy to Environmental Assessment Practitioner

7. Comments submitted directly to:
   Gauteng Department of Agriculture and Rural Development
   18th Floor Glencairn Building, Eloff Street, Johannesburg or fax (011) 355 1860
   Gaut reference 002/11-12/E0001

8. A copy of your comments must be sent to:
   Seaton Thomson and Associates
   E-mail seaton@yebo.co.za, or
   Fax: (012) 667 2109, or
   Post: PO Box 936, Irene, 0062.

Comments at indicated in (1) and (2) must be submitted **within 21 days of the date** of this notice, i.e. by the **2 September 2011**.

Yours sincerely
SEATON THOMSON & ASSOCIATES

JUDY JOHNSTON

Received By	
Name	
Signature	
Date	

TOURISM DEVELOPMENT, CONSERVATION & ENVIRONMENTAL PLANNING **www.seaton.co.za**

Gauteng Office
Tel.: +27 (0)12 667 2107 • Fax: +27 (0)12 667 2109
Cell: Judy Johnston +27 (0)82 920 6115

63 St Anne's Lane, Irene, Centurion
P O Box 936 Irene 0062, South Africa
e-mail: seaton@yebo.co.za

Members: J H Johnston B.Sc TRP(SA) • G S Thomson IMM • Company Reg. No. CK 95/02499/23

SEATON THOMSON & ASSOCIATES

23 June 2011

Deputy Director: Water Quality - Crocodile (West) and Marico
Department of Water Affairs
Private Bag X995
PRETORIA
0001
Attention: Justice Maluleke

DRAFT BASIC ASSESSMENT REPORT:

APPLICATION FOR AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) FOR THE PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE

Further to your status as a stakeholder in the above application, we would like to advise you that the Draft Basic Assessment Report is now for your review and the submission of any further comments or concerns. A copy is enclosed herewith for your information and reference.

Any comments must be submitted in writing to Seaton Thomson and Associates at the details listed on this letter, on or before **3 August 2011**, ie info@seaton.co.za or fax 012 667 2109 or postal at PO Box 936, Irene, 0062

Should we not hear from you by this date, it will be assumed that you have no comments to make.

Should you have any queries please contact the writer.

Yours sincerely
SEATON THOMSON & ASSOCIATES

Received By	
Name	Dakeledi
Signature	
Date	23/06/2011

JUDY JOHNSTON

Deliver to: Butogo Building East, 15th Floor, 285 Schoeman Street (Cnr van der Walt), Pretoria

Tel.: +27 (0)12 667 2107 • Fax: +27 (0)12 667 2109
Cell: Judy Johnston +27 (0)82 920 6115
Cell: Walter Dhooge +27 (0)84 515 4866
Member: J H Johnston B.Sc. (Rh/SA)
63 St Anne's Lane, Irene, Centurion
P O Box 936, Irene 0062, South Africa
e-mail: seaton@yebo.co.za
Company Reg. No. CK 95/02499/23

SEATON THOMSON & ASSOCIATES

23 June 2011

Mr V. Nesengani
Ekurhuleni Environmental Department
PO Box 25
Edenvale
1610

DRAFT BASIC ASSESSMENT REPORT:

APPLICATION FOR AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) FOR THE PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE

Further to your status as a stakeholder in the above application, we would like to advise you that the Draft Basic Assessment Report is now for your review and the submission of any further comments or concerns. 3 copy is enclosed herewith for your information and reference.

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Should we not hear from you by this date, it will be assumed that you have no comments to make.

Should you have any queries please contact the writer.

Yours sincerely
SEATON THOMSON & ASSOCIATES

JUDY JOHNSTON

Received By	
Name	[illegible]
Signature	
Date	24 June 2011

Tel.: +27 (0)12 667 2107 • Fax: +27 (0)12 667 2109
Cell: Judy Johnston +27 (0)82 920 6115
Cell: Walter Dhooge +27 (0)84 579 [illegible]
Member: J H Johnston B.Sc. (Hons) (SA)
63 St Anne's Lane, Irene, Centurion
P O Box 936, Irene 0062, South Africa
E-mail: seaton@yebo.co.za
Company Reg. No. CK 95/02499/23

SEATON THOMSON & ASSOCIATES

23 June 2011

City of Johannesburg
Environmental Management Department
8th Floor Traduna House
118 Jorissen Street
Braamfontein
Attention: Mashudu Ratshitanga

DRAFT BASIC ASSESSMENT REPORT:

APPLICATION FOR AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) FOR THE PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE

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Any comments must be submitted in writing to Seaton Thomson and Associates at the details listed on this letter, on or before **3 August 2011**, ie info@seaton.co.za or fax 012 667 2109 or postal at PO Box 936, Irene, 0062

Should we not hear from you by this date, it will be assumed that you have no comments to make.

Should you have any queries please contact the writer.

Yours sincerely
SEATON THOMSON & ASSOCIATES

JUDY JOHNSTON

Received By	
Name	Tendani Nduvheni
Signature	
Date	23/06/2011

Tel.: +27 (0)12 667 2107 • Fax: +27 (0)12 667 2109
Cell: Judy Johnston +27 (0)82 920 6115
Cell: Walter Dhooge +27 (0)84 515 4666
Member: J H Johnston B.Sc. (Wits) (SA)
63 St Anne's Lane, Irene, Centurion
P O Box 936, Irene 0062, South Africa
e-mail: seaton@yebo.co.za
Company Reg. No. CK 95/02499/23

Seaton Thomson and Associates

From: Seaton Thomson and Associates [seaton@yebo.co.za]
Sent: 23 June 2011 07:17 AM
To: 'Charl van Niekerk'
Subject: Waterfall Junction Water Pipeline

23 June 2011

Heartland Properties
PO Box 500
MODDERFONTEIN
1645
Attention: Mr Charl van Niekerk

DRAFT BASIC ASSESSMENT REPORT:

APPLICATION FOR AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA) FOR THE PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE

Further to your status as a stakeholder in the above application, we would like to advise you that the Draft Basic Assessment Report is now for your review and the submission of any further comments or concerns.

A copy of the draft report is available on line and to download a copy of the report and the various Appendices log into

Web: www.seaton.co.za/admin
Username: waterfal
Password: water822

Any comments must be submitted in writing to Seaton Thomson and Associates at the details listed on this letter, on or before **3 August 2011**, ie info@seaton.co.za or fax 012 667 2109 or postal at PO Box 936, Irene, 0062

Should we not hear from you by this date, it will be assumed that you have no comments to make.

Should you have any queries please contact the writer.

Yours sincerely

SEATON THOMSON & ASSOCIATES

JUDY JOHNSTON

Files

There are 20 files for project: Waterfall Junction Water Pipeline Basic Assessment

Search for a file, or click on a listed file's download link to download the file.

All A B C D E F G H I J K L M N O P Q R S T U V W X Y Z 50

Viewing results **1** to **20** of **20** (page **1** of **1**)

File Name ▾	File Size	Notes
A Basic Assessment Report for Waterfall Junction Water Pipeline.pdf	381 kB	—
A Cover for a Basic Assessment Report Waterfall Junction Water Pipeline.pdf	31 kB	—
Appendix A Waterfall Junction Water line locality plan.pdf	272 kB	—
Appendix A.1 Site Plan.pdf	803 kB	—
Appendix B Position of Site Photos.pdf	273 kB	—
Appendix B.1 Site Photos Position A.pdf	2 MB	—
Appendix B.2 Site Photos Position B.pdf	2 MB	—
Appendix B.3 Site Photos Position C.pdf	2 MB	—
Appendix D.01 Waterfall Junction Pipeline Route.pdf	520 kB	—
Appendix D.02 Waterfall Junction Route Co Ordinates.pdf	273 kB	—
Appendix E.01 Proof of Site Notices.pdf	1 MB	—
Appendix E.02 Writen Notices Issued to I&APs.pdf	639 kB	—
Appendix E.03 Proof of Newspaper Advert.pdf	344 kB	—
Appendix E.04 Communications with I&APs.pdf	396 kB	—
Appendix E.06 Comments and Responses Report.doc	38 kB	—
Appendix E.09 Register of Interested Parties.xls.pdf	13 kB	—
Appendix E.10 Comments from I&APs on the Application.pdf	436 kB	—
Appendix G Waterfall Pipeline Wetland Assessment.pdf	1 MB	—
Appendix H Waterfall Junction Pipeline EMP.pdf	491 kB	—

File Name ▾	File Size	Notes
Appendix I. Other - Assessment Criteria.pdf	[illegible] kB	—

APPENDIX E.5

MINUTES OF ANY PUBLIC AND OR STAKEHOLDER MEETINGS

No meetings were held

APPENDIX E.6

COMMENTS AND RESPONSES REPORT

Comments and Responses Report

Raised by	Nature / Issue / Comment	Response
Comments made on the application		
B van den Heuvel **Sasol Gas** 5/04/2011	Facilities will not be affected, no objection	Nil required
Lilian Kwakwa **Ekurhuleni Environmental Management** 6/4/2011	Wish to register	Copy of the Basic Report to be circulated
Charl van Niekerk **Heartland Properties** 7/4/2011	Wish to register	Copy of the Basic Report to be circulated
Mashudu Ratshitanga **Joburg Environmental Management**	Wish to register	Copy of the Basic Report to be circulated
Comments from I&AP's on Draft Scoping report		
Pule Makena **Dept of Water Affairs** 27/7/2011	Indicate that due to presence of hillslope seep areas, a Water Use License will be required.	The applicant is aware of this and such WULA application will be made once the ROD is obtained.

APPENDIX E.7

COMMENTS FROM I&APS ON BASIC ASSESSMENT (BA) REPORT

DEPARTMENT OF WATER AFFAIRS AND FORESTRY
REPUBLIC OF South Africa
Sanlam Plaza East, 285Schoeman Street, Pretoria
Private Bag x995, Pretoria 0001

Fax (012) 392 -1486

	DATE: 02 August 2011
TO:	Judy Johnston
ORGANISATION:	Seaton Thomson & Associates
FAX:	012 667 2109
FROM:	MR. Pule Makena
TEL:	(012) 392 1355
FAX:	(012) 392 1486
E-MAIL:	makenap@dwa.gov.za
NO.OF PAGES	02 (Including cover)
SUBJECT:	DRAFT BAR for the proposed CONSTRUCTION OF WATERFALL JUNCTION WATER PIPELINE

Message:
Please find the attached comments

water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

OFFICE OF THE: **REGIONAL DIRECTOR: North West**
Bothongo Plaza East, 285 Schoeman Street, Pretoria

(012) 392 1486 | P/Bag X 995 | Mr. Pule Makena
PRETORIA | (012) 392 1355
e-mail: makenap@dwaf.gov.za | 0001 | 16/2/7/A210/ D1/E3

Seaton Thomson & Associates
P O Box 936
Irene
0062

For Attention: Judy Johnston

DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE (REF NO: GAUT 002/11-12/E0001)

Reference is made to the above-mentioned proposed construction; this office would like to acknowledge receipt of the above mentioned document and would like to respond as follows:

- Page 7 of the wetland report. It was mentioned that several hillsope seepage wetland were found to occur along the proposed pipeline route. It should be noted that this activity will require water use authorisation under section 21 (c) & (i) of the National Water Act, Act 36 of 1998. For this Department to approve the above-mentioned activity, license application forms (part 1 & part 2) available in the Department's website www.dwa.gov.za should be fully completed by the proponent and submitted to this Department. Furthermore a prescribed fee of R114-00 is required for administration purposes. An external guideline for the application of Water Use Authorisation is also available on the Department's website for more information.

Any query regarding the content of this letter can be directed to the above-mentioned contact details.

Yours Faithfully

Regional Head: North West
Date: 27/07/2011

APPENDIX E.8

COMMENTS FROM I&APS ON AMENDMENTS TO THE BA REPORT

Not applicable

APPENDIX E.9

COPY OF THE REGISTER OF I&APS

State Departments administering a law affecting the environment:

State Departments administering a law affecting the environment:	Johannesburg Metropolitan Municipality		
Contact person:	N Maduse, City of Johannesburg Environmental Management		
Postal address:	P O Box 30733, BRAAMFONTEIN		
Postal code:	2017	**Cell:**	
Telephone:	011 407 6520	**Fax:**	011 339 1885
E-mail:			

State Departments administering a law affecting the environment:	Department of Water Affairs Deputy Director: Water Quality - Crocodile (West) and Marico		
Contact person:	Justice Maluleke		
Postal address:	Private Bag X995, MARSHALLTOWN		
Postal code:	2107	**Cell:**	082 804 9817
Telephone:	012 392 1409	**Fax:**	
E-mail:	012 392 1486		

State Departments administering a law affecting the environment:	Gauteng Dept of Roads and Transport (Gautrans)		
Contact person:	Mr D Emett		
Postal address:	Private Bag X83, MARSHALLTOWN		
Postal code:	2107	**Cell:**	
Telephone:	011355 7255	**Fax:**	011 355 7184
E-mail:			

Register of Interested and Affected Parties

Rec #	Date	Name	Company / Department / Organisation	E-mail	Fax	Address 1	Address 2	Address 3	Code
1	5/4/2011	Bruce van den Heuvel	Sasol	bruce.vandenheuvel@sasol.com		PO Box 1234		RANDBURG	2125
2	6/4/2011	Lilian Kwakwa	Ekurhuleni Environmental Resources	lilian.Kwakwa@ekurhuleni.gov.za	0865284810				2017
3	7/4/2011	Charl van Niekerk	Heartland Properties	charlvn@heartland.co.za		PO Box 500		MODDERFONTEIN	1645
4	19/4/2011	Mashudu Ratshitanga	Joburg Environmental Management	MashuduR@joburg.org.za	866277516	6tyh Fl Traduna House	118 Jorissen St	BRAAMFONTEIN	2107
4		Justice Maluleke	Dept of Water Affairs			P/Bag X995		PRETORIA	0001

APPENDIX E.10

COMMENTS FROM I&APS ON THE APPLICATION

Walter Dhooge

From: MashuduR@joburg.org.za
Sent: 19 April 2011 11:43 AM
To: info@seaton.co.za
Subject: Waterfall Junction water pipeline

Dear Judy

We have receive the notice for the above-mentioned project. Please send us a copy of the report for comments to incorporate into the final reprt to be submitted to the relevant authorities.

Regards

Mashudu Ratshitanga
Senior Specialist: Environment Impact Management
Department of Environmental Management
City of Johannesburg

Tel: 011 587 4236
Fax: 086 627 7516
Email: MashuduR@joburg.org.za
Address: 6th Floor Traduna Building
118 Jorissen Street
Braamfontein

Our Ref : F (N30 161)
Your Ref :

Enquiries : S Nothnagel
011 865 8549

05 April 2011

Judy Johnston
Seaton Thomson & Associates
PO Box 936
Irene
0062

Dear Sir / Madam,

PROPOSED CONSTRUCTION OF THE WATERFALL JUNCTION WATER PIPELINE

In reply to your letter dated 04 April 2011, we would like to advise that we have no objection against the above-mentioned application, as Sasol Gas will not be affected.

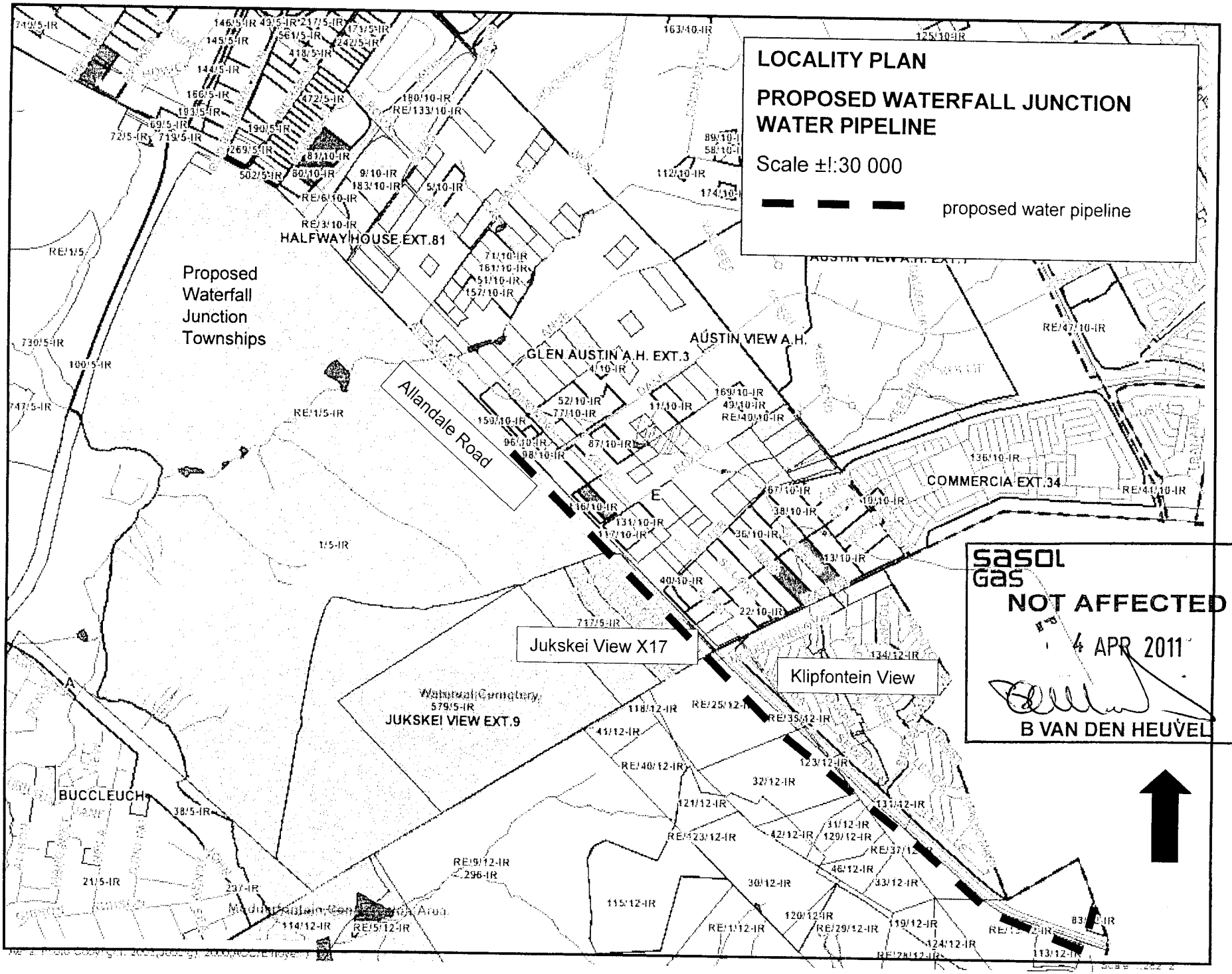
This wayleave is valid for 12 months.

Thank you for your co-operation in submitting this request.

Yours faithfully

B van den Heuvel
Head: Route Management

Direct Tel : (011) 865 8563
Direct Fax : (011) 865 8591
Cell: 082 450 2822
bruce.vandenheuvel@sasol.com


LOCALITY PLAN
PROPOSED WATERFALL JUNCTION WATER PIPELINE
Scale ±1:30 000
proposed water pipeline
Proposed Waterfall Junction Townships
HALFWAY HOUSE EXT.81
GLEN AUSTIN A.H. EXT.3
AUSTIN VIEW A.H.
Allandale Road
COMMERCIA EXT.34
Jukskei View X17
Klipfontein View
JUKSKEI VIEW EXT.9
BUCCLEUCH
sasol Gas
NOT AFFECTED
4 APR 2011
B VAN DEN HEUVEL

Walter Dhooge

From: Charl van Niekerk [Charlvn@heartland.co.za]
Sent: 07 April 2011 09:27 AM
To: info@seaton.co.za
Subject: Registration as I&AP - Proposed construction of the waterfall junction water pipeline.

Dear Judy,

Please register us as an affected party for the Proposed construction of the waterfall junction water pipeline.

Regards,

Charl van Niekerk
Engineering Manager

T +27 11 579 1000 F +27 11 579 1001 M +27 82 4989 274

HEARTLAND

Heartland House, 1 Casino Road, Modderfontein 1645 P O Box 500, Modderfontein 1645
E charlvn@heartland.co.za **www.heartland.co.za**

Walter Dhooge

From: Lilian Kwakwa [Lillian.Kwakwa@ekurhuleni.gov.za]
Sent: 06 April 2011 11:50 AM
To: info@seaton.co.za
Subject: Proposed construction of Waterfall Juction Water

Hi

I am hereby requesting to be register as an interested and affected party for the above mentioned subject.

Regards
Lilian Kwakwa
Enviromental Officer
Ekurhuleni Municipality
Environmental Resource Management
Tel:011 999-3171
Fax:086 528-4810

APPENDIX E.11

OTHER

No other information

APPENDIX F

WATER USE LICENSE(S), SAHRA INFORMATION, SERVICE LETTERS FROM MUNICIPALITIES, WATER SUPPLY INFORMATION

Water Use License
A Water Use License will be applicable to the water line, prior to commencement of construction.

The application will be commenced on the issuing of a ROD, as this is required by the Dept of Water Affairs to form part of the submission

Advertising for the WULA has, however, been undertaken, as shown in the Proof of Advertising. A copy of the Draft BA will be circulated to DWA

City of Joburg and Ekurhuleni Metro Council
The pipeline traverses both these local Council areas and will be provided a copy of the report for commenting

Gautrans
A copy of the draft BA will NOT be circulated to this department, as they have indicated they do now wish to be involved in the environmental process

APPENDIX G

SPECIALIST REPORTS

Wetland Delineation and Assessment Waterfall Junction Pipeline, Wetland Consulting Services, June 2011

Wetland Delineation and Assessment: Waterfall Junction Pipeline

For:

Judy Johnston
Seaton Thompson & Associates
P O Box 936
Irene, 0062
Tel: (012) 667 2107
seaton@yebo.co.za

By:

Wetland Consulting Services

Wetland Consulting Services (Pty.) Ltd.
PO Box 72295
Lynnwood Ridge
Pretoria
0040

Tel: 012 349 2699
Fax: 012 349 2993
Email: info@wetcs.co.za

Wetland
Consulting Services (Pty.) Ltd.

REF: 710/2011

APPROVAL

COMPILED BY:	CHECKED BY:	APPROVED BY:
NAME: Dieter Kassier	NAME: Allan Batchelor	NAME: Allan Batchelor
DATE: May 2011	DATE: May 2011	DATE: June 2011

DISTRIBUTION LIST

AGENCY, ORGANISATION OR PERSON	NO. OF COPIES
Seaton Thompson & Associates	**1**

REVISION

DATE	No.	DESCRIPTION OF REVISION OR AMENDMENT	INITIAL

DOCUMENT SUMMARY DATA

PROJECT:	**Wetland Delineation and Assessment: Waterfall Junction Pipeline**
CLIENT:	**Seaton Thompson & Associates**
CONTACT DETAILS:	**Judy Johnston**
	P O Box 936
	Irene, 0062
	Telephone number: (012) 667 2107
	E-mail: seaton@yebo.co.za
CONSULTANT:	**Wetland Consulting Services (Pty) Ltd.**
CONTACT DETAILS:	**Allan Batchelor**
	PO Box 72295
	Lynnwood Ridge
	0040
	Telephone number: (012) 349 2699
	Fax number: (012) 349 2993
	E-mail: allanb@wetcs.co.za

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INDEMNITY AND CONDITIONS RELATING TO THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and Wetland Consulting Services (Pty.) Ltd. and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

Although Wetland Consulting Services (Pty.) Ltd. exercises due care and diligence in rendering services and preparing documents, Wetland Consulting Services (Pty.) Ltd. accepts no liability, and the client, by receiving this document, indemnifies Wetland Consulting Services (Pty.) Ltd. and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by Wetland Consulting Services (Pty.) Ltd. and by the use of the information contained in this document.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

DECLARATION OF INDEPENDENCE

Declaration

Independent Specialist Consultant

I, Allan Batchelor, Pr.Sc.Nat. Registration Number 400092/06, representing Wetland Consulting Services (Pty) Ltd in my capacity as director, declare that we

- Act as independent specialist consultants, in this application, in the field of wetland ecology, delineation and classification.
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2006;
- Have, and will have no vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2006; and
- Will provide the competent authority with access to all the information at our disposal regarding the application, whether such information is favourable to the applicant or not.

Wetland Consulting Services (Pty) Ltd
Name of Company

Allan Batchelor
Name of Specialist Consultant

Signature of Specialist Consultant

9June 2011
Date

1. BACKGROUND INFORMATION

Wetland Consulting Services (Pty.) Ltd. was appointed by Seaton Thompson & Associates to conduct a wetland delineation and assessment, including a small mammal survey and a brief, scoping-level vegetation survey, for the proposed Waterfall Junction Pipeline.

Given the stringent legislation regarding developments within or near wetland areas, it is important that these areas are identified and developments planned sensitively around them to minimize any potential negative impacts. This report provides a map showing the location and extent of the wetlands on site and an assessment of their current condition so as to facilitate decision making regarding the proposed development.

2. TERMS OF REFERENCE

The following terms of reference apply to the wetland delineation and assessment:

- Initial desktop delineation of the wetlands along the alignment;
- Groundtruthing of the wetlands along the alignment as per the DWA Wetland Delineation Guidelines (DWA, 2005);
- Basic floral and faunal assessment of the wetlands;
- Functional, Present ecological status (PES) and ecological importance and sensitivity (EIS) assessments of the wetlands;
- Compilation of a detailed map and shapefiles of the sections of wetlands crossed by the pipeline;
- Recommendations for suitable mitigation measures to avoid and minimise impacts; and
- Compilation of the findings in a specialist wetland report.

3. ASSUMPTIONS AND LIMITATIONS

Due to the scale of the remote imagery used (1:10 000 ortho-photos and Google Earth Imagery), as well as the accuracy of a hand held GPS unit used for capturing coordinates of the boundaries, scale and boundaries cannot be guaranteed beyond an accuracy of approximately 15 meters on the ground. The boundaries will need to be marked in the field and surveyed using conventional survey techniques to provide for more accurate mapping.

4. STUDY AREA

4.1 Location

The proposed pipeline is be located in Midrand, Gauteng Province, along Allandale Road to the east of the N1, running alongside the southern side of the road within the road reserve for approximately 3 100 m before turning south-westwards for a further 320 m. The study area is defined as the proposed pipeline route and a 100m buffer zone around the pipeline. The location of the pipeline is indicated in Figure 1 below.

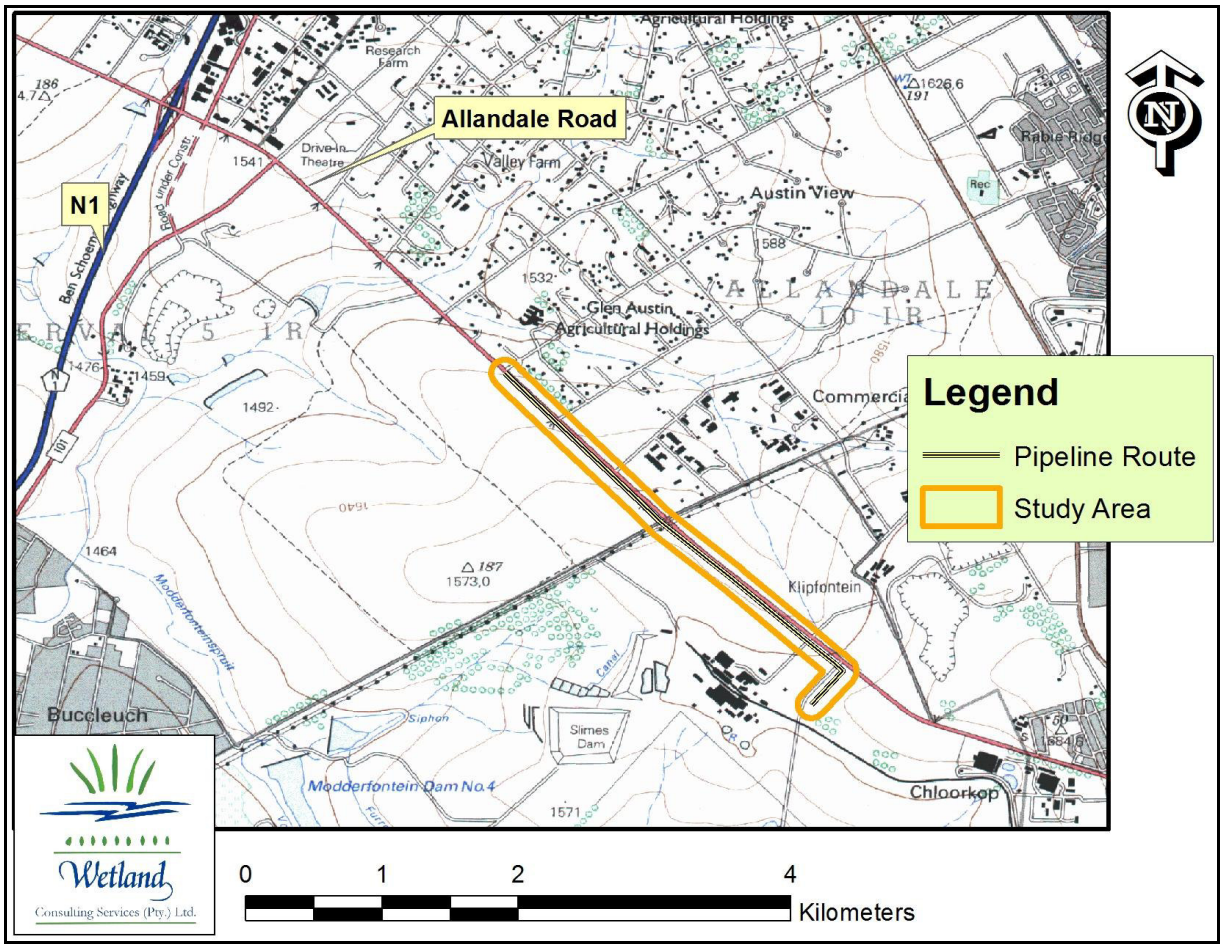

Figure 1. Map showing the location of the proposed Waterfall Junction Pipeline.

4.2 Catchments

The study area is located within Primary Catchment A, the Limpopo River catchment, and more specifically within quarternary catchment A21C which is drained by the Jukskei River (Figure 2). More information regarding the catchment is provided in the table below.

From Figure 2 it is immediately apparent that the catchment has been extensively urbanised, especially in its upper reaches. This is likely to have significantly impacted run-off from the catchment as well as any receiving water resources. One such receiving water resource, located outside the boundaries of the catchment, is the Haartebeestpoort Dam.

Table 1: Catchment characteristics for quarternary catchment A21K (Midgley, D.C., Pitman, W.V. and Middleton, B.J. 1994)

Quarternary Catchment	Catchment area (ha)	Mean annual precipitation (MAP) in mm	Mean annual run-off (MAR) in mm	MAR as a percentage of MAP
A21C	68 639	682.17	49	7.2 %

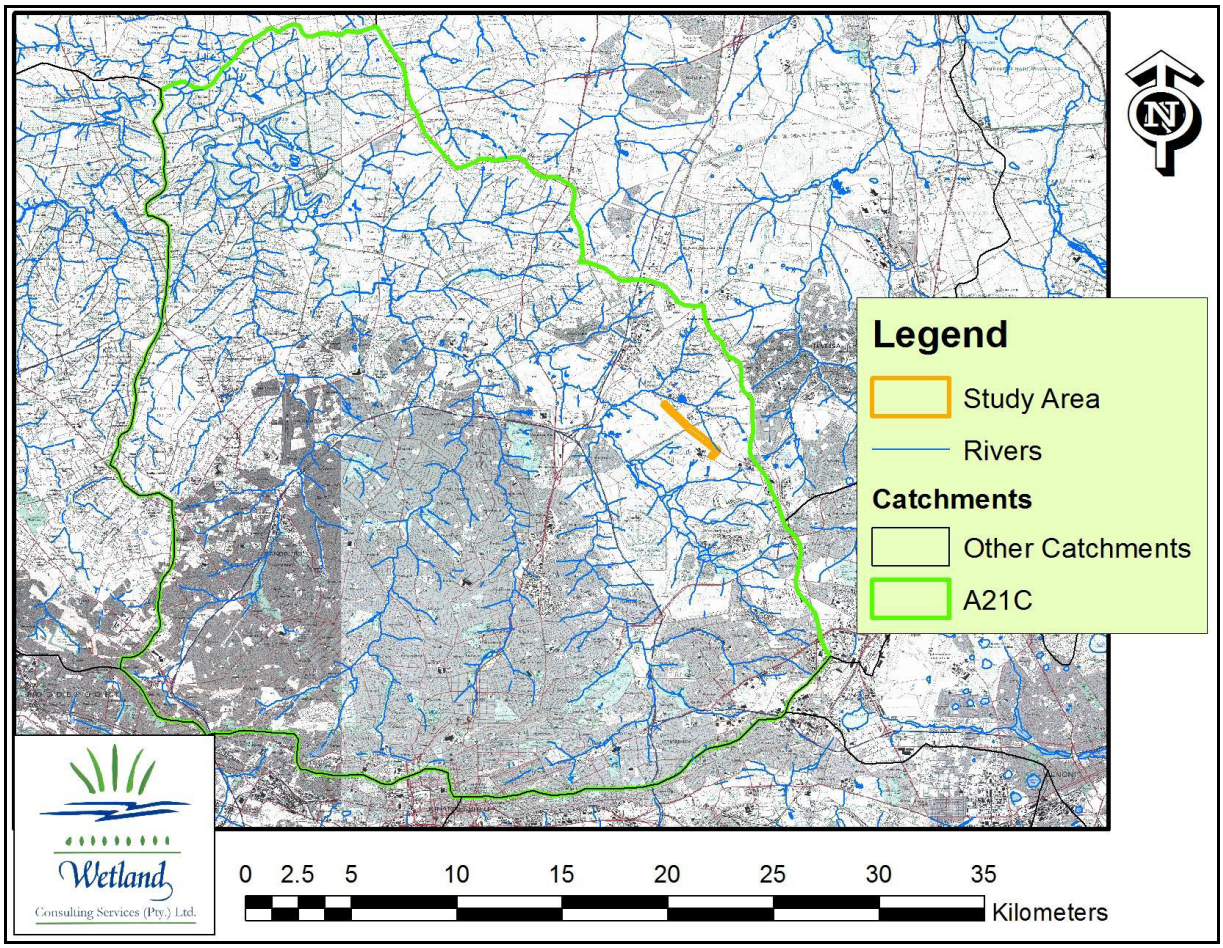

Figure 2: Map showing the size and position of the study area in relation to the quarternary catchment A21C.

4.3 Geology

According to the 1:250 000 Geological Map Series of South Africa (Map Sheet 2628), the entire study area is underlain by the Halfway House Granite Formation. The north western half of the study area is underlain by a lithology described as “gneiss, migmatite, porphyritic granodiorite”, while the south eastern half is described as “grey, medium-grained granodiorite”. A lineament or possible dyke is also indicated along the north western half of the route.

The halfway house granites typically weather to form sandy soils that allow easy infiltration of rainwater into the soil profile. Plinthic horizons are also very common within these soils and provide an aquitard that supports a perched water table across large portions of the granite landscape. Where this perched water table approaches the surface and extends into the top 50 cm of the soil profile the expression of moisture on the soil surface occurs in the form of wetlands characterised by hydrophilic vegetation. Given these conditions the wetlands on the Halfway House Granites are dominated by extensive hillslope seepage wetlands. These wetlands are typically only seasonal or even temporary in nature and strongly dependant on rainfall infiltrating into the soil.

4.4 Vegetation

The study area is located in the Grassland Biome of South Africa and within the Mesic Highveld Grassland Bioregion. According to the latest vegetation mapping of the country, the specific vegetation type is classified as Egoli Granite Grassland (Mucina & Rutherford, 2006). Further detail provided by Mucina and Rutherford (2006) is summarised below:

Egoli Granite Grassland is mostly restricted to the Gauteng Province and occurs between northern Johannesburg in the south, Lanseria Airport and Centurion in the north, Muldersdrift in the west and Tembisa in the east. The landscape consists of moderately undulating plains and low hills dominated by tall, usually *Hyparrhenia hirta* dominated, grassland. Soils are described as leached, shallow, coarsely grained, sandy soils poor in nutrients. Rainfall is strongly seasonal.

Common grass species encountered include *Aristida canescens, A. congesta, Cynodon dactylon, Digitaria monodactyla, Eragrostis capensis, E. chloromelas, E. curvula, E. racemosa, Heteropogon contortus, Hyparrhenia hirta, Melinis repens, Monocymbium ceresiiforme, Setaria sphacelata, Themeda triandra,* and *Tristachya leucothrix*.

The vegetation type is considered *Endangered*, with only roughly 3 % of a target of 24 % conserved. Current rates of transformation due to mostly urbanisation threaten most of the remaining untransformed areas.

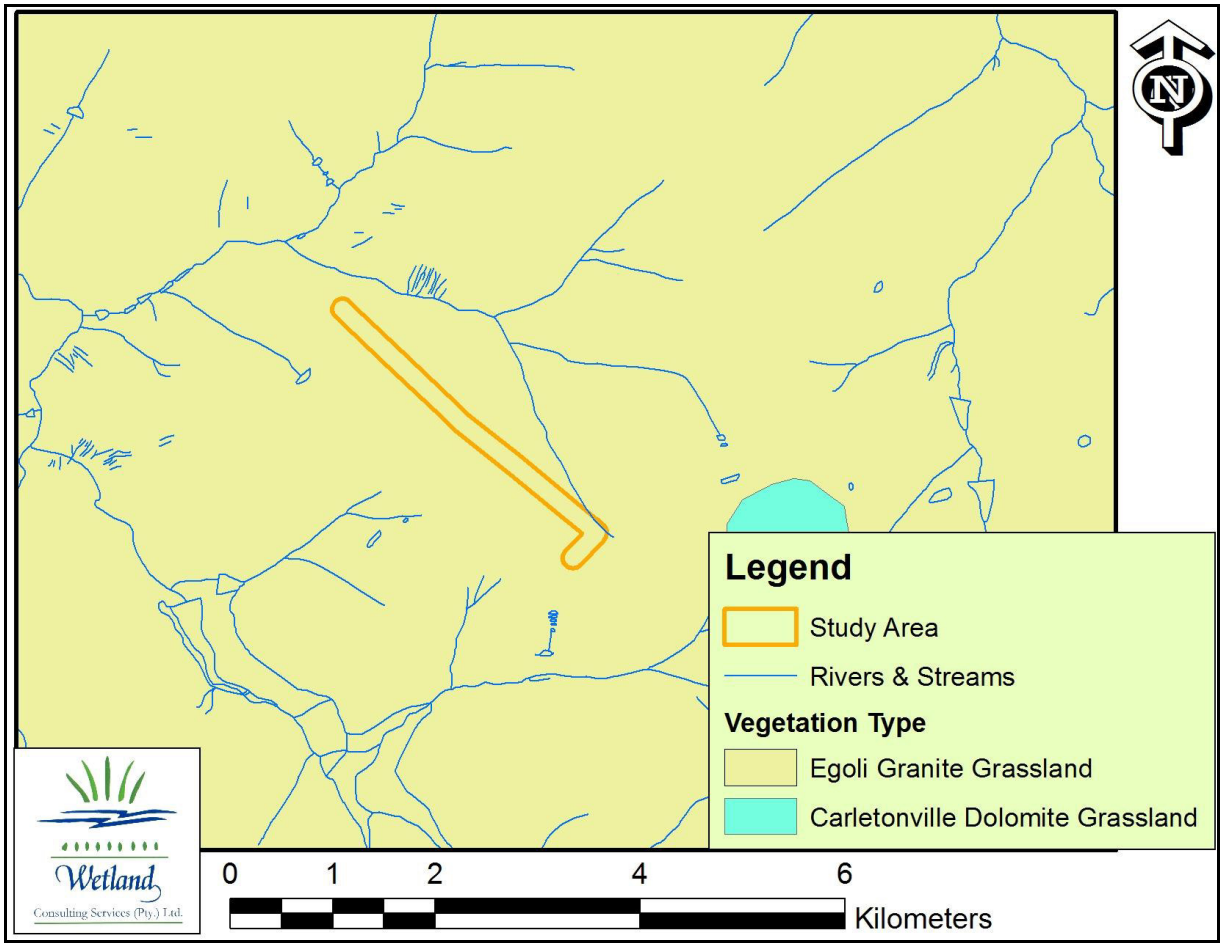

Figure 3. Map showing the vegetation types of the study area, based on Mucina & Rutherford, 2006.

5. APPROACH

The National Water Act, Act 36 of 1998, defines wetlands as follows:

> **Wetlands** - *"Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."*

5.1 Delineation and Classification

Use was made of 1:50 000 topographic maps, geo-referenced Google Earth images and aerial photographs to generate digital base maps of the study area onto which the wetland boundaries were delineated using ArcView 9.1. The method described in Thompson et al (2002) was used to delineate wetlands at a desktop level, based on wetness signatures (darker or greenish areas) on satellite imagery and aerial photographs. All identified potential wetlands were then verified in the field.

In the field, wetlands were delineated according to the delineation procedure given in "*A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas*" (DWAF 2005). Indirect indicators of prolonged saturation, namely wetland plants (hydrophytes) and wetland soils (hydromorphic soils) were used to identify wetland areas. Hydromorphic soils must display signs of wetness (mottling and gleying) within 50cm of the soil surface for an area to be classified as a wetland. The study area was sub-divided into transects and the soil profile was examined for signs of wetness within 50 cm of the surface using a hand augur along transects. The wetland boundaries were then determined by the positions of augured holes that showed signs of wetness as well as by the presence or absence of hydrophilic vegetation.

The wetlands were subsequently classified according to their hydro-geomorphic determinants based on the system proposed by Brinson (1993) and modified for use in South Africa by Marneweck and Batchelor (2002), subsequently revised by Kotze et al (2004) and most recently updated by SANBI (2009). The presence of wetlands in the landscape can be linked to the presence of both surface water and perched groundwater. Wetland types are differentiated based on their hydro-geomorphic (HGM) characteristics; i.e. on the position of the wetland in the landscape, as well as the way in which water moves into, through and out of the wetland systems. A schematic diagram of how these wetland systems are positioned in the landscape is given in Figure 3 below.

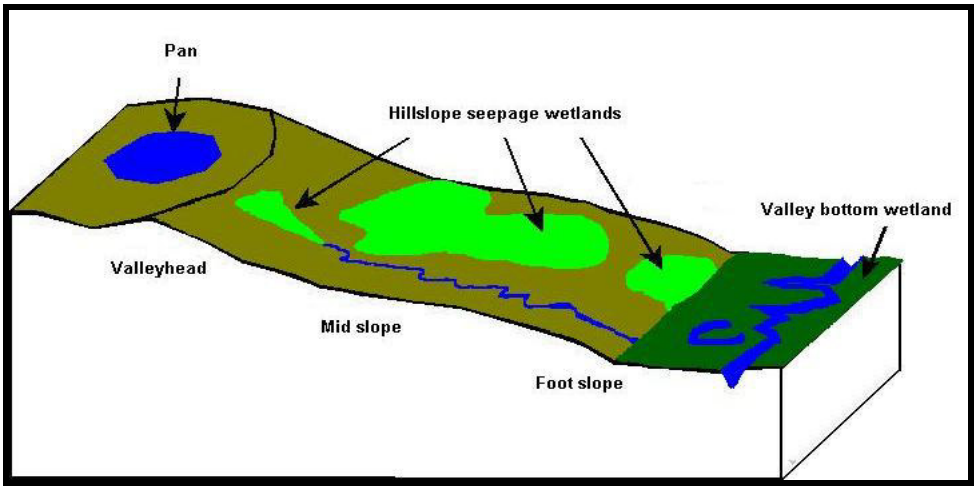

Figure 4. Schematic diagram illustrating the position of the various wetland types within the landscape.

5.2 Functional Assessment

A functional assessment of the wetlands on site was undertaken using the level 2 assessment as described in "Wet-EcoServices" (Kotze et al., 2005). This method provides a scoring system for establishing wetland ecosystem services. It enables one to make relative comparisons of systems based on a logical framework that measures the likelihood that a wetland is able to perform certain functions

5.3 Present Ecological State (PES) and Ecological Importance & Sensitivity (EIS) of Wetlands

The Present Ecological State assessment determines the level of disturbance to or modification of a wetland relative to its natural state or reference condition. Wetlands are rated on a scale of A to F, with A being a natural or unimpacted wetland and F being a completely modified and disturbed wetland (Table 2). The PES score is based on observed physical disturbance and hydrological changes. Scores are assigned using tables developed by Marneweck and Batchelor (2002), adapted from the document "Resource Directed Measures for Protection of Water Resources, Volume 4. Wetland Ecosystems. (DWAF, 1999).

Table 2. Table explaining the scoring system used for the PES assessment.

Mean*	Category	Explanation
Within generally acceptable range		
>4	A	Unmodified, or approximates natural condition
>3 and <=4	B	Largely natural with few modifications, but with some loss of natural habitats
>2.5 and <=3	**C**	Moderately modified, with some loss of natural habitats
<=2.5 and >1.5	**D**	Largely modified. A large loss of natural habitat and basic ecosystem function has occurred.
Outside generally acceptable range		
>0 and <=1.5	E	Seriously modified. The losses of natural habitat and ecosystem functions are extensive
0	F	Critically modified. Modification has reached a critical level and the system has been modified completely with almost complete loss of natural habitat.

Ecological Importance and Sensitivity is a concept introduced in the reserve methodology to evaluate a wetland in terms of:

- Ecological Importance;
- Hydrological Functions; and
- Direct Human Benefits

The scoring assessments for these three aspects of wetland importance and sensitivity have been based on the requirements of the NWA, the original Ecological Importance and Sensitivity assessments developed for riverine assessments (DWAF, 1999), and the work conducted by Kotze et al (2008) on the assessment of wetland ecological goods and services (the WET-EcoServices tool). Based on this methodology, an EIS assessment was undertaken for all the delineated wetlands on site.

Table 3. Scoring system used for the EIS assessment.

Ecological Importance and Sensitivity categories	Range of Median	Ecological Management Class
Very high Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and <=4	A
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and <=3	B
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and <=2	C
Low/marginal Wetlands that is not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and <=1	D

5.4 Fauna

A desktop study was conducted to determine the species potentially occurring within Quarter Degree Square (QDS) 2628aa based upon available information on faunal distribution ranges in southern Africa.
A field survey was then conducted in May 2010 to assess the study area. This assessment included identifying the types of habitat available and opportunistically surveying the site for signs of species presence (tracks, scats, skulls, visual sightings).

Using information on individual species habitat requirements and the data gained during the field survey it was possible to determine the likelihood of each species occurring based on the presence or absence of important habitat features and the levels of human disturbance.

The list of bird species present within QDS 2628aa was obtained from the South African Bird Atlas Project (SABAP 1) conducted by the Animal Demography Unit, University of Cape Town South and the South African National Biodiversity Institute.

Information on the distribution ranges of reptile and amphibian species was gained from various reference texts and Red Data books, and aditional information regarding sightings and species richness of reptiles and amphibians in the area was obtained from the Animal Demography Unit's website.

6. WETLAND ASSESSMENT

6.1 Wetland Delineation

The site visit for the wetland assessment study was undertaken on the 11 May 2011. Several hillslope seepage wetlands were found to occur along the proposed pipeline route, with all of the identified wetlands draining in a north/north-easterly direction towards Allandale Road. Immediately downslope of the proposed pipeline route all of the identified wetlands are crossed by Allandale

Road (the pipeline is proposed to run in the road reserve to the south of Allandale Road). A series of drop-down culverts conveys flows underneath the road, with a cement-lined stormwater channel also conveying flows along Allandale Road into these culverts. The area north of Allandale Road is mostly developed, consisting of housing, industrial developments, and small holdings. The wetland delineation study thus focused on the proposed pipeline route and the area south of Allandale Road as this is mostly still undeveloped, with the exception of the Jukskei View development currently under construction.

Hillslope seepage wetlands on this site are associated with soils derived from, and the weathering profile of, the Halfway House Granites. In this environment, hillslope seepage wetlands are predominantly seasonal and associated with summer rains. The wetland soils on site have a pronounced plinthic horizon which is relatively impermeable to water. Therefore rainfall that enters the soil profile is intercepted by either a soft or hard plinthic layer which restricts the vertical infiltration of water into the soils and increases horizontal flow closer to the surface. This subsurface water then influences both the soil and the vegetation, typically creating wetland conditions. In several locations on site the perched water table intersected the soil surface and surface water was observed.

Figure 5 below indicates the location and extent of the various wetlands delineated on site. Wetlands are numbered from north-west to south-east (1 to 5) along the route and each wetland is discussed individually.

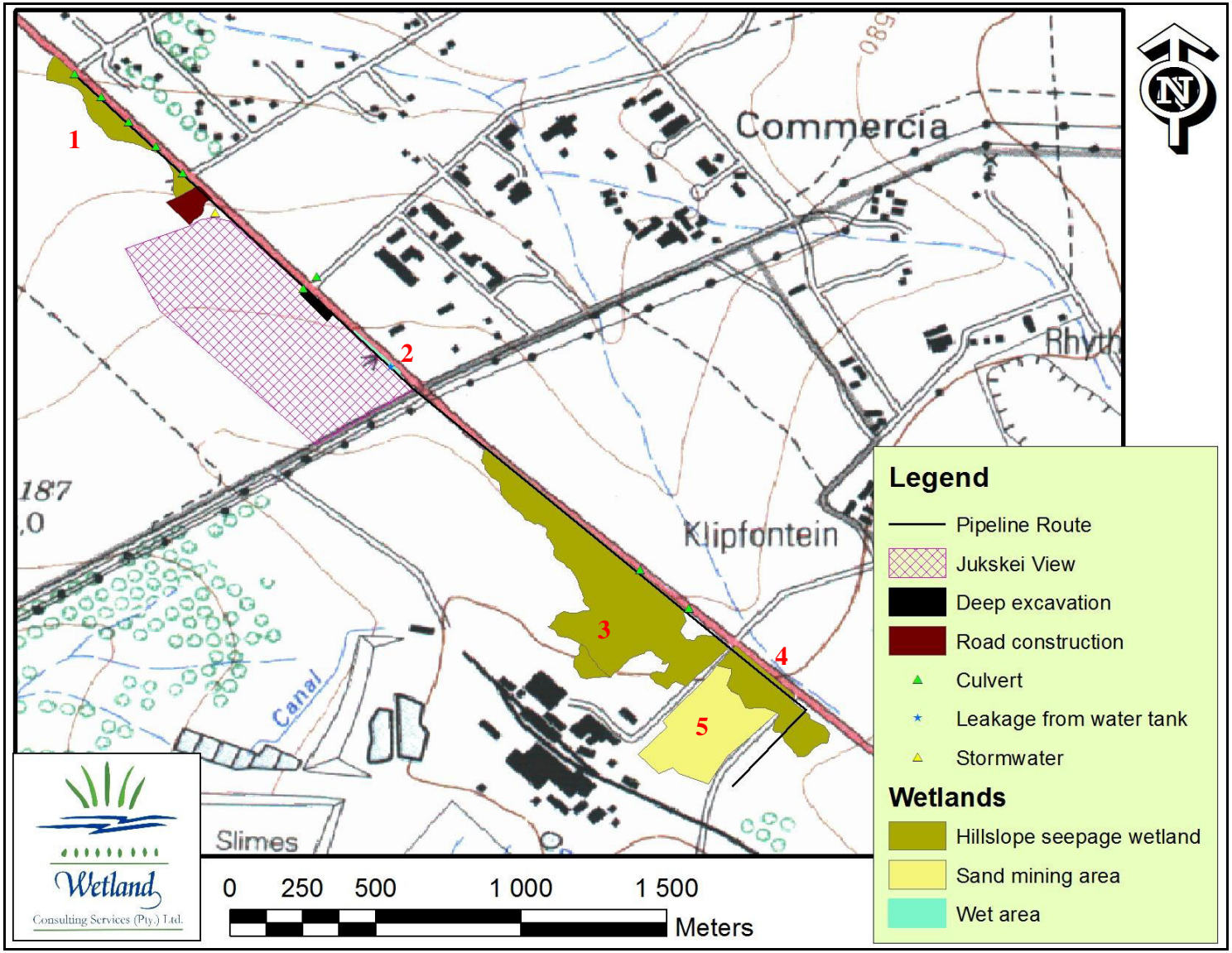

Figure 5. Extent and position of wetlands within the study area.

Wetland Unit 1 is considered to represent the extreme upper end of a hillslope seepage wetland draining in a northerly direction. The wetland is characterised by shallow sandy soils over a ferricrete horizon with distinct mottling present in the soil horizon. Surface water was observed in the central regions of the wetland unit indicating the perched water table intercepting the soil surface. The more temporary reaches of this wetland were characterised by *Hyparrhenia hirta* grassland, while the more seasonally wet sections were dominated by a *Cyperaceae* species as well as *Eragrostis gummiflua*. Other wetland indicator species observed within this area include the blue flowering *Wahlenbergia calendonica* and *Kyllinga erecta*. Several informal roads and tracks cross this wetland, resulting in disturbance to the vegetation, with species such as *Verbena bonariensis*, *Chenopodium album* and *Bidens pilosa* common in these areas. Upslope of the wetland most of the area has been previously cultivated.

Unit 2 consists of a small area between Allandale Road and the palisade fence surrounding the Jukskei View development (currently under construction) which displayed signs of wetness in both the soil profile and in terms of vegetation. This section is considered to potentially represent a remnant portion of hillslope seepage wetland that has been isolated by the Allandale Road construction to the north and the Jukskei View development to the south. The area is significantly disturbed with a two-track running along the entire narrow wet area between the road and the fence. This two-track appears to have created a preferential flow path for surface run-off, resulting in some shallow erosion along the track. The presence of a leaking water tank associated with the construction camp in the Jukskei View development provides a source of water to this wetland. It is assumed that water derived from the construction camp as well as surface run-off along the two-track provide the water that is currently supporting the wetland indicator species within this Unit.

Wetland Unit 3 has been extensively cultivated in the past, as evidenced by extensive stands of alien and weedy species such as *Chenopodium album*, *Pennisetum clandestinum*, *Sorghum* sp., and *Verbena bonariensis*, as well as pioneer species such as *Cynodon dactylon*. This is the largest wetland system along the proposed pipeline route and also the only wetland to display signs of permanent or near permanent wetness, as evidenced by the stands of *Phragmites australis* that occur in the central reaches of the wetland. Such *Phragmites* stands in Midrand hillslope seepage wetlands are highly unusual and might indicate additional sources of water to this wetland (e.g. leaking pipes, discharge of water from industrial activities upslope etc.) other than infiltrated rainwater.

Wetland Unit 4 has also undergone various disturbances in the past. Numerous alien species occur within the wetland (e.g. *Cortaderia sellona*, *Pennisetum clandestinum*, *Solanum mauritianum*), while an old (now vegetated and stabilise) erosion scar also occurs within the central portions of the site. The eastern portions of the wetland are dominated by *Hyparrhenia hirta*.

Area 5 has previously been exposed to sand mining activities, and is currently characterised by a mosaic of exposed granite, exposed plinthic horizons, shallow soils (where the topsoil layer has been removed) and areas of deeper soils. Several trenches have also been excavated in the past. While this area displays signs of wetness under current conditions with surface water in some places and stands of *Typha capensis* occurring, it was impossible to accurately delineate any natural wetland area that may have occurred here in the past. It is speculated that the lower reaches of the sand mining area would have formed part of the hillslope seepage wetland (wetland unit 4) in the past, but that the upper reaches would have been characterised by terrestrial grassland under natural conditions. *This area will not be crossed by the proposed pipeline*.

Figure 6. Photographs of the wetlands on site (clockwise from top left): wetland unit 1, wetland unit 2, wetland unit 3 and wetland unit 4.

6.2 Present Ecological State (PES) Assessment

The description of the wetlands identified on site has already highlighted various impacts and activities that have altered the state of the wetland and resulted in degradation of the wetland habitat. The PES assessment undertaken for the wetlands assesses the wetland in terms of changes it has undergone from its natural or unimpacted condition (the reference state). Various factors are assessed:

- Hydrologic
- Water quality
- Hydraulic/Geomorphic/Physical
- Biota

All of the wetlands within and around the pipeline route have been impacted upon to some degree. No pristine wetlands were found to occur along the route. Impacting activities that have resulted in wetland degradation include:

1. Cultivation. Large areas adjacent to and within the wetlands (especially the large south eastern hillslope seepage wetlands, wetland units 3 and 4) appear to have been previously cultivated, resulting in vegetational changes that reflect this, including reduced diversity and increased encroachment by alien invasive plants.

2. Alien Vegetation: Most of the areas that were previously cultivated are currently dominated by alien and weedy species.
3. Habitat Fragmentation: The wetland area on site has been isolated from the downstream valley bottom wetland by Allandale Road and the development of a housing estate between the seepage wetlands and the valley bottom.
4. Roads: Roads and tracks have been constructed through wetland areas, causing interception of water and flow changes, especially where Allandale Road is located in a shallow cutting, as well as habitat fragmentation.
5. Flow interception: Flows intercepted by Allandale Road are concentrated in culverts conveying these flows underneath the road, with flows being discharged in a concentrated manner downslope of the road.
6. Infrastructure: The construction of infrastructure within the wetland including, walls, fences, stormwater infrastructure, and dams.
7. Historical sand mining. Sand mining and the removal of the top soil has altered the movement of water resulting in increased surface runoff and decreased infiltration, while also increasing erosion and sediment transport into the downstream wetlands.

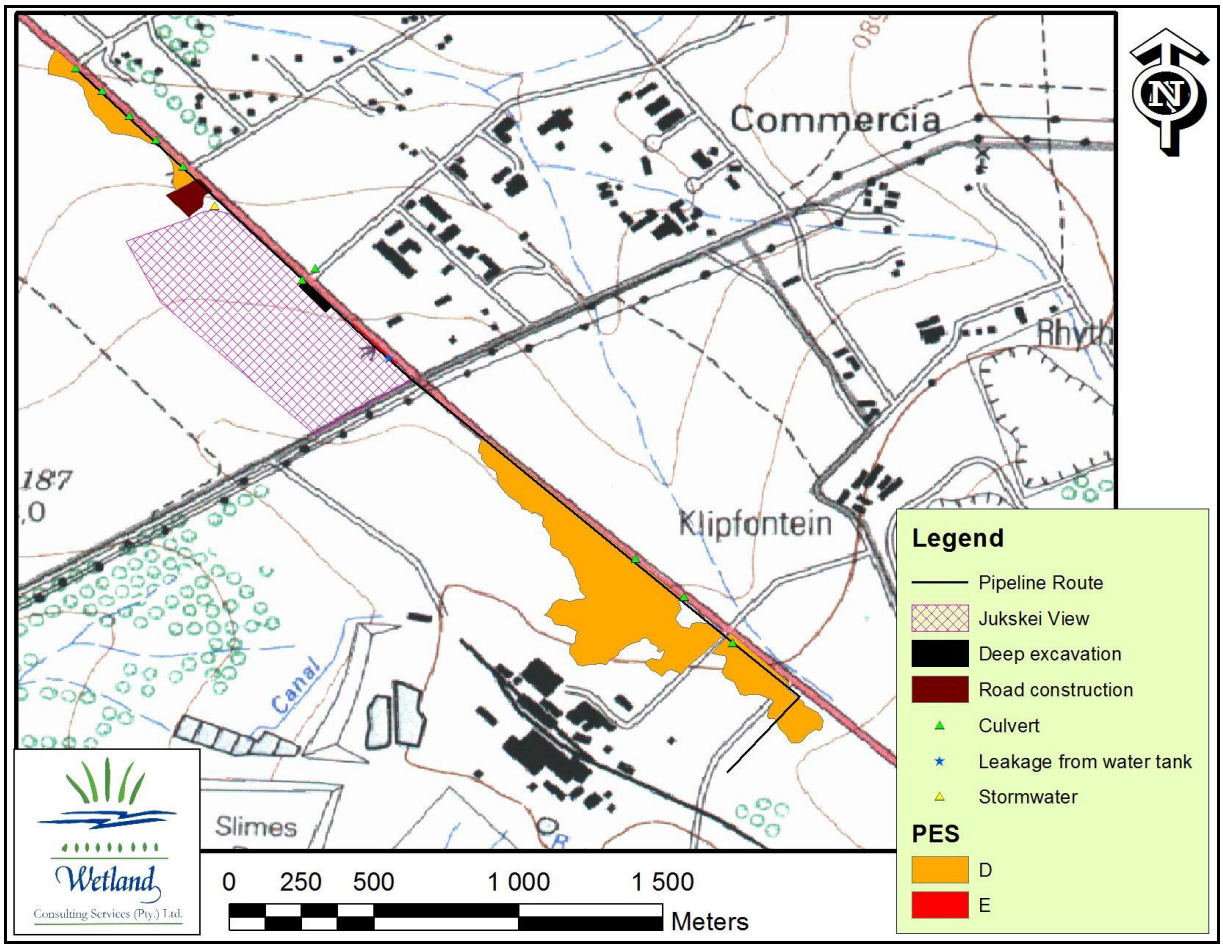

Figure 7. Map showing the results of the PES assessment.

Table 4. PES scores for wetlands recorded on site.

Wetland Type	Unit	PES Category	Description
Hillslope Seepage	1	D	Largely modified
Hillslope Seepage	2	E	Seriously modified
Hillslope Seepage	3	D	Largely modified
Hillslope Seepage	4	D	Largely modified

6.3 Ecological Importance and Sensitivity

An Ecological Importance and Sensitivity (EIS) assessment was conducted using the scoring system applied in the procedure for the determination of Resource Directed Measures for wetland ecosystems (DWAF, 1999) and categories modified based on those from Kleynhans, 1996 and 1999.

All the wetland areas were rated as being of low/marginal ecological importance and sensitivity with a recommended ecological management class of D (low/marginal ecological importance and sensitivity).

7. FAUNA

The study area, which lies along Allandale Road in Midrand, falls within the Grassland vegetation biome, and is more specifically classified as Egoli Granite Grassland. Egoli Granite Grassland is considered to be an Endangered vegetation unit due to the extensive transformation which has occurred across much of its extent. Within the study area this transformation is evident through past cultivation and present urban development which has left the remaining habitat in a highly degraded state. This habitat can be divided into short to medium height transformed grassland and predominantly temporary to seasonal wetlands dominated by graminoids, herbaceous species and several sedges. Human presence within, and adjacent to, the study area is high.

The literature review indicated that 335 bird, 92 mammal, 53 reptile and 18 amphibian species occur or potentially occur within QDS 2628AA (Appendices 2, 3, 4 and 5). This suggests that this area is able to support high faunal species richness. However, due to the highly transformed nature of the vegetation on site, location of the study area within the urban edge, continuous high levels of human disturbance, and limited connectivity of the study area, it is unlikely that the actual species richness on site is particularly high. Species expected to be found on site include generalist species, and those which have adapted to living in urban areas or in close proximity to human activity.

7.1 Red Data List Species

No protected or Red Data List faunal species were observed during the site visit. The study area lies within the distribution ranges of a number of Red Data List species, yet suitable habitat to support these species is not present on site.

At least 21 Red Data List bird species have been recorded in QDS 2628AA, many of these species being associated with open grassland or wetland habitat. While these habitats occur on site, the wetlands are too limited in extent and level of inundation, and both the wetlands and remaining grasslands are in too poor a condition to support populations of any of the Red Data List species recorded (Appendix 2).

Eighteen small- to medium-sized Red Data List mammal species potentially occur on site (Appendix 3), however, none of these species have a high likelihood of occurring within the study area due to the high levels of disturbance and limited availability of suitable habitat. The Rough-haired golden mole (Critically Endangered), South African hedgehog (Near Threatened), water rat (Near Threatened) and White-tailed mouse (Endangered) have a moderate likelyhood of occurring in the area based on their distribution ranges and the presence of some suitable habitat, but the degraded nature of the habitat and the high levels of disturbance suggest that if present at all, utilisation of the site would be extremely limited.

The Giant bullfrog (Near Threatened) is the only Red Data List amphibian with a distribution range extending across the site (Appendix 4). The presence of this species on site is highly unlikely given that the Giant bullfrog is known to prefer pans, vleis and rain-filled depressions, and is not expected to occur within the hillslope seepage wetlands on site.

Both the Southern African python (Vulnerable – South African Assessment) and the Giant girdled lizard (Vulnerable) have distribution ranges which include this area of Gauteng (Appendix 5), but no suitable habitat is present for these species. The Southern African python prefers rocky habitat in close proximity to water, and the Giant girdled lizard prefers open, flat to gently undulating *Themeda triandra* grassland.

8. VEGETATION

A scoping level assessment of the vegetation (terrestrial and wetland) along the proposed pipeline route was also undertaken as part of the current study to determine if a more detailed vegetation study would be required.

As indicated previously, the entire pipeline route is located within the Egoli Granite Grassland vegetation type which has been identified by Mucina and Rutherford (2006) as being an *endangered* vegetation type based on the degree of transformation that has already taken place within this vegetation unit.

This transformation is also observed along the pipeline route with most of the route, with the exception of some of the wetland areas, having been previously cultivated. This is evident from the disturbed nature of the vegetation on site, as well as from historical imagery of the area that clearly shows past cultivation. Some of the wetland areas along the route have also been previously cultivated.

The vegetation associated with wetland unit 1 was considered to be the least disturbed vegetation along the route and the greatest diversity of indigenous species was encountered here, including the orange listed *Hypoxis hemerocallidea.* This area consists of a narrow strip of vegetation (approx. 40m wide) located between the previously cultivated field to the south west and Allandale Road to the north east. Although also assumed to be previously cultivated, its location in a power line servitude and its proximity to the road has probably resulted in it not having been as recently cultivated as the area immediately to the south west.

A narrow strip of disturbed vegetation lies between Allandale Road and the boundary fence of the Jukskei View development along the middle reaches of the pipeline route, while the vegetation of the large seepage wetland, wetland unit 3, is dominated mostly by the exotic *Pennisetum clandestinum* (kikuyu grass). The south eastern end of the pipeline route that branches south away from Allandale Road traverses *Hyparrhenia hirta* dominated secondary grassland.

A list of common and dominant plant species recorded on site is provided in the table below.

Table 5. List of plant species recorded along the pipeline route.

Species Name
*Acacia mearnsi**
Andropogon eucomis
*Bidens pilosa**
*Chenopodium album**
Commelina africana
*Cortaderia sellona**
Cynodon dactylon
Cyperus congestus
Digitaria eriantha
Eragrostis chloromelas
Eragrostis curvula
Eragrostis gummiflua
Eragrostis racemosa
Hyparrhenia hirta
Hypoxis hemerocallidea
Isolepis spp.
Kyllinga erecta
Melinis repens
*Pennisetum clandestinum**
Persicaria attenuata
Phragmites australis
Pogonathria squarrosa
Seriphium plumosum
Sorghum spp.
Sporobulos africanus
*Tagetes minuta**
Themeda triandra
Typha capensis
*Verbena bonariensis**
Wahlenbergia calendonica

In our opinion the vegetation along the proposed pipeline route is not considered sensitive.

8.1 Red and Orange listed species

No Red Data plant species were recorded along the proposed pipeline route. However, the Orange listed *Hypoxis hemerocallidea*, listed as declining, was recorded on site with numerous individuals observed mostly along the north-western end of the route (-26.034249; 28.138303) within the hillslope seepage wetland, wetland unit 1. It is recommended that all individuals of *Hypoxis hemerocallidea* be removed from the construction servitude prior to the commencement of construction activities and be relocated to an appropriate environment.

9. IMPACT ASSESSMENT

9.1 Project Description

The proposed project involves the installation and operation of a water pipeline along Allandale Road. No further details regarding the proposed project were available. It is assumed that the pipeline will be buried. It is expected that a trench will be excavated parallel to Allandale Road, that bedding material will be placed in the trench, that the pipe will be positioned in the trench, and that the trench will be back-filled and rehabilitated. While it is likely that "lay down" areas will be required along the pipeline route for temporary storage of construction material, no indication of the location or extent of such "lay down" areas was provided, and no impacts associated with "lay down" areas have been assessed.

To minimise any impacts due to the proposed project, it is recommended that the Environmental Best Practice Specifications for Construction, as published by the DWAF (2005) in the Integrated Environmental Management Series be fully implemented (this document is available from the DWA website: http://www.dwa.gov.za/iem.aspx). Some of the recommendations from this document are reproduced below, as well as some additional recommendations.

- The construction servitude should be identified and be clearly demarcated prior to the commencement of any construction activities on site and before the arrival of construction machinery.
- The demarcations should stay in place for the entire construction phase and no personnel, construction machinery or construction material should move or be placed outside the demarcated construction servitude.
- As per the best practice guidelines, a construction servitude width of 15m is permitted for machine excavation, and 6m for manual excavation. If required, the ECO can specify a smaller servitude. The servitude must accommodate all construction related activities, including materials storage, access routes, soil stockpiles etc.
- Care must be taken during excavation that the topsoil is removed and stockpiled separately from the subsoil (if the topsoil layer is not easily identifiable, the top 300mm should be removed as topsoil). Soil layers should then also be replaced separately and in the correct order.

A typical pipeline construction process is illustrated in the figure below.

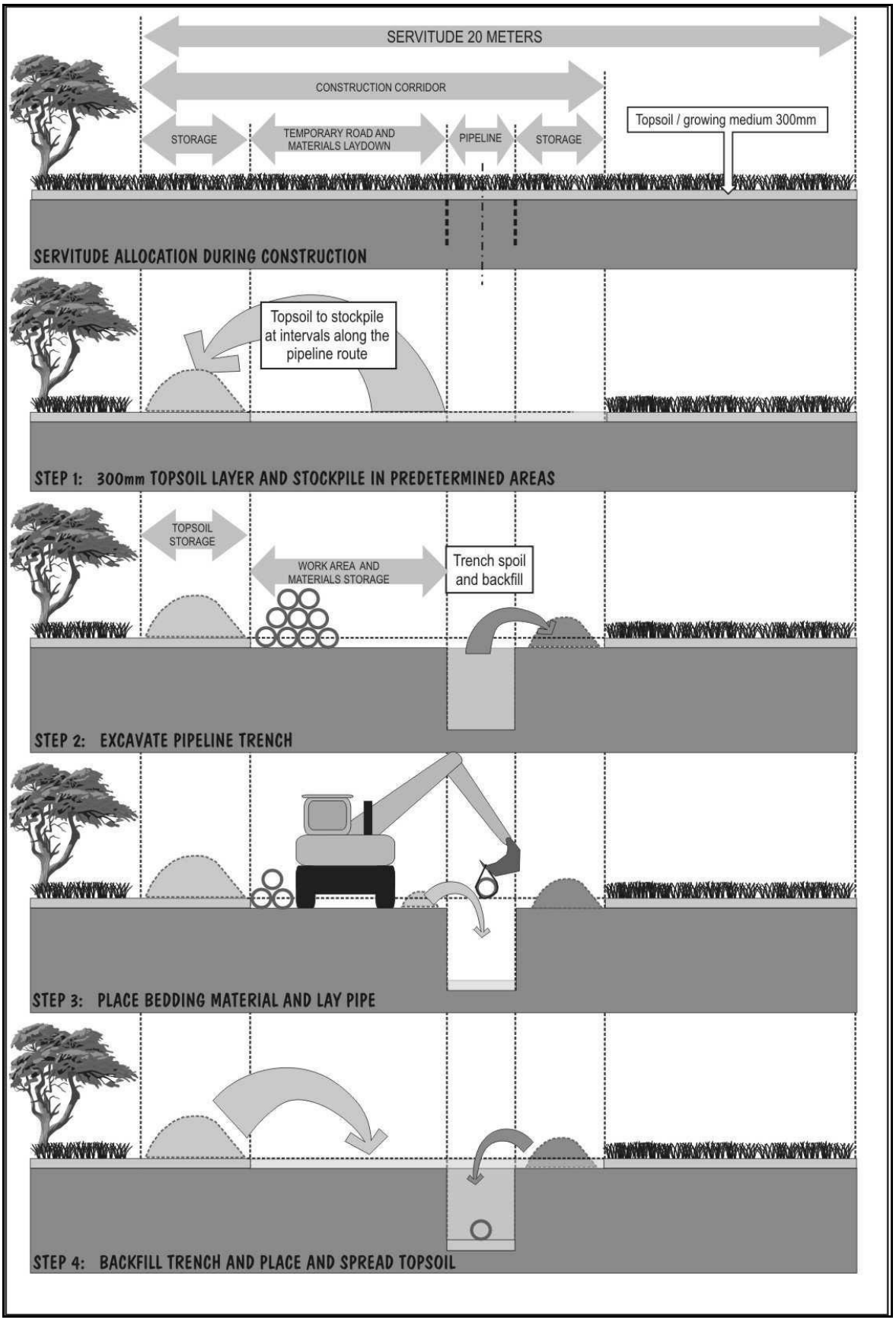

Figure 8. Illustration of a typical pipeline construction process, limiting construction activities to a 15m or narrower servitude and sequencing soil removal (taken from IEMS, DWAF, 2005b).

9.2 Impact Assessment

The impact assessment methodology utilised for the current study is included in Appendix 1.

Expected impacts include:

- Removal and loss of vegetation;
- Interception of the perched water table;
- Increased erosion;
- Increased sedimentation;
- Water quality deterioration;
- Soil compaction; and
- Increase in alien vegetation and weedy species.

All of these impacts will commence during the construction phase of the project, though some of these impacts, specifically the interception of the perched water table and the increase in alien and weedy species, will persist into the operational phase.

9.2.1 Removal and loss of vegetation

Where the proposed pipeline crosses wetlands along the route, wetland vegetation will be destroyed within the direct trench excavation as well as within the construction servitude. Given the disturbed nature of the wetlands and the fact that they are mostly charaterised by secondary vegetation, this impact is not considered to be of great significance. However, the removal and disturbance of the wetland vegetation will provide further opportunity for invasion by alien and weedy species, leading to further degradation of the wetland habitat. Removal of vegetation will also expose the wetland soils to erosion. This impact is expected to be Definite, Short-term, restricted to Site, and Moderate, leading to an impact of ***Moderate environmental significance***.

Mitigation

The Environmental Best Practice Specifications for Construction, as published by the DWAF (2005) in the Integrated Environmental Management Series should be fully implemented (this document is available from the DWA website: http://www.dwa.gov.za/iem.aspx). The construction servitude should be clearly demarcated (ideally it should be fenced) prior to the commencement of any construction activities on site. No heavy machinery should be permitted outside the demarcated construction servitude where this servitude crosses any wetland. In addition, no materials or soil should be stockpiled outside the demarcated servitude. Following the completion of construction the entire disturbed servitude should be rehabilitated. Where soils have been compacted or where vehicle tracks or rills have created preferential flow paths, the construction servitude should be ripped, scarified and landscaped to the natural landscape profile and re-vegetated with suitable indigenous grass species.

It is recommended that all individuals of *Hypoxis hemerocallidea* be removed from the construction servitude prior to the commencement of construction activities. Salvaged specimens should be relocated to an appropriate location or should be re-established on site following the completion of construction activities.

9.2.2 Interception of the perched water table

The hillslope seepage wetlands delineated on site are assumed to be supported by shallow perched water tables maintained by infiltrated rainfall. Such perched water tables are maintained in the soil by the presence of aquitards within the soil profile. Excavation of the pipeline trench across the hillslope seepage wetlands will result in the interception of this perched water table. Depending on the depth of the excavation as well as the nature of the bedding material, various scenarios are possible:

- Where the excavation breaches the aquitard supporting the perched water table this could lead to some loss of water from the perched water table to deeper infiltration into the soil/groundwater and resultant decreased flows in the downslope wetland. However, in all cases the wetlands along the proposed pipeline route are crossed immediately downslope by Allandale Road, reducing the significance of the decreased flows;
- Where the hydraulic conductivity of the bedding material is greater than that of the surrounding soil, the bedding material could create a preferential flow path in the subsurface, potentially leading to diversion of flows and piping resulting in erosion;
- The pipe and bedding material could create an impermeable or partially permeable barrier to the perched water table resulting in impoundment of flows upslope of the pipeline. Such impoundment would lead to increased saturation of the soil profile upslope of the pipeline and decreased saturation downslope.

This impact is expected to be Definite, Long-term, restricted to Site, and Moderate, leading to an impact of ***Moderate environmental significance***.

Mitigation

Ideally the pipeline should cross all wetlands perpendicular to the direction of flow to minimise impacts. Given the proposed route and the restriction on alternative alignments posed by Allandale Road, as well as the fact that flow directions through especially the south eastern hillslope seepage wetlands are not all parallel, this is not possible.

It is recommended that a material with low hydrological conductivity (a Bentonite mix is recommended), in the form of trench breakers should be packed around the pipe and should be installed at a minimum of 20m intervals to prevent the pipeline surface behaving as a conduit and to intercept any concentrated flow down the pipeline route. Where steeper slopes are encountered, trench breakers should be spaced so that flows impounding behind one trench breaker extend back to the base of the previous trench breaker. Given that the pipeline route runs immediately upslope of Allandale Road, no further mitigation measures are foreseen.

9.2.3 Increased erosion

Removal of vegetation and disturbance to the soils along the pipeline route will lead to an increase in erosion in these areas, with the wetlands being particularly susceptible. Ruts caused by vehicles and heavy machinery traversing the wetlands will further exacerbate erosion by concentrating surface run-off within the ruts. This impact is expected to be Definite, Short-term, restricted to Site and Moderate, leading to an impact of ***Moderate environmental significance***.

Mitigation

Mitigation measures should include:

- Construction activities should be undertaken during the dry season to minimise the threat of erosion due to surface run-off following heavy rains;
- Rather than excavating the entire pipeline trench at once, the trench should be excavated in phases with the pipe positioned and the trench backfilled within 3 days of excavation;
- The construction servitude should be limited to 15m and all activities and construction vehicle movement should be restricted to the servitude; and
- Following installation of the pipe and back filling of the trench the disturbed soils should be landscaped and re-vegetated as soon as possible.

9.2.4 Increased sedimentation

Bare, exposed soils and topsoil stockpiles are likely to be significant sediment sources to downslope wetland areas. Increased sedimentation in the wetlands could result in changes in vegetation communities as well as increase turbidity of surface waters in the wetlands. This impacts is expected to be Highly Probable, Short-term, restricted to Site and Low, leading to an impact of ***Low environmental significance.***

Mitigation

Mitigation measures should include:

- Construction activities should be undertaken during the dry season to minimise the threat of erosion due to surface run-off following heavy rains;
- Rather than excavating the entire pipeline trench at once, the trench should be excavated in phases with the pipe positioned and the trench backfilled within 3 days of excavation;
- Topsoil stockpile should be positioned on the upslope side of the excavated trench so that any sediment washed off the stockpiles is transported back into the trench rather than into downslope wetland areas;
- The construction servitude should be limited to 15m and all activities and construction vehicle movement should be restricted to the servitude; and
- Following installation of the pipe and back filling of the trench the disturbed soils should be landscaped and re-vegetated as soon as possible.

9.2.5 Water quality deterioration

Spillages of hazardous substances stored or used on site during the construction process, e.g. diesel and oil, could result in water quality deterioration should these enter any of the wetlands on site, or downstream wetlands. This impact is expected to be Definite, Short-term, restricted to Site and Moderate, leading to an impact of ***Moderate environmental significance***.

Mitigation

To prevent such spillages, no diesel or oil should be stored on site, other than what is required for work undertaken during the course of 1 day. Such diesel and oil should be stored in a way that will allow any spillages to be easily and quickly isolated (e.g. stored on plastic sheeting). Spills should be clean-up with approved absorbent material such as “Drizit” or “Spillsorb”. These should be kept in sufficient quantities on site to deal with small spills. Absorbent material and contaminated soil should be disposed of at a registered hazardous waste site. Should cement be used on site, the following guidelines apply:

- Carefully control all on-site operations that involve the use of cement and concrete.
- Limit cement and concrete mixing to single sites where possible.
- Use plastic trays or liners when mixing cement and concrete: Do not mix cement and concrete directly on the ground.
- Dispose of all visible remains of excess cement and concrete after the completion of tasks. Dispose of in the approved manner (solid waste concrete may be treated as inert construction rubble, but wet cement and liquid slurry, as well as cement powder must be treated as hazardous waste)

9.2.6 Soil compaction

Movement of vehicles and construction machinery along the construction servitude will result in the compaction of soils. Compacted soils will pose an obstacle to re-vegetation of the disturbed area and will lead to an increase in surface run-off and possibly erosion. This impacts is expected to be Highly Probable, Short-term, restricted to Site and Low, leading to an impact of ***Low environmental significance.***

Mitigation

Following the completion of construction the entire disturbed servitude should be rehabilitated. Where soils have been compacted or where vehicle tracks or rills have created preferential flow paths, the construction servitude should be ripped, scarified and landscaped to the natural landscape profile and re-vegetated with suitable indigenous grass species.

9.2.7 Increase in alien vegetation and weedy species

Removal of vegetation and other disturbances associated with the construction process will provide opportunity for the establishment of alien vegetation along the pipeline servitude. This impact is expected to be Definite, Short-term, restricted to Site and Moderate, leading to an impact of ***Moderate environmental significance***.

Mitigation

All alien vegetation should be removed along the entire pipeline servitude following the completion of construction. 6 monthly follow-up surveys should then also be done for a period of 2 years (4 additional surveys in total) to remove all alien vegetation.

10. CONCLUSIONS

The literature review indicated that 335 bird, 92 mammal, 53 reptile and 18 amphibian species occur or potentially occur within Quarter Degree Square 2628AA While this may suggest that this area is able to support high faunal species richness, the highly transformed nature of the vegetation on site, location of the study area within the urban edge, continuous high levels of human disturbance, and limited connectivity of the study area, make it unlikely that the actual species richness on site is particularly high. Species expected to be found on site include generalist species, and those which have adapted to living in urban areas or in close proximity to human activity. No protected or Red Data List faunal species were observed during the site visit. The study area lies within the distribution ranges of a number of Red Data List species, yet suitable habitat to support these species is not present on site. However, should any Red data List species

be encountered on site during the construction of the pipeline, a suitably qualified zoologist should be consulted to determine the proper method of handling, and the proper location for release of, the animal/s.

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APPENDIX 1

Impact Rating Methodology

Occurrence		
Probability of occurrence (how likely is it that the impact may occur?), and		
Duration of occurrence (how long may it last?).		
Severity		
Magnitude (severity) of impact (will the impact be of high, moderate or low severity?), and		
Scale/extent of impact (will the impact affect the national, regional or local environment, or only that of the site?)		
In order to assess each of these factors for each impact, the following ranking scales were used:		
Probability	***Duration***	
5 - Definite/don't know	5 - Permanent	
4 - Highly probable	4 - Long-term (ceases with the operational life)	
3 - Medium probability	3 - Medium-term (5-15 years)	
2 - Low probability	2 - Short-term (0-5 years)	
1 - Improbable	1 - Immediate	
0 - None		
Scale	***Magnitude***	
5 - International	10 - Very high/don't know	
4 - National	8 - High	
3 - Regional	6 - Moderate	
2 - Local	4 - Low	
1 - Site only	2 - Minor	
0 - None		
Once the above factors had been ranked for each impact, the environmental significance of each was assessed using the following formula:		
SP = (magnitude + duration + scale) x probability		
The maximum value is 100 significance points (SP). Environmental effects were rated as either of high, moderate or low significance on the following		
More than 60 significance points indicated high (H) environmental significance.		
Between 30 and 60 significance points indicated moderate (M) environmental significance.		
Less than 30 significance points indicated low (L) environmental significance.		

APPENDIX 2: AVIFAUNAL SPECIES LIST

Bird species recorded within QDS 2628AA during the South African Bird Atlas Project 1.
(CR = Critically Endangered, EN = Endangered, NT = Near Threatened, VU = Vulnerable, LC = Least Concern).

SPECIES	COMMON NAME	CONSERVATION STATUS
Podiceps cristatus	Great Crested Grebe	LC
Podiceps nigricollis	Black-necked Grebe	LC
Tachybaptus ruficollis	Little Grebe	LC
Phalacrocorax lucidus	White-breasted Cormorant	LC
Phalacrocorax africanus	Reed Cormorant	LC
Anhinga rufa	African Darter	LC
Ardea cinerea	Grey Heron	LC
Ardea melanocephala	Black-headed Heron	LC
Ardea goliath	Goliath Heron	LC
Ardea purpurea	Purple Heron	LC
Egretta alba	Great Egret	LC
Egretta garzetta	Little Egret	LC
Egretta intermedia	Yellow-billed Egret	LC
Egretta ardesiaca	Black Heron	LC
Bubulcus ibis	Cattle Egret	LC
Ardeola ralloides	Squacco Heron	LC
Butorides striata	Green-backed Heron	LC
Nycticorax nycticorax	Black-crowned Night-Heron	LC
Ixobrychus minutus	Little Bittern	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Scopus umbretta	Hamerkop	LC
Ciconia ciconia	White Stork	LC
Ciconia nigra	Black Stork	NT
Ciconia abdimii	Abdim's Stork	LC
Ephippiorhynchus senegalensis	Saddle-billed Stork	EN
Leptoptilos crumeniferus	Marabou Stork	NT
Mycteria ibis	Yellow-billed Stork	NT
Threskiornis aethiopicus	African Sacred Ibis	LC
Plegadis falcinellus	Glossy Ibis	LC
Bostrychia hagedash	Hadeda Ibis	LC
Platalea alba	African Spoonbill	LC
Phoenicopterus ruber	Greater Flamingo	NT
Phoenicopterus minor	Lesser Flamingo	NT
Dendrocygna viduata	White-faced Duck	LC
Dendrocygna bicolor	Fulvous Duck	LC
Thalassornis leuconotus	White-backed Duck	LC
Alopochen aegyptiaca	Egyptian Goose	LC
Tadorna cana	South African Shelduck	LC
Anas undulata	Yellow-billed Duck	LC
Anas sparsa	African Black Duck	LC
Anas capensis	Cape Teal	LC
Anas hottentota	Hottentot Teal	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Anas erythrorhyncha	Red-billed Teal	LC
Anas smithii	Cape Shoveler	LC
Netta erythrophthalma	Southern Pochard	LC
Sarkidiornis melanotos	Comb Duck	LC
Plectropterus gambensis	Spur-winged Goose	LC
Oxyura maccoa	Maccoa Duck	LC
Sagittarius serpentarius	Secretarybird	NT
Gyps coprotheres	Cape Vulture	VU
Milvus migrans	Black Kite	LC
Elanus caeruleus	Black-shouldered Kite	LC
Aviceda cuculoides	African Cuckoo Hawk	LC
Aquila verreauxii	Verreauxs' Eagle	LC
Aquila wahlbergi	Wahlberg's Eagle	LC
Aquila pennatus	Booted Eagle	LC
Aquila ayresii	Ayres's Hawk-Eagle	NT
Lophaetus occipitalis	Long-crested Eagle	LC
Polemaetus bellicosus	Martial Eagle	VU
Circaetus cinereus	Brown Snake-Eagle	LC
Circaetus pectoralis	Black-chested Snake-Eagle	LC
Haliaeetus vocifer	African Fish-Eagle	LC
Buteo vulpinus	Steppe Buzzard	LC
Buteo rufofuscus	Jackal Buzzard	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Kaupifalco monogrammicus	Lizard Buzzard	LC
Accipiter ovampensis	Ovambo Sparrowhawk	LC
Accipiter minullus	Little Sparrowhawk	LC
Accipiter melanoleucus	Black Sparrowhawk	LC
Accipiter badius	Shikra	LC
Melierax gabar	Gabar Goshawk	LC
Circus ranivorus	African Marsh-Harrier	VU
Falco biarmicus	Lanner Falcon	NT
Falco subbuteo	Eurasian Hobby	LC
Falco vespertinus	Red-footed Falcon	LC
Falco amurensis	Amur Falcon	LC
Falco rupicolus	Rock Kestrel	LC
Falco rupicoloides	Greater Kestrel	LC
Falco naumanni	Lesser Kestrel	VU
Peliperdix coqui	Coqui Francolin	LC
Scleroptila levaillantii	Red-winged Francolin	LC
Scleroptila levaillantoides	Orange River Francolin	LC
Pternistis swainsonii	Swainson's Spurfowl	LC
Coturnix coturnix	Common Quail	LC
Numida meleagris	Helmeted Guineafowl	LC
Turnix sylvaticus	Kurrichane Buttonquail	LC
Anthropoides paradiseus	Blue Crane	VU
Rallus caerulescens	African Rail	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Crex crex	Corn Crake	VU
Crecopsis egregia	African Crake	LC
Amaurornis flavirostris	Black Crake	LC
Sarothrura rufa	Red-chested Flufftail	LC
Porphyrio madagascariensis	African Purple Swamphen	LC
Gallinula chloropus	Common Moorhen	LC
Fulica cristata	Red-knobbed Coot	LC
Eupodotis senegalensis	White-bellied Korhaan	VU
Afrotis afra	Southern Black Korhaan	LC
Actophilornis africanus	African Jacana	LC
Rostratula benghalensis	Greater Painted-snipe	NT
Charadrius hiaticula	Common Ringed Plover	LC
Charadrius pecuarius	Kittlitz's Plover	LC
Charadrius tricollaris	Three-banded Plover	LC
Vanellus coronatus	Crowned Lapwing	LC
Vanellus armatus	Blacksmith Lapwing	LC
Vanellus senegallus	African Wattled Lapwing	LC
Actitis hypoleucos	Common Sandpiper	LC
Tringa glareola	Wood Sandpiper	LC
Tringa stagnatilis	Marsh Sandpiper	LC
Tringa nebularia	Common Greenshank	LC
Calidris ferruginea	Curlew Sandpiper	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Calidris minuta	Little Stint	LC
Philomachus pugnax	Ruff	LC
Gallinago nigripennis	African Snipe	LC
Limosa limosa	Black-tailed Godwit	LC
Limosa lapponica	Bar-tailed Godwit	LC
Phalaropus fulicaria	Red Phalarope	LC
Recurvirostra avosetta	Pied Avocet	LC
Himantopus himantopus	Black-winged Stilt	LC
Burhinus capensis	Spotted Thick-knee	LC
Cursorius temminckii	Temminck's Courser	LC
Glareola nordmanni	Black-winged Pratincole	NT
Larus fuscus	Lesser Black-backed Gull	LC
Larus cirrocephalus	Grey-headed Gull	LC
Larus pipixcan	Franklin's Gull	LC
Chlidonias hybrida	Whiskered Tern	LC
Chlidonias leucopterus	White-winged Tern	LC
Columba livia	Rock Dove	LC
Columba guinea	Speckled Pigeon	LC
Columba arquatrix	African Olive-Pigeon	LC
Streptopelia semitorquata	Red-eyed Dove	LC
Streptopelia capicola	Cape Turtle-Dove	LC
Streptopelia senegalensis	Laughing Dove	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Oena capensis	Namaqua Dove	LC
Psittacula krameri	Rose-ringed Parakeet	LC
Corythaixoides concolor	Grey Go-away-bird	LC
Cuculus canorus	Common Cuckoo	LC
Cuculus gularis	African Cuckoo	LC
Cuculus solitarius	Red-chested Cuckoo	LC
Cuculus clamosus	Black Cuckoo	LC
Clamator jacobinus	Jacobin Cuckoo	LC
Chrysococcyx klaas	Klaas's Cuckoo	LC
Chrysococcyx caprius	Diderick Cuckoo	LC
Centropus burchellii	Burchell's Coucal	LC
Tyto alba	Barn Owl	LC
Tyto capensis	African Grass-Owl	VU
Asio capensis	Marsh Owl	LC
Otus senegalensis	African Scops-Owl	LC
Ptilopsis granti	Southern White-faced Scops-Owl	LC
Bubo africanus	Spotted Eagle-Owl	LC
Bubo lacteus	Verreaux's Eagle-Owl	LC
Caprimulgus europaeus	European Nightjar	LC
Caprimulgus pectoralis	Fiery-necked Nightjar	LC
Caprimulgus rufigena	Rufous-cheeked Nightjar	LC
Caprimulgus tristigma	Freckled Nightjar	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Apus apus	Common Swift	LC
Apus barbatus	African Black Swift	LC
Apus caffer	White-rumped Swift	LC
Apus horus	Horus Swift	LC
Apus affinis	Little Swift	LC
Tachymarptis melba	Alpine Swift	LC
Cypsiurus parvus	African Palm-Swift	LC
Colius striatus	Speckled Mousebird	LC
Colius colius	White-backed Mousebird	LC
Urocolius indicus	Red-faced Mousebird	LC
Ceryle rudis	Pied Kingfisher	LC
Megaceryle maximus	Giant Kingfisher	LC
Alcedo semitorquata	Half-collared Kingfisher	NT
Alcedo cristata	Malachite Kingfisher	LC
Halcyon senegalensis	Woodland Kingfisher	LC
Halcyon albiventris	Brown-hooded Kingfisher	LC
Merops apiaster	European Bee-eater	LC
Merops persicus	Blue-cheeked Bee-eater	LC
Merops bullockoides	White-fronted Bee-eater	LC
Merops pusillus	Little Bee-eater	LC
Coracias garrulus	European Roller	LC
Coracias caudatus	Lilac-breasted Roller	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Coracias naevius	Purple Roller	LC
Upupa africana	African Hoopoe	LC
Phoeniculus purpureus	Green Wood-Hoopoe	LC
Rhinopomastus cyanomelas	Common Scimitarbill	LC
Tockus nasutus	African Grey Hornbill	LC
Tockus leucomelas	Southern Yellow-billed Hornbill	LC
Lybius torquatus	Black-collared Barbet	LC
Tricholaema leucomelas	Acacia Pied Barbet	LC
Pogoniulus chrysoconus	Yellow-fronted Tinkerbird	LC
Trachyphonus vaillantii	Crested Barbet	LC
Indicator indicator	Greater Honeyguide	LC
Indicator minor	Lesser Honeyguide	LC
Prodotiscus regulus	Brown-backed Honeybird	LC
Campethera abingoni	Golden-tailed Woodpecker	LC
Dendropicos fuscescens	Cardinal Woodpecker	LC
Dendropicos namaquus	Bearded Woodpecker	LC
Jynx ruficollis	Red-throated Wryneck	LC
Mirafra cheniana	Melodious Lark	NT
Mirafra africana	Rufous-naped Lark	LC
Mirafra apiata	Cape Clapper Lark	LC
Calendulauda sabota	Sabota Lark	LC
Chersomanes albofasciata	Spike-heeled Lark	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Calandrella cinerea	Red-capped Lark	LC
Spizocorys conirostris	Pink-billed Lark	LC
Eremopterix leucotis	Chestnut-backed Sparrowlark	LC
Hirundo rustica	Barn Swallow	LC
Hirundo albigularis	White-throated Swallow	LC
Hirundo dimidiata	Pearl-breasted Swallow	LC
Hirundo semirufa	Red-breasted Swallow	LC
Hirundo cucullata	Greater Striped Swallow	LC
Hirundo abyssinica	Lesser Striped Swallow	LC
Hirundo spilodera	South African Cliff-Swallow	LC
Hirundo fuligula	Rock Martin	LC
Delichon urbicum	Common House-Martin	LC
Riparia riparia	Sand Martin	LC
Riparia paludicola	Brown-throated Martin	LC
Riparia cincta	Banded Martin	LC
Campephaga flava	Black Cuckooshrike	LC
Dicrurus adsimilis	Fork-tailed Drongo	LC
Oriolus oriolus	Eurasian Golden Oriole	LC
Oriolus larvatus	Black-headed Oriole	LC
Corvus capensis	Cape Crow	LC
Corvus albus	Pied Crow	LC
Turdoides jardineii	Arrow-marked Babbler	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Pycnonotus nigricans	African Red-eyed Bulbul	LC
Pycnonotus tricolor	Dark-capped Bulbul	LC
Turdus libonyanus	Kurrichane Thrush	LC
Turdus olivaceus	Olive Thrush	LC
Psophocichla litsitsirupa	Groundscraper Thrush	LC
Oenanthe monticola	Mountain Wheatear	LC
Oenanthe pileata	Capped Wheatear	LC
Cercomela familiaris	Familiar Chat	LC
Thamnolaea cinnamomeiventris	Mocking Cliff-Chat	LC
Myrmecocichla formicivora	Ant-eating Chat	LC
Saxicola torquatus	African Stonechat	LC
Cossypha caffra	Cape Robin-Chat	LC
Cercotrichas paena	Kalahari Scrub-Robin	LC
Sylvia borin	Garden Warbler	LC
Sylvia communis	Common Whitethroat	LC
Parisoma subcaeruleum	Chestnut-vented Tit-Babbler	LC
Hippolais icterina	Icterine Warbler	LC
Acrocephalus arundinaceus	Great Reed-Warbler	LC
Acrocephalus baeticatus	African Reed-Warbler	LC
Acrocephalus palustris	Marsh Warbler	LC
Acrocephalus schoenobaenus	Sedge Warbler	LC
Acrocephalus gracilirostris	Lesser Swamp-Warbler	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Bradypterus baboecala	Little Rush-Warbler	LC
Phylloscopus trochilus	Willow Warbler	LC
Apalis thoracica	Bar-throated Apalis	LC
Sylvietta rufescens	Long-billed Crombec	LC
Eremomela icteropygialis	Yellow-bellied Eremomela	LC
Sphenoeacus afer	Cape Grassbird	LC
Cisticola juncidis	Zitting Cisticola	LC
Cisticola aridulus	Desert Cisticola	LC
Cisticola textrix	Cloud Cisticola	LC
Cisticola ayresii	Wing-snapping Cisticola	LC
Cisticola lais	Wailing Cisticola	LC
Cisticola chiniana	Rattling Cisticola	LC
Cisticola tinniens	Levaillant's Cisticola	LC
Cisticola aberrans	Lazy Cisticola	LC
Cisticola fulvicapilla	Neddicky	LC
Prinia subflava	Tawny-flanked Prinia	LC
Prinia flavicans	Black-chested Prinia	LC
Muscicapa striata	Spotted Flycatcher	LC
Melaenornis pammelaina	Southern Black Flycatcher	LC
Bradornis mariquensis	Marico Flycatcher	LC
Sigelus silens	Fiscal Flycatcher	LC
Batis molitor	Chinspot Batis	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Stenostira scita	Fairy Flycatcher	LC
Terpsiphone viridis	African Paradise-Flycatcher	LC
Motacilla aguimp	African Pied Wagtail	LC
Motacilla capensis	Cape Wagtail	LC
Anthus cinnamomeus	African Pipit	LC
Anthus similis	Long-billed Pipit	LC
Anthus leucophrys	Plain-backed Pipit	LC
Anthus vaalensis	Buffy Pipit	LC
Anthus lineiventris	Striped Pipit	LC
Macronyx capensis	Cape Longclaw	LC
Lanius minor	Lesser Grey Shrike	LC
Lanius collaris	Common Fiscal	LC
Lanius collurio	Red-backed Shrike	LC
Laniarius ferrugineus	Southern Boubou	LC
Laniarius atrococcineus	Crimson-breasted Shrike	LC
Dryoscopus cubla	Black-backed Puffback	LC
Nilaus afer	Brubru	LC
Tchagra australis	Brown-crowned Tchagra	LC
Tchagra senegalus	Black-crowned Tchagra	LC
Telophorus zeylonus	Bokmakierie	LC
Malaconotus blanchoti	Grey-headed Bush-Shrike	LC
Prionops plumatus	White-crested Helmet-Shrike	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Acridotheres tristis	Common Myna	LC
Spreo bicolor	Pied Starling	LC
Creatophora cinerea	Wattled Starling	LC
Cinnyricinclus leucogaster	Violet-backed Starling	LC
Lamprotornis nitens	Cape Glossy Starling	LC
Onychognathus morio	Red-winged Starling	LC
Nectarinia famosa	Malachite Sunbird	LC
Cinnyris mariquensis	Marico Sunbird	LC
Cinnyris afer	Greater Double-collared Sunbird	LC
Cinnyris talatala	White-bellied Sunbird	LC
Chalcomitra amethystina	Amethyst Sunbird	LC
Zosterops virens	Cape White-eye	LC
Plocepasser mahali	White-browed Sparrow-Weaver	LC
Passer domesticus	House Sparrow	LC
Passer melanurus	Cape Sparrow	LC
Passer diffusus	Southern Grey-headed Sparrow	LC
Petronia superciliaris	Yellow-throated Petronia	LC
Sporopipes squamifrons	Scaly-feathered Finch	LC
Amblyospiza albifrons	Thick-billed Weaver	LC
Ploceus cucullatus	Village Weaver	LC
Ploceus capensis	Cape Weaver	LC
Ploceus velatus	Southern Masked-Weaver	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Anomalospiza imberbis	Cuckoo Finch	LC
Quelea quelea	Red-billed Quelea	LC
Euplectes orix	Southern Red Bishop	LC
Euplectes afer	Yellow-crowned Bishop	LC
Euplectes albonotatus	White-winged Widowbird	LC
Euplectes ardens	Red-collared Widowbird	LC
Euplectes progne	Long-tailed Widowbird	LC
Lagonosticta rubricata	African Firefinch	LC
Lagonosticta rhodopareia	Jameson's Firefinch	LC
Lagonosticta senegala	Red-billed Firefinch	LC
Uraeginthus angolensis	Blue Waxbill	LC
Estrilda astrild	Common Waxbill	LC
Coccopygia melanotis	Swee Waxbill	LC
Ortygospiza atricollis	African Quailfinch	LC
Sporaeginthus subflavus	Orange-breasted Waxbill	LC
Amadina erythrocephala	Red-headed Finch	LC
Spermestes cucullatus	Bronze Mannikin	LC
Vidua macroura	Pin-tailed Whydah	LC
Vidua paradisaea	Long-tailed Paradise-Whydah	LC
Vidua chalybeata	Village Indigobird	LC
Crithagra mozambicus	Yellow-fronted Canary	LC
Crithagra atrogularis	Black-throated Canary	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Serinus canicollis	Cape Canary	LC
Crithagra flaviventris	Yellow Canary	LC
Crithagra gularis	Streaky-headed Seedeater	LC
Emberiza flaviventris	Golden-breasted Bunting	LC
Emberiza capensis	Cape Bunting	LC
Emberiza tahapisi	Cinnamon-breasted Bunting	LC
Anas platyrhynchos	Mallard	LC

APPENDIX 3: MAMMAL SPECIES LIST

Small- to medium-sized mammal species potentially occurring in QDS 2628AA based on their distribution ranges and their likelihood of occurrence within the study site.
(CR = Critically Endangered, EN = Endangered, NT = Near Threatened, VU = Vulnerable, LC = Least Concern).

SPECIES	COMMON NAME	CONSERVATION STATUS	LIKELYHOOD OF OCCURENCE
Amblysomus septentrionalis	Highveld golden mole	NT	LOW
Chrysospalax villosus	Rough-haired golden mole	CR	MODERATE
Aonyx capensis	Cape clawless otter	LC	LOW
Atilax paludinosus	Water/Marsh mongoose	LC	MODERATE
Canis mesomelas	Black-backed jackal	LC	LOW
Caracal caracal	Caracal	LC	LOW
Cynictis penicillata	Yellow mongoose	LC	HIGH
Felis nigripes	Black-footed cat	LC	LOW
Felis silvestris	African wild cat	LC	LOW
Galerella sanguinea	Slender mongoose	LC	HIGH
Genetta genetta	Small-spotted genet	LC	LOW
Genetta tigrina	Large-spotted genet	LC	LOW
Helogale parvula	Dwarf mongoose	LC	LOW
Ichneumia albicauda	White-tailed mongoose	LC	LOW
Ictonyx striatus	Striped polecat	LC	MOERATE
Leptailurus serval	Serval	NT	LOW
Lutra maculicollis	Spotted-necked otter	NT	LOW
Mellivora capensis	Honey badger (Ratel)	NT	LOW
Mungos mungo	Banded mongoose	LC	LOW

SPECIES	COMMON NAME	CONSERVATION STATUS	LIKELYHOOD OF OCCURENCE
Poecilogale albinucha	Striped/African weasel	DD	MODERATE
Suricata suricatta	Suricate	LC	LOW
Vulpes chama	Cape fox	LC	LOW
Cloeotis percivali	Short-eared trident bat	CR	LOW
Epomophorus wahlbergi	Wahlberg's epauletted fruit bat	LC	LOW
Miniopterus schreibersii	Schreibers' long-fingered bat	NT	LOW
Myotis tricolor	Temminck's hairy bat	NT	LOW
Myotis welwitschii	Welwitsch's hairy bat	NT	LOW
Neoromicia capensis	Cape serotine bat	LC	HIGH
Nycteris thebaica	Egyptian slit-faced bat	LC	LOW
Pipistrellus rusticus	Rusty bat	NT	LOW
Rhinolophus blasii	Peak-saddle horseshoe bat	VU	LOW
Rhinolophus clivosus	Geoffrey's horseshoe bat	NT	LOW
Rhinolophus darlingi	Darling's horseshoe bat	NT	LOW
Rhinolophus simulator	Bushveld horseshoe bat	LC	LOW
Sauromys petrophilus	Flat-headed free-tailed bat	LC	LOW
Scotophilus dinganii	Yellow house bat	LC	MODERATE
Scotophilus viridis	Lesser yellow house bat	LC	MODERATE
Tadarida aegyptiaca	Egyptian free-tailed bat	LC	MODERATE
Taphozous mauritianus	Tomb bat	LC	MODERATE
Atelerix frontalis	South African hedgehog	NT	MODERATE
Crocidura cyanea	Reddish-grey musk shrew	DD	LOW

SPECIES	COMMON NAME	CONSERVATION STATUS	LIKELYHOOD OF OCCURENCE
Crocidura fuscomurina	Tiny musk shrew	DD	LOW
Crocidura hirta	Lesser red musk shrew	DD	MODERATE
Crocidura maquassiensis	Maquassie musk shrew	VU	LOW
Crocidura mariquensis	Swamp musk shrew	DD	LOW
Crocidura silacea	Lesser grey-brown musk shrew	DD	MODERATE
Myosorex cafer	Dark-footed forest shrew	DD	MODERATE
Myosorex varius	Forest shrew	DD	MODERATE
Suncus infinitesimus	Least dwarf shrew	DD	LOW
Suncus lixus	Greater dwarf shrew	DD	MODERATE
Suncus varilla	Lesser dwarf shrew	DD	LOW
Procavia capensis	Rock dassie	LC	LOW
Lepus saxatillus	Scub hare/Savannah hare	LC	HIGH
Pronolagus randensis	Jameson's red rock rabbit	LC	LOW
Elephantulus brachyrhynchus	Short-snouted elephant-shrew	DD	LOW
Elephantulus myurus	Rock elephant-shrew	LC	MODERATE
Cercopithecus aethiops	Vervet monkey	LC	LOW
Galago moholi	Lesser bushbaby	LC	LOW
Papio ursinus	Chacma baboon	LC	LOW
Aethomys ineptus	Tete veld rat	LC	LOW
Cryptomys hottentotus	Common mole-rat	LC	HIGH
Dasymys incomtus	Water rat	NT	MODERATE
Dendromus melanotis	Grey climbing mouse	LC	MODERATE

SPECIES	COMMON NAME	CONSERVATION STATUS	LIKELYHOOD OF OCCURENCE
Dendromus mystacalis	Chestnut climbing mouse	LC	MODERATE
Graphiurus murinus	Woodland dormouse	LC	LOW
Graphiurus platyops	Rock dormouse	DD	LOW
Hystrix africaeaustralis	Porcupine	LC	MODERATE
Lemniscomys rosalia	Single-striped mouse	DD	HIGH
Mastomys coucha	Multimammate mouse	LC	HIGH
Micaelamys namaquensis	Namaqua rock mouse	LC	LOW
Mystromys albicaudatus	White-tailed mouse	EN	MODERATE
Otomys angoniensis	Angoni vlei rat	LC	LOW
Otomys irroratus	Vlei rat	LC	MODERATE
Pedetes capensis	Springhare	LC	LOW
Rhabdomys pumilio	Striped mouse	LC	HIGH
Saccostomus campestris	Pouched mouse	LC	HIGH
Steatomys krebsii	Krebs' fat mouse	LC	MODERATE
Steatomys pratensis	Fat mouse	LC	MODERATE
Tatera bransii	Highveld gerbil	LC	HIGH
Tatera leucogaster	Bushveld gerbil	DD	LOW
Thallomys paedulcus	Tree mouse	LC	LOW
Thryonomys swinderianus	Greater cane rat	LC	LOW
Xerus inauris	Cape Ground squirrel	LC	LOW
Oreotragus oreotragus	Klipspringer	LC	LOW
Ourebia ourebi	Oribi	EN	LOW

SPECIES	COMMON NAME	CONSERVATION STATUS	LIKELYHOOD OF OCCURENCE
Pelea capreolus	Grey rhebok	LC	LOW
Raphicerus campestris	Steenbok	LC	MODERATE
Redunca arundinum	Reedbuck	LC	LOW
Redunca fulvorufula	Mountain reedbuck	LC	LOW
Sylvicapra grimmia	Common duiker	LC	HIGH
Phacochoerus africanus	Warthog	LC	LOW
Orycteropus afer	Aardvark	LC	LOW

APPENDIX 4: AMPHIBIAN SPECIES LIST

Amphibian species potentially occurring in QDS 2628AA based on their distribution ranges. (CR = Critically Endangered, EN = Endangered, NT = Near Threatened, VU = Vulnerable, LC = Least Concern).

SPECIES	COMMON NAME	CONSERVATION STATUS
Breviceps adspersus	Bushveld rain frog	LC
Amietophrynus garmani	Eastern olive toad	LC
Amietophrynus gutturalis	Guttural Toad	LC
Amietophrynus poweri	Western olive toad	LC
Amietophrynus rangeri	Raucous toad	LC
Poyntonophrynus fenoulheti	Northern Pygmy toad	LC
Kassina senegalensis	Bubbling kassina	LC
Semnodactylus wealii	Rattling frog	LC
Phrynobatrachus natalensis	Snoring puddle frog	LC
Xenopus laevis	Common platanna	LC
Amietia angolensis	Common river frog	LC
Amietia fuscigula	Cape river frog	LC
Cacosternum boettgeri	Boettger's caco	LC
Pyxicephalus adspersus	Giant bullfrog	NT
Strongylopus fasciatus	Striped stream frog	LC
Tomopterna cryptotis	Tremolo sand frog	LC
Tomopterna natalensis	Natal sand frog	LC
Tomopterna tandyi	Tandy's sand frog	LC

APPENDIX 5: REPTILE SPECIES LIST

Reptile species potentially occurring in QDS 2628AA based on their distribution ranges.
(CR = Critically Endangered, EN = Endangered, NT = Near Threatened, VU = Vulnerable, LC = Least Concern).

SPECIES	COMMON NAME	CONSERVATION STATUS
Agama aculeata	Ground agama	LC
Agama atra	Southern rock/Knobel's agama	LC
Monopeltis infuscata	Dusky spade-snouted worm lizard	LC
Aparallactus cepensis	Cape centipede eater	LC
Atractaspis bibronii	Southern/Bibron's burrowing asp	LC
Atractaspis duerdeni	Duerden's/Beaked burrowing asp	LC
Python natalensis	Southern African python	VU*
Crotaphopeltis hotamboeia	Herald/Red-lipped snake	LC
Dasypeltis scabra	Common/Rhombic egg eater	LC
Duberria lutrix	Common slug eater	LC
Lamprophis aurora	Aurora house snake	LC
Lamprophis fuliginosus	Brown house snake	LC
Lamprophis inornatus	Olive house snake	LC
Lycodonomorphus rufulus	Common brown water snake	LC
Lycophidion capense	Cape wolf snake	LC
Mehelya capensis	Cape file snake	LC
Philothamnus hoplogaster	Green water snake	LC
Philothamnus natalensis	Eastern green snake	LC
Philothamnus semivariegatus	Spotted bush snake	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Psammophis brevirostris	Short-snouted grass snake	LC
Psammophis crucifer	Cross marked/Montane grass snake	LC
Psammophis leightoni	Cape/Namib/Fork-marked sand snakes	LC
Psammophylax rhombeatus	Spotted/Rhombic skaapsteker	LC
Psammophylax tritaeniatus	Striped skaapsteker	LC
Pseudaspis cana	Mole snake	LC
Cordylus giganteus	Giant girdled lizard/Sungazer	VU
Cordylus vittifer	Transvaal girdled lizard	LC
Elapsoidea sunderwallii	Sundevall's garter snake	LC
Hemachatus haemachatus	Rinkhals	LC
Homoroselaps lacteus	Spotted harlequin snake	LC
Naja mossambica	Mozambique spitting cobra	LC
Lygodactylus capensis capensis	Cape dwarf gecko	LC
Pachydactylus affinis	Transvaal thick-toad gecko	LC
Pachydactylus capensis	Cape thick-toed gecko	LC
Gerrhosaurus flavigularis	Yellow-throated plated lizard	LC
Ichnotropis squamulosa	Common rough-scaled lizard	LC
Nucras ornata	Ornate sandveld lizard	LC
Pedioplanis lineoocellata	Spotted sand lizard	LC
Leptotyphlops conjunctus conjunctus	Cape thread snake	LC
Leptotyphlops scutifrons	Peter's thread snake	LC
Acontias gracilicauda	Thin-tailed legless skink	LC

SPECIES	COMMON NAME	CONSERVATION STATUS
Mabuya capensis	Cape skink	LC
Mabuya striata	Striped skink	LC
Mabuya varia	Variable skink	LC
Panaspis wahlbergii	Wahlberg's snake-eyed skink	LC
Rhinotyphlops lalandei	Delalande's beaked blind snake	LC
Typhlops bibronii	Bibron's blind snake	LC
Varanus albigularis	Rock/White-throated monitor	LC
Varanus niloticus	Nile/Water monitor	LC
Bitis arietans	Puff adder	LC
Causus rhombeatus	Common/Rhombic night adder	LC
Trachemys scripta	American red-eared terrapin	LC
Pelomedusa subrufa	Marsh/Helmeted terrapin	LC

* South African Assessment only.

APPENDIX H

EMP

Prepared for Group Five Construction (Pty) Ltd

ENVIRONMENTAL MANAGEMENT PLAN

WATERFALL JUNCTION WATER PIPELINE

Ref 002/11-12/E0001

Prepared by Seaton Thomson and Associates
June 2011

P O Box 936
IRENE
0062

Tel (012) 667-2107
Fax (012) 667-2109
E-mail seaton@yebo.co.za

ENVIRONMENTAL MANAGEMENT PLAN

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WATERFALL JUNCTION WATER PIPELINE

1.0 INTRODUCTION

The Environmental Management Plan (EMP) provides guidelines and directions to ensure that the proposed development is able to pursue its economic goals without impairing the long- term sustainability of the biophysical and cultural environment. The EMP addresses the managerial and operational activities of the development during and after construction. Once approved by the authority (GDARD), compliance is obligatory for developers, contractors, service providers and property owners.

2.0 ACTIVITIES COVERED BY THE EMP

The proposed activity comprises of the construction of a bulk water pipeline

The application will include Regulation 544 Activities 9 and 11 of the National Environmental Management Act (NEMA) (No. 107 of 1998), Environmental Impact Assessment Regulations 2010

The various activities associated with the development are as follows

Regulation 544 Activity 9 - The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water –

(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:

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.

Regulation 544 Activity 11 - The construction of:

(i) canals;
(ii) channels;
(iii) bridges;
(iv) dams;
(v) weirs;
(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 metres in size; or
(xi) infrastructure or structures covering 50 square metres or more

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.

Regulation 544 Activity 18 - The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from

(i) a watercourse;
(ii) the sea;
(iii) the seashore;

(iv) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater-

but excluding where such infilling, depositing, dredging, excavation, removal or moving

(i) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or occurs behind the development setback line.

3.0 CONTRACTOR / ENGINEER FOR THE PROPOSED WATER LINE

GROUP FIVE CONSTRUCTION (PTY) LTD

The contractor / engineer is ultimately responsible for:

- Commissioning the preparation, implementation and monitoring of the EMP.
- Ensuring that the EMP is submitted for approval with the Environmental Impact Assessment and that approval in the form of a Record of Decision is given before development begins.
- Appointing the Environmental Control Officer.
- Ensuring compliance by all parties and the imposition of penalties for non-compliance through the ECO.
- Bearing the costs of development and implementation.
- Implementing corrective action where required
- After the development has been completed and individual buyers take ownership, the above responsibilities devolve to the property owners association or other appropriate organisation.

4.0 ENVIRONMENTAL CONSULTANT

SEATON THOMSON AND ASSOCIATES

The consultant is responsible for:

- Preparing the EMP.
- Facilitating its submission to the Authority for a Record of Decision.
- The consultant is *not* responsible for the implementation or the monitoring of the EMP unless expressly commissioned to do so.

Seaton Thomson and Associates have ±30 years experience in town, regional and environmental planning. This includes environmental impact assessment and environmental management. The Company has undertaken numerous EIA and BA applications for authorisation under the recently ended Environment Conservation Act in all Provinces in South Africa, including diverse land use development applications, various types of bulk and service infrastructure, filling stations and game lodges in conservation areas.

5.0 AUTHORITY

GAUTENG PROVINCIAL DEPARTMENT OF AGRICULTURE AND RURAL DEVELOPMENT (GDARD)

The Authority is responsible for:

- Appraising the EMP in the light of the BAR findings and other relevant information.
- Calling for modifications, extensions or further information if required.
- Issuing a Record of Decision on the Basic Assessment Report, which includes approval (or otherwise) of the EMP.

6.0 ENVIRONMENTAL CONTROL OFFICER (ECO)

TO BE APPOINTED

The ECO is appointed by the developer and is responsible for:

- Implementing all aspects of the EMP.
- Monitoring and verifying compliance with the EMP by contractors, sub-contractors, estate agents, property owners and any other parties concerned with the development.
- Being fully familiar with relevant legislation and regulations.
- Providing guidance and assistance to all participants in implementing and complying with the EMP.
- Keeping a permanent, written and photographic record of activities, instances of non-compliance.
- Implementing corrective action with regard to the EMP and imposing appropriate penalties for non-compliance as authorised by the owner/developer.

7.0 CONTRACTORS AND SERVICE PROVIDERS

All contractors, sub-contractors and service providers are responsible for:

- Incorporating the EMP into their contracts and signing agreements to comply with its conditions.
- Submitting an obligatory Methods Statement for approval by the ECO before any work is undertaken.
- Adhering to any instructions issued by the ECO.

8.0 PROPERTY OWNERS ASSOCIATION (OR SIMILAR BODY)

Once ownership of the development falls to the buyers of property, responsibility for implementing all aspects of the EMP must be incorporated into the constitution of the property owners association.

9.0 LEGISLATION

Management of the development during both the construction and the operational stages is subject to a suite of environmental law. Compliance with this legislation is an integral aspect of the EMP. Examples of the some of the relevant legislation:

Environmental Conservation Act 73 of 1989
National Environmental Management Act 107 of 1998
Development Facilitation Act 67 of 1995
National Water Act 36 of 1998
Atmospheric Pollution Prevention Act 45 of 1965
Local Government Municipal Structures Act 117 of 1998
Hazardous Substances Act 85 of 1993

Fire Services Act 99 of 1956
Occupational Health and Safety Act 85 of 1993
Relevant building codes (e.g. SABS 089)
Local authority ordinances
Regional Development Frameworks
Land Use Planning Policies.
Johannesburg Spatial Development Framework

10.0 PLANNING AND DESIGN PHASE

The conditions contained in the Planning and Design phase will be applicable to all phases of the application and for all infrastructural services

Planning and design of all elements of the application to be in accordance with acceptable and approved standards by the required and relevant authorities.

Planning and design to take cognisance of localised conditions and circumstances, particularly in terms of control of building operations, appropriate approved and registered contractors, access to the site, source of labour and transportation.

11.0 PRE-CONSTRUCTION AND CONSTRUCTION PHASE:

GENERAL WORKS

The conditions contained in the Pre-construction and Construction phase will be applicable to all phases of the application site. It should be pointed out that, due to the large size of the site, it is highly likely the development will be implemented over many years. The time basis, therefore, that the EMP refers to is the period within which the most of the anticipated earthworks and bulk of development will occur, ie installation of all major infrastructure and roads and the early phases of implementation of structures. This is anticipated to be between a 3 and 5 year period. However, the effectiveness of the EMP shall be applicable throughout the development of all construction and operational phases.

11.1 Contractual issues

The appointed contractors will be contractually bound to these conditions as well as the provisions of the proposed EMP.

The appointed contractors will undertake an induction process with all staff and workers on site and issue a written schedule of rules and work conditions specific to the site

11.2 Site Establishment etc

The contractors will establish, if required, a temporary and limited base on an existing disturbed part of the site. Any temporary store sheds and other structures will be painted in neutral colour and positioned to be as discrete from public view as possible. Material laydown areas will be defined in the same area. All plant and equipment will be stored overnight at the temporary base. No major servicing or repair of plant will be allowed on site. Routine maintenance will be conducted over appropriate ground cover to contain contamination. Fuel storage tanks to be established on

site in liaison with the ECO. Security will be provided both day and night to control access to the base and works sites.

Suitable signage must be placed at the entrance to the area indicating the nature of the work and warning the public of danger of construction activities.

11.3 Demarcation of the Site

The “site” here refers to all areas required for construction purposes included on the site, all bulk service infrastructure on the site, roads forming part of the application site and stormwater, sewage and water pipelines on the site. The boundaries and limits of these areas will be agreed with the ECO.

The Contractors shall demarcate the boundaries of “the site” in order to restrict their construction activities within the site. The method of demarcating the boundaries shall be determined by the Contractor and greed to by the ECO prior to any work being undertaken. The Contractor shall maintain the demarcation line and ensure that materials used for construction on the site do not blow on or move outside the site and environs, or pose a threat to any surrounding residents outside the site. The boundaries of the site shall be demarcated prior to any work commencing on the site. The site boundary demarcation fence shall be removed when the site is disestablished.

The Contractors shall ensure that all their plant, labour and materials remain within the boundaries of the site, unless otherwise agreed in writing with ECO. Failure to do so may result in the ECO requiring the Contractors to fence the boundaries of the site with wire mesh at his own expense to the satisfaction of the ECO

It will be the responsibility of the Contractors to decide on an appropriate system of protective fencing for the site.

11.4 Sensitive Areas

The Contractor is advised that certain sections surrounding the site are considered to be environmentally sensitive. These are the areas; in particular, the wetlands and associated drainage channels, rivers and spruits must be protected from all construction activities.

Damage caused by failure of the Contractor to protect the environment surrounding the site and adjoining properties, shall be cause for the Contractors to be required to make good any damaged area to the satisfaction of the ECO. All expenses incurred by the Contractors in protecting the site and making good shall be for his account.

11.5 Movement of Construction Personnel and Equipment

The Contractors shall ensure that all construction personnel and equipment remain within the demarcated construction site at all times. Where construction personnel and/or equipment wish to move outside the boundaries of the site, the Contractors shall obtain written permission from the ECO.

11.6 Location of Construction Camps

Construction camps includes all construction camps, workshops, temporary stockpile sites, fuel installations, other storage and work areas, required by the Contractors, sub-contractors and suppliers.

The Contractors shall submit a locality and site plan of all construction camps indicating the location of fuel supplies, stockpile sites, offices and the construction area for approval by the ECO prior to establishing any camps.

11.7 Ablution Facilities

The Contractors shall provide the necessary ablution facilities for all site personnel. The siting of toilets shall be agreed with the ECO.

The Contractors shall supply an adequate number of chemical or other suitable and approved toilets throughout the site where construction personnel will be operating. Toilets shall be easily accessible and where applicable shall be capable of being relocated.

The Contractors shall ensure that any chemicals and / or waste from the toilets is not spilled on the ground at any time. Should there be spillage of chemicals and/or waste, the ECO, shall require the Contractors to place the toilets on a solid base with a sump. The contractors will be required to provide a suitable and approved method plan to remove accumulations of chemicals and waste from the site and dispose of it at an approved waste disposal site or sewage plant base at their own expense.

Abluting anywhere other than in the toilets shall not be permitted. The Contractors shall be responsible for cleaning up any waste deposited by personnel.

11.8 Living and Eating Areas

The Contractors, unless agreed with the ECO and with the exception of security personnel, shall not house his construction personnel on the site or in the construction camp. The Contractors shall supply security personnel with adequate sanitation, water and refuse collection facilities. The Contractors shall supply security personnel with facilities for cooking and heating. Open fires will not be permitted.

If employees are to eat on site other than at the construction camp, the Contractor shall, in agreement with the ECO, designate specific areas for eating and shall provide adequate refuse bins at all places. The refuse bins shall be cleaned on a daily basis.

11.9 Provision of Water

The Contractors shall be responsible for providing construction, drinking and washing water for their staff and the professional supervisory staff. Construction water shall be obtained from locations as agreed with the ECO.

11.10 Construction Procedures

The Contractors shall submit written procedures for all activities that could be potentially harmful to the environment. Such construction procedures shall include timing of activities, equipment and materials to be used (where applicable), visual screening, protection of the site, methods for cleaning the site both during construction and on completion of the works, disposal of waste and any other information deemed necessary. Construction procedures shall be submitted to the ECO at least five working days prior to commencing work on an activity. The Contractors shall not commence work on any activity until such time as the construction procedure has been scrutinized and agreed to in writing by the ECO.

In addition, the ECO may call for emergency construction procedures to be submitted within 24 hours of work commencing on activities that are deemed harmful to the environment. If absolutely necessary, changes may be made to construction procedures once construction has commenced.

11.11 Erosion Control

The Contractors shall take all reasonable measures to ensure that erosion does not occur as a result of his activities. The Contractors shall be responsible for making good at their own expense any erosion damage identified by the ECO. The method of erosion control or management shall be agreed to with the ECO and prior to implementation. The final remedial or protective works shall be accepted in writing.

The day-lighting of stormwater pipes to be designed to ensure breaking of water volumes and velocities to prevent erosion of the land. Such systems could be achieved with the construction of wide openings packed with rocks. Pipes to be angled obliquely, at about 30º to 60º, to the natural flow of runoff and, preferably, stormwater should be released at more than one point in order to break the force of the water in any central point.

11.12 Hours of Operation

The Contractor’s hours of operation shall be normal working hours, except where prior written agreement has been obtained. The ECO shall be notified of any written agreements varying the standard hours of work prior to the work taking place. Construction will be permitted on weekends and public holidays.

12.0 CONSTRUCTION PHASE: ENVIRONMENTAL MANAGEMENT

The conditions contained in the Construction Phase, relating specifically to Environmental Management in this section, will be applicable to the development

12.1 Physical Environment

Access for Construction Traffic

MANAGEMENT PLAN

Objective	Prevention of impacts associated with access for construction traffic.
Potential Negative Impact	Congestion and degradation of local road network. Increased noise and dust levels.
Duration of Impact	Approx. 6 to 18 months.

Mitigation:

- Scheduling of Deliveries - The Contractor shall schedule activities on public roads to avoid peak traffic times wherever possible.
- Damping Down of Unsurfaced Roads - All unsurfaced roads on and adjoining the site shall be damped down on a regular basis, as often as is necessary under prevailing climatic conditions, to reduce the levels of dust created by construction vehicles operating on unsurfaced roads. Furthermore, dust can be an aesthetic nuisance for adjacent landowners as well as a significant health hazard.
- Traffic Routing - Construction traffic vehicles and worker-related traffic shall be routed to minimise disturbances, where ever and if relevant. This should be undertaken in conjunction with the Council's traffic department
- The condition of existing surfaced roads must be maintained during construction and cracks and potholes repaired to prevent tyre damage and halt further erosion.

Infrastructure

MANAGEMENT PLAN

Objective	Prevention of impacts associated with installation of bulk and internal services.
Potential Negative Impact	Prohibit the loss of and negative impacts to sensitive areas and major alteration of the natural ground surface.
Duration of Impact	Approx. 6 to 18 months.

- Construction activities for access roads and other infrastructure associated with provision of power, water, sewer and stormwater pipes to minimise impact on adjoining properties. Any damage caused to be rehabilitated by Contractors and temporary access tracks to be rehabilitated and replanted

- Digging and trenching for roads and underground services to be restricted to the area within the road reserve and to limit excavation activities within the natural areas
- All route alignments to be rehabilitated once the relevant service has been laid.

Cultural, Historic and Archaeological Features

MANAGEMENT PLAN

Objective	Prevention of impacts associated with damage to heritage features
Protection of important cultural, historic & archaeological features	Prohibit the loss of and negative impacts to important heritage features & graveyards.
Duration of Impact	Approx. 6 to 18 months.

Mitigation Measures

- Should any unusual features, artefacts, graves etc be discovered on the site during excavation and construction, this must be brought to the immediate attention of the Developer / Project Manager and to SAHRA for further investigation

- Any archaeological sites exposed during construction must not be disturbed during or after the construction period prior to authorisation from SAHRA. The removal, exhuming, destruction, altering or any other disturbance of heritage sites must be authorised by SAHRA in terms of the National Heritage Resources Act (No 25 of 1999)

Noise

MANAGEMENT PLAN

Objective	Minimisation of noise impacts on any adjoining neighbouring areas.
Potential Negative Impact	Nuisance from excessive noise associated with construction
Duration of Impact	Approx. 6 to 18 months

Mitigation:

- Keep surrounding land owners informed of unusually noisy activities
- Noise suppression measures - Noise suppression measures can be applied to all equipment. Equipment must be kept in good working order, and where appropriate fitted with silencers which are to be kept in good working order. Should the vehicles or equipment not be in good working order, the Contractors may be instructed to remove the offending vehicle or machinery from site.
- Should complaints regarding noise levels be received, as a result of activities on the site, these shall be recorded by the ECO, and if these noise levels are proved to be higher than acceptable levels, as laid down in the Noise Regulations of the Environment Conservation Act,

then the offending machinery or vehicle shall be identified and remedial measures implemented

- Noise Disturbance by Labour Arriving and Leaving Site - The Contractors shall take measures to discourage labourers from loitering in the area and causing noise disturbance. No labour will be housed on site without consultation with the ECO. The contractors will transport all labour to and from the site excluding such persons as may be required for security purposes.

Soils

MANAGEMENT PLAN

Objective	Prevention of Changes to Original Soil Structures and Fertility Prevention of soil erosion
Potential Negative Impact	Changes to Soil Structure and Fertility as a Result of Excavation and Disturbance Loss of topsoil due to erosion
Duration of Impact	Approx. 6 to 18 months

Mitigation:

- Stripping of Top and Subsoils - No soil stripping shall take place on areas within the site that the Contractors do not require for services, structures or infrastructure or areas of retained vegetation.
- Stockpiles - All good topsoil exposed will be stockpiled for use in rehabilitation. Stockpiles will be established as close to areas of final utilisation as soon as possible. Topsoil stockpiles will be kept separate from other stockpiles, shall not be compacted, and shall not exceed 2 metres in height. Stockpiles shall be kept free of any contaminants whatsoever, including paints, building rubble, cement, chemicals, oil, etc.
- Stockpiles shall be located within the development footprint already impacted. It is anticipated that due to the relatively short period of impact, seed stock in topsoil will still be fertile limiting the potential need for extensive reseeding.
- Site Management and Borrow Material - Strict control will be applied to the activity of equipment, labour and machinery on the site in order to limit damage to the site other than that which is being rehabilitated.
- Work areas and storage areas shall be clearly demarcated as part of site establishment.
- Removed contaminated soil shall be transported to an approved landfill site.
- Rehabilitation of Compacted Soils - Soils compacted by activities shall be deep ripped to loosen compacted layers and re-graded to evenly running levels, or original levels, whichever is more pertinent. Topsoil shall be re-spread over landscaped areas and the area re-vegetated with locally indigenous vegetation upon completion of construction activities
- Use of Fertilisers - Fertilisers are not be used on any of the areas that are to be retained in their natural condition
- Hazardous Substances - Fuel storage areas to be located on the site in liaison with the ECO.

- Where herbicides and pesticides are used in the removal of alien plants, the use of these materials will conform to the recommendations as stipulated by the ECO.
- Any contaminated soils (by fuels, oils etc) shall be removed to the full depth of contamination and disposed of at a DWAF approved landfill site.
- Mixing of cement and mortar - Cement and mortar shall not be mixed in any area to be landscaped or retained as natural area. All cement or mortar mixing shall be done in already impacted areas, and on trays or sealed areas, to prevent soil contamination. Precaution must be taken not to allow cement in any form to spread into natural areas.

Groundwater Pollution

MANAGEMENT PLAN

Objective	To prohibit the pollution of the groundwater and soils.
Potential Negative Impact	Pollution of groundwater and soils.
Duration of Impact	Approx. 6 to 18 months

Mitigation:

- Wherever relevant, the terms, conditions and recommendations contained in the specialist reports must be implemented, relating to precautionary measures and foundation treatment, specifically in the management of wet services and stormwater control.

- Hazardous Substances - All storage vessels must be designed and managed in order to prevent pollution of drains, downstream watercourses, groundwater and soils. See recommendations under “Soils”.

- Storm water - Appropriate measures will be applied to minimising runoff and to restoring existing diversion drainage as well as restoring natural site levels and grades.

- Spillage Containment Measures - The use and storage of fuels and chemicals which could leach into the ground shall be controlled. Adequate spillage containment measures shall be implemented. The necessary fire fighting equipment shall be maintained on site to deal with any fire incidents.

- Residue from Spillages - Appropriate contractors shall remove any residue from spillages from site. Handling, storage and disposal of excess or containers of potentially hazardous materials shall be in accordance with the requirements of the relevant Regulations and Acts.

- Disposal of Chemicals - The main contractor will be responsible for ensuring that used oils/lubricants are not disposed of on/near the site, and that contractors purchasing these materials understand the liability under which they must operate. The ECO will be responsible

for reporting the storage/use of any other potentially harmful materials to the relevant authority.

- Storage - The main contractor will be responsible for ensuring that potentially harmful materials are properly stored in dry, secure environments, with concrete or sealed flooring and a means of preventing unauthorized entry. The ECO will ensure that materials storage facilities are cleaned/maintained on a regular basis, and that leaking containers are disposed of in a manner that allows no spillage onto the bare soil or surface water. The management of such storage facilities and means of securing them shall be agreed.

Storm water Management, Surface Water Pollution and Hydrology

Stormwater shall be collected and discharged appropriately as described below.

MANAGEMENT PLAN

Objective	Prevention of water pollution Management of stormwater runoff to prevent flooding of the construction site Management of stormwater to protect any drainage channels
Potential Negative Impact	Pollution of downstream water courses Flooding or erosion downstream Negative impact on water quality of existing streams.
Duration of Impact	Approx. 6 to 18 months.

Mitigation:

Mitigation measures relate to the management of stormwater within the site during construction.

- Wherever relevant, the terms, conditions and recommendations contained in the specialist reports must be implemented, relating to precautionary measures and foundation treatment, specifically in the management of wet services and stormwater control.

- Drainage Systems – All works on the site must be aimed at preventing contamination of the down stream drainage channels

- The day-lighting of stormwater pipes to be designed to ensure breaking of water volumes and velocities to prevent erosion of the land. Such systems could be achieved with the construction of wide openings packed with rocks. Pipes to be angled obliquely, at about 30º to 60º, to the flow of the natural flow of stormwater and, preferably, stormwater should be released at more than one point in order to break the force of the water.

- Physical Measures for the Prevention of Pollution - The site must be managed in order to prevent pollution of nearby drainage systems or

groundwater, due to suspended solids, silt or chemical pollutants. The following measures shall be implemented to assist in achieving this objective:

- The use and storage of all materials, fuels and chemicals which could leach into the ground shall be controlled. Adequate spillage containment measures shall be implemented.

- Any residue from spillages shall be removed from site by appropriate contractors. Handling, storage and disposal of excess or containers of potentially hazardous materials shall be in accordance with the requirements of the adjudicating authority or any other relevant department

- No storage of any materials whatsoever will occur in or near any drainage systems.

- Sanitation and Ablution Facilities - Adequate sanitation and ablution facilities must be provided for workers. Any toilets required (chemical latrines) should be located away from any drainage systems and well secured so as not to be blown over.

- The Contractors shall take steps to ensure that littering by workers does not occur and persons shall regularly collect litter from the site and immediate surroundings daily. Suitable containers will be provided on site for the collection of litter. Strict penalties will be applied to the contractor in the event of littering or failure to of labour and staff to utilise ablution facilities provided.

- Storage of Materials - The Contractors shall maintain storage of all potentially polluting materials, and shall undertake potentially polluting operations as far away as practically possible from areas of natural vegetation and any drainage areas, and topsoil/subsoil stockpiles. The Contractor will ensure that additional supervisory time is spent to monitor such works. Such materials/operations include (but are not limited to):

  batching, storing of cement, concrete and mortar;
  petrol, oil and chemical storage and transfer;
  washing, ablution and toilet facilities;
  plant storage

- Storage Facilities - The ECO and Contractors will be responsible for ensuring that potentially harmful materials are properly stored in dry, secure environments, with sealed flooring and a means of preventing unauthorized entry. The Environmental Officer will further ensure that materials storage facilities are cleaned/maintained on a regular basis, and that leaking containers are disposed of in a manner that allows no spillage onto the bare soil. The management of such storage facilities and means of securing them shall be agreed.

Air Pollution due to Dust and Odours

MANAGEMENT PLAN

Objective	Prevention of air pollution due to dust and odours
Potential Negative Impact	Air pollution due to dust and odours
Duration of Impact	Approx. 6 to 18 months

Mitigation:

- Damping of Soil Surfaces - The Contractors will dampen exposed soil surfaces with a water bowser or sprinklers, as necessary to minimise dust problems. Mitigation will be especially significant during extended dry periods or due to particular operations such as during soil stripping or excavations at which times damping down shall take place on a continual basis.
- Rehabilitation of Exposed Surfaces - The Contractors will commence rehabilitation of exposed soil surfaces as soon as practical after completion of earthworks.
- Maintenance of Plant and Machinery - The regular maintenance of plant and machinery will be undertaken to ensure that gaseous emissions are minimised. The Contractors shall ensure that his Sub Contractors comply with this condition. Any offending machinery or plant may be instructed to be removed off site.
- Control of Smoke - Cooking will only be permitted at a designated area and the establishment of open fires will not be allowed. As the site is located in a high fire risk area, smoking of cigarettes, etc will only be permitted on a pre-designated safe zone on the site, designated by the ECO.
- Control of Blasting – Where blasting is required, noise suppression measures to be used as far as possible

Security

MANAGEMENT PLAN

Objective	Prevention of Security Risks to Adjacent Properties
Potential Negative Impact	Crime and other security risks due to influx of construction labour
Duration of Impact	Approx. 6 to 18 months

Mitigation:

- Fencing and Security of Site - The site need not be fenced, but security shall be provided at all times on site.

- Transportation of Labour - Labour must be transported to and from the site in vehicles, where possible, arranged by the Contractors to discourage loitering in adjacent areas and possible increase in crime

or disturbance. Unsociable activities such as unauthorised consumption or illegal selling of alcohol, drug utilisation or selling and prostitution on the site shall be banned and any persons found to be engaged in such activities shall have disciplinary or criminal action taken against them. The Contractors shall ensure that there is a contact phone number available so that surrounding land users or any other person may make contact in an emergency resulting from unsocial activities on the site.

- Procurement of labour shall not take place at the site but shall follow formal procurement procedures that should be implemented by the contractor.
- Informal Settlements – no labour shall be housed on the site. Measures shall be put in place, in consultation with the local authority, to prevent squatting on the site and in areas immediately adjacent to the site, should this occur and if specifically related to the development.
- Lighting - No work is anticipated to take place outside of normal daylight working hours. Artificial lighting will not be needed.

Solid Waste Management

MANAGEMENT PLAN

Objective	Correct disposal of rubble and waste
Potential Negative Impact	Prevention of pollution
Duration of Impact	Approx. 6 to 18 months

Mitigation

- Waste here refers to all construction debris and domestic waste.
- The Contractors shall institute a waste control and removal system for the site that is acceptable to the ECO.
- The Contractors shall not dispose of any waste and/or construction debris by burning, or by burying. All waste shall be disposed of off site at an approved landfill site.
- The Contractors shall supply waste bins/skips throughout the site at locations where construction personnel are working. The bins shall be provided with lids and an external closing mechanism to prevent their contents blowing out and shall be scavenger-proof to prevent animals that may be attracted to the waste. The Contractors shall ensure that all personnel immediately deposit all waste in the waste bins for removal by the Contractor. Bins shall be emptied on a daily basis and the waste removed to the construction camp where it shall be properly contained in a scavenger, water and wind-proof containers until disposed of. The bins shall not be used for any purposes other than waste collection.
- Waste separation and recycling - All waste generated on site will be separated into glass, plastic, paper, metal and wood and recycled where through an arrangement with the nearest collection and recycling depot or via the local municipal waste disposal facilities.

Hazardous waste.

Petroleum, chemical, harmful and hazardous waste throughout the site shall be stored in enclosed, bunded areas, the location of which shall be determined on site in conjunction with the ECO. The bunded areas shall be clearly marked. Such waste shall be disposed of off site at a hazardous waste disposal site.

Visual

MANAGEMENT PLAN

Objective	Reduce negative visual impacts
Potential Negative Impact	Negative visual impact of construction activities from surrounding areas
Duration of Impact	Approx. 6 to 18 months

Mitigation

- Location of construction activities - No works (direct or indirect) will take place beyond the existing site boundaries. These boundaries are to be indicated by the ECO prior to activity on site.
- Laydown areas - These are to be agreed prior to construction according to the SDP. A construction camp and laydown area for equipment may be established on areas which will take place on existing impacted areas.
- Staff accommodation - No staff accommodation will be erected on site.
- Litter - Litter will be strictly controlled. Litter will be cleared on an ongoing basis and placed in bins on site in a specific area. Litter will be separated at source into the various types. Tins, cans, cardboard and plastic will be transported regularly as above.

Fire

- A fire risk may exist on and adjacent to the site. The Contractors shall take all the necessary precautions to ensure that fires are not started as a result of activities on site.
- The Contractors shall report all fires immediately to the ECO.
- The Contractors shall be liable for any expenses incurred by any organisations called to assist with fighting fires and for any costs relating to the rehabilitation of burnt areas and/or property, and/or persons should the fire be caused by activities on the site.
- No open fires for heating or cooking shall be permitted on site. Closed fires or stoves shall only be permitted at agreed designated safe sites in the construction camp. Adequate suitable fire fighting equipment shall be provided at each fire place or stove.
- The Contractors are advised that sparks generated during operations involving welding, cutting of metal or gas cutting can cause fires. Every possible precaution shall therefore be taken when working with this equipment near potential sources of combustion. Such precautions include having a suitable, tested and approved fire

extinguisher immediately available at the site of any such activities and the use of welding curtains.

- The Contractors shall be responsible for providing the necessary basic fire-fighting equipment. All equipment shall be maintained in good operating order.
- The Contractors shall supply all living quarters, site offices, kitchen areas, workshop areas, materials, stores and any other areas identified by the ECO with suitable tested and approved fire fighting equipment.
- The Contractors shall appoint members of their staff as the fire officer and fire-fighting team. All expenses incurred shall be for the Contractor's account.

12.2 Biological Environment

Conservation of Flora and Fauna

MANAGEMENT PLAN

Objective	Ensure conservation of flora and fauna
Potential Negative Impact	Reduction of biodiversity as a result of the development
Duration of Impact	Approx. 6 to 18 months.

Mitigation:

Conservation of Flora

- No development of any physical structures or infrastructure to be undertaken in areas not specifically required for the pipeline.
- Where relevant, all plants or areas to be conserved/ retained in their natural state, with the exception of identified aliens, shall be clearly demarcated or indicated prior to any works. This vegetation shall be indicated by the ECO.
- Sensitive and protected areas should ideally be fenced off for protection purposes during the construction phase
- No clearing or removal of vegetation shall occur beyond the existing development footprint or within the demarcated natural open spaces or parklands or from adjoining properties
- All alien, invasive vegetation to be removed and alternative indigenous species should be established before eradication takes place

Plant Collection, Utilisation of Trees for Fires, etc.

MANAGEMENT PLAN

Objective	Prevention of plant collection
Potential Negative Impact	Damage to Flora
Duration of Impact	Approx. 6 to 18 months.

Mitigation:

- Firewood collection - Fires and firewood collection will not be permitted on site or on any of the adjoining properties

Invasive Weeds

MANAGEMENT PLAN

Objective	Removal of Invasive Weeds from Site and Prevention of Spreading of Weeds to adjacent areas
Potential Negative Impact	Emergence of Invasive Weeds to the Detriment of Indigenous Plant Species
Duration of Impact	Approx. 6 to 18 months

Mitigation:

- Programme of Weed Control - It is proposed that indigenous grass species be used, if required, to rehabilitate stripped and disturbed areas to mitigate the establishment of pioneer exotic plant communities. No removal/replacement of indigenous species to occur. This is to be decided/stipulated/executed as part of the construction EMP.
- Spread of Exotics - The spread of exotic species of plants occurring throughout the site shall be controlled. Those species listed as exotic invader species and especially those which are declared weeds, pose the biggest threat to indigenous vegetation, and should be the focus of control measures. These species, apart from vegetation specified to be retained should be completely eradicated from the site through a program of manual removal or use of registered herbicides by experienced weed control experts.

Loss of Habitats

MANAGEMENT PLAN

Objective	Minimise Loss of Habitats and Recreational Areas, maintain ecological links.
Potential Negative Impact	Loss of Habitat
Duration of Impact	Approx. 6 to 18 months

Mitigation:

- Limit site disturbance - Only the minimum area required for clearing and removal works will be utilised by the Contractors, and shall be adequately demarcated to prevent encroachment into other areas.
- Provide Ecological Links - The open areas shall be kept as an ecological link through the retention of natural vegetation in these areas

12.3 Socio-Economic Environment

Employment

- The impacts here will be largely positive in the form of temporary employment during the construction period for semi-skilled and unskilled labour. Opportunities will exist for skills transfer and training within this labour group.

MANAGEMENT PLAN

Objective	Maximise Employment Opportunities for Local Labour
Potential Positive Impact	Job training and a decrease in local unemployment
Duration of Impact	Approx. 6 to 18 months. (impacts of upliftment may be indefinite)

Optimisation:

- Utilise Local Market - The labour force should largely be recruited from the local communities, where ever possible, including skilled and semi-skilled positions. The Contractors must indicate that recruitment will take place through formal procurement procedures, which will be implemented in conjunction with the local community.
- Training and Education In order to facilitate training and education, it is recommended that the contractors, where possible, recruits its employees from previously disadvantaged groups and from adjoining low income areas, and not only will they fill certain posts, but for those posts that they are inexperienced in, a mentorship process should be initiated.
- Labour intensive construction methods - Where appropriate, labour intensive construction methods should be utilised to maximise the potential number of employment opportunities whilst mitigating impact on site of machinery.

Safety and Security of Employees

MANAGEMENT PLAN

Objective	Maximise the safety and security of employees during the construction phase
Potential Positive Impact	Economic Growth
Duration of Impact	Approx. 6 to 18 months

Mitigation:

All contractors to ensure standard safety and Emergency Management Plans are in place that makes provision for accident management and that has been submitted to the local emergency services of the Council).

Supplies, Materials and Local Benefits

MANAGEMENT PLAN

Objective	Maximise local benefits through local, regional or national sourcing of supplies and materials
Potential Positive Impact	Economic Growth
Duration of Impact	Approx. 6 to 18 months (impacts of upliftment may be indefinite)

Optimisation:

Local Sourcing - Where possible, raw materials and other supplies, should be sourced, where possible, from local suppliers. All materials must be SABS approved.

Unsociable Activities on Site

MANAGEMENT PLAN

Objective	Prevent Unsociable Activities on Site
Potential Negative Impact	Prostitution, Heavy Drinking, Crime
Duration of Impact	Approx. 6 to 18 months.

Mitigation:

- Security - Implementation of security on site by boarding/fencing the site and controlling access only to labourers and other authorised persons. No unauthorised selling of alcohol shall be permitted on site and any person found importing alcohol, drugs or encouraging prostitution, shall be disciplined or criminal action taken. This impact can effectively mitigated by having no labour or staff accommodated on site.

- Local Sourcing of Labour - As prostitution and other forms of unsocial behaviour generally occur when labourers are away from home, locally recruited labour should have a lower incidence of such behaviour. Accordingly there is a preference to employ labour from the local area.

13.0 OPERATIONAL ACTIVITIES

The conditions contained in the Operational Phase will be applicable to the development

13.1 Open Spaces and Landscaped Areas

- Any open space areas/ parks or landscaped areas along the line will require specific management during the operational period and as much indigenous vegetation as possible should be used

- Gardens or landscaped areas around the proposed development should be planted with indigenous (preferably using endemic or local species from the area) grasses, forbs, shrubs and trees, which are water wise and require minimal horticultural practices. A species list of suitable species should be compiled.

- A Re-vegetation and Rehabilitation Manual should be prepared for the use of contractors, landscape architects and groundsmen. Where herbicides are used to clear vegetation, specimen-specific chemicals should be applied to individual plants only. General spraying should be prohibited. All alien vegetation should be eradicated over a five-year period. Invasive species (*Melia azedarach, Acacia mearnsii, Eucalyptus sp., Pinus pinaster, Jacaranda mimisifoila*) should be given the highest priority.

- Where the removal of alien species may leave spoil exposed, alternative indigenous species should be established before eradication takes place. Property owners should be encouraged to plant indigenous non-invasive plants, shrubs and trees. The attention of property owners must be drawn to the most recent Declared Weeds List (2001) in the *Conservation of Agricultural Resources Act* 43 of 1983 and the associated penalties and prohibitions. Horticultural activities such as fertilisers, herbicide and pesticide runoff, increase in alien vegetation and weedy species, dumping of refuge and building material must be strictly managed and be environmentally sensitive and should meet the following requirements:

    - Limited to building environs and limited areas of proposed development.
    - No landscaping activities within the conserved areas as well as biological corridors. Except alien vegetation removal and rehabilitation of degraded areas.
    - Limited irrigation by water-wise gardening (use local plants adapted to local conditions).
    - Strict fertiliser, pesticide and herbicide control (limited usage)

- Invertebrate pests on the site should be controlled in the following manner:
- The least environmentally damaging insecticides must be applied. Pyrethroids and Phenylpyrazoles are preferable to Acetylcholines. Use insecticides that are specific to the pest (species specific) in question. The lowest effective dosages must be applied. The suppliers advice should always be sought. Do not irrigate for 24 hours after applying insecticides in areas where there is a chance of contaminating of dams, fungal pathogens should be used in preference to chemical insecticides.
- Reduction of weed and erosion by minimum tillage gardening practices (groundcovers and mulching better in all respects).
- No dumping of any materials in undeveloped open areas and neighbouring properties. Activities in the conserved or open undeveloped areas must be strictly regulated and managed.

13.2 Cultural Historic and Archaeological Resources

- The cultural, historic and archaeological features within the development should ideally remain fenced and protected from the general activities of the development

- Should any unusual features, artefacts, fauna, etc be discovered on the site during the operational phase of the activity, this must be brought to the immediate attention of the Developer/Project Manager for further investigation. The removal, exhuming, destruction, altering or any other disturbance of heritage sites must be authorised by SAHRA in terms of the National Heritage Resources Act (No 25 of 1999)

13.3 Stormwater and Surface Control

The following steps and measures are recommended for implementation for the purpose of managing stormwater and erosion control

- As vegetation plays a critical role in decreasing run-off, storm-water and runoff should, where ever possible, be attenuated through landscaped areas
- Sufficient measures must be implemented to prevent the possible contamination of the surface water and surrounding groundwater.
- Storm water - Appropriate measures will be applied to minimising runoff and to restoring existing diversion drainage as well as restoring natural site levels and grades.
- Wherever relevant, the terms, conditions and recommendations contained in the specialist reports must be implemented, relating to precautionary measures and foundation treatment, specifically in the management of wet services and stormwater control.
- Operators shall ensure and maintain compliance with the standards and requirements of the Department of Water Affairs and Forestry, wherever necessary.

13.4 Fencing and Ecological Connectivity

Ideally fences should not restrict the natural migratory movements of certain animals. Palisade fencing with adequate gaps is recommended should any fences be necessary. Sufficient biological corridors must be retained along the wetland area.

13.5 Artificial Lighting

During the operational phase, artificial lighting must be restricted to areas strictly requiring lighting and not directed towards the residential area, in order to minimize the potential negative effects of the lights. Where lighting is required for safety or security reasons, this should be targeted at the areas requiring attention. Yellow sodium lights should be prescribed as they do not attract as many invertebrates (insects) at night and will not disturb the existing wildlife. Sodium lamps require a third less energy than conventional light bulbs.

13.6 Exotic Animals

Ideally no domestic animals should be allowed in the wetland area. All exotic animals entering these sensitive habitats should be humanely as possible removed from the site.

13.7 Management of Waste

Management of waste on the site will be undertaken in accordance with the following

Waste Categories

Domestic and Household Waste - This type of waste includes foodstuffs, garden waste, packaging materials, such as glass, paper, cardboard and plastics. It is expected that domestic waste will be generated from the site

Business and Commercial waste – This type of waste includes foodstuffs, garden waste, packaging materials, such as glass, paper, cardboard and plastics. It is expected that domestic waste will be generated from the site

Sanitary waste – sanitary waste is not considered as part of the general waste stream, but if no proper sanitation system exists, arrangements for the controlled removal and disposal of sanitary waste must be provided. This waste will not form part of the application.

Non-hazardous Industrial Waste – there will not be any non-hazardous industrial waste generated by the activities on the site

Construction waste – this generally consists of inert materials such as rubble and bulky construction debris. Care will be taken to remove the construction waste as quickly as possible and not to mix it with other forms of waste.

Hospital and Medical waste – this type of waste is not applicable to the site.

Hazardous and toxic waste – there will be no hazardous or toxic waste disposal generated form the site**.**

On-site storage and management of Waste

As indicated above, waste generated on the site by the individual operators will comprise of various forms of waste. Domestic waste comprises of limited foodstuffs, packaging material (plastic, paper, cans, etc) it can be stored in 85 litre plastic bin liners that will be inserted into 85 litre rubber/ galvanised steel bins.

The bin liners will be kept in a confined place as required in terms of requirements of the Council Solid Waste Disposal By-laws until it is collected by the Council refuse removal service.

Other forms of waste not addressed by the Council must be stored on the sites in demarcated areas and removed by relevant contractors for their management and disposal

Hazardous Substances - All storage vessels must be managed in order to prevent pollution of drains, downstream watercourses, groundwater and soils. (no such waste is envisage)

Spillage Containment Measures - The use and storage of fuels and chemicals which could leach into the ground shall be controlled. Adequate spillage containment measures shall be implemented. The necessary fire fighting equipment shall be maintained on site to deal with any fire incidents.

Residue from Spillages - Appropriate contractors shall remove any residue from spillages from site. Handling, storage and disposal of excess or containers of potentially hazardous materials shall be in accordance with the requirements of the relevant Regulations and Acts.

Disposal of Chemicals – The operators will be responsible for ensuring that used oils/lubricants are not disposed of on/near the site

13.8 Safety, Security and Crime Prevention

Land Owners and any Home Owners Association to ensure standard Safety and Emergency Management Plans are in place that makes provision for accident management and that has been submitted to the local emergency services of the Council.

The control of safety, security and crime prevention should be addressed and managed by the Home Owners Association, to which all land owners and residents should become obligatory members, to ensure inclusivity of all property owners

14.0 SPECIFIC MITIGATION MEASURES

In order to mitigate the impacts associated with the disruption of the hydrology the following principles should be considered when installing the pipeline, from both a groundwater and surface runoff perspective:

General Principles:
Ideally all wetlands should be crossed perpendicular to the direction of flow along the shortest practically possible route. The objectives of the mitigation measures where pipelines cross wetlands is to ensure that the pre and post hydrological conditions on both sides of the pipeline are the same.

Design Principles:
Where the pipeline runs parallel with the direction of flow, a material with low hydrological conductivity (a Bentonite mix is recommended), in the form of trench breakers should be packed around the pipe and should be installed at 20m intervals to prevent the pipeline surface behaving as a conduit and to intercept any concentrated flow down the pipeline route.

River diversions should be located within the footprint of the active channel. Ideally the diversion should not breach historical terraces as this could cause a weak point in the floodplain that might encourage channel switching. If the above is not possible, then the locality of the diversion should be selected so as to avoid any foot slope seepage wetlands that may be present at the interface between the floodplain and the terrestrial landscape.

In addition to the above, the following is recommended:

- Construction activities should be scheduled as far as possible to take place during low flow periods when as little of the construction site and exposed sediment is in contact with the flow as possible.

- As per the best practice guidelines, a construction servitude width of 15m is permitted for machine excavation, and 6m for manual excavation. If required, the ECO can specify a smaller servitude. The servitude must accommodate all construction related activities, including materials storage, access routes, soil stockpiles etc.

- The construction servitude should be identified and be clearly demarcated prior to the commencement of any construction activities on site and before the arrival of construction machinery. The demarcations should stay in place for the entire construction phase and no personnel, construction machinery or construction material should move or be placed outside the demarcated construction servitude.

- All dumped building material and litter should be removed from the proposed alignment and dumped in an appropriate landfill site.

- All construction roads in or adjacent to riparian zones and watercourses should be aligned and managed so as to minimise disturbance of the watercourses as well as in-stream habitats.

- The original geometry, topography and geomorphology, in both cross-sectional and longitudinal profile, should be reinstated along the pipe line following construction.

- Appropriate mitigation measures for controlling sediment input into the watercourses will be required during the construction phase. This should include methods for controlling Total Suspended Solids (TSS) in pools and actively flowing reaches of the watercourses affected by the line construction activities.

- Erosion prevention structures should be constructed at all culverts where there is a risk of high stormwater flows.

- Where necessary and according to risks in terms of bank erosion, as discussed for each crossing, gabions or storm water control structures should be used to disperse stormwater flows and/or prevent/control erosion

- All alien invasive vegetation (Category 1,2,3) must be removed from the proposed alignment preventing possible further invasion along the line and immediate areas.

- Where necessary and according to slope and risks in terms of bank erosion disturbed areas of the riparian zone should be re-vegetated using either a specified seed mix and/or appropriate indigenous trees after the completion of construction activities.

- Care must be taken during excavation that the topsoil is removed and stockpiled separately from the subsoil (if the topsoil layer is not easily identifiable, the top 300mm should be removed as topsoil). Soil layers should then also be replaced separately and in the correct order.

- Care should be taken to not remove or damage any large trees within or adjacent to the construction servitude.

- Following completion of construction activities, a clean-up operation of the construction servitude and 100m either side of the servitude, should be undertaken to remove all litter and construction related waste.

15.0 REHABILITATION

The following section provides environmental management measures to be undertaken during the rehabilitation of relevant parts of the site after completion of all construction activities.

- All temporary stockpile areas, litter and rubble must be removed on completion of construction.
- Any temporary roads and tracks to be revegetated with indigenous species
- Where the removal of alien species may leave spoil exposed, alternative indigenous species should be established before eradication takes place.

16.0 CLOSURE

The issue of closure of the activity is not envisaged

17.0 MONITORING AND AUDITING

The following steps are envisaged to form part of the monitoring and auditing of the activity

- Auditing during the construction phase must be carried out on a regular basis, (weekly or monthly) due to the extended period of construction.

- Records relating to monitoring and auditing must be made available by the applicant on request by any local authority in respect of the activity

- An independent post construction environmental audit must be conducted by the ECO to ensure that the conditions, mitigation measures and recommendations stipulated in the Record of Decision, the final Environmental impact assessment report and its appendices and the EMP are compiled with before operation commences. The results of this audit should be submitted in writing to the department within 10 days after completion of the audit

- The mitigation/ rehabilitation measures may be altered by the applicant where monitoring and auditing of the construction and operation of the project show this to be beneficial. Any significant alternations shall be subject to the approval by the department. Such a submission to department must be accompanied by recommendations of the ECO.

- The recommendations for monitoring in the wetland report should be undertaken

- The following shall be maintained on site during the construction phase

    - A daily site diary, a non-conformance register, a public complaints register and a register of audits
    - Records relating to monitoring and auditing must be made available by the applicant on request by any local authority in respect of the development

DRAFT METHOD STATEMENT

Scope of Method Statement

This Method Statement describes the works operation to undertake the laying of a water pipeline including the construction of structures that comply with the specified requirements for pipeline construction from the intersection of the M39 (Allandale Rd) and M18 (Andrew Mopheto St) to the boundary of the Waterfall Junction development.

Scope of the Works

The works covers the excavation of the trenches, the removal of material unsuitable for use, the preparation of the bedding, the laying of the pipes, the completion of the bedding, the construction of structures/chambers, the backfilling of the pipeline excavations and finishing the works.

Reference Documents

- The standardized specifications for Civil Engineering Construction of the SA National Standards Authority (Bureau of Standards).
- National Environmental Act No 107 of 1998.

Materials

Bedding and fill material is to be sourced from in-situ and commercial sources.

Pipes, fittings and concrete will be sourced from Commercial Suppliers complying with specification, and approved by the Engineer.

Plant and Labour

Likely plant and Labour to be employed for the work is as follows:

1 x Excavator
1 x Loader
2 x Pedestrian Rollers
2 x Tippers
1 x 8000 litre water cart
Labour

Construction

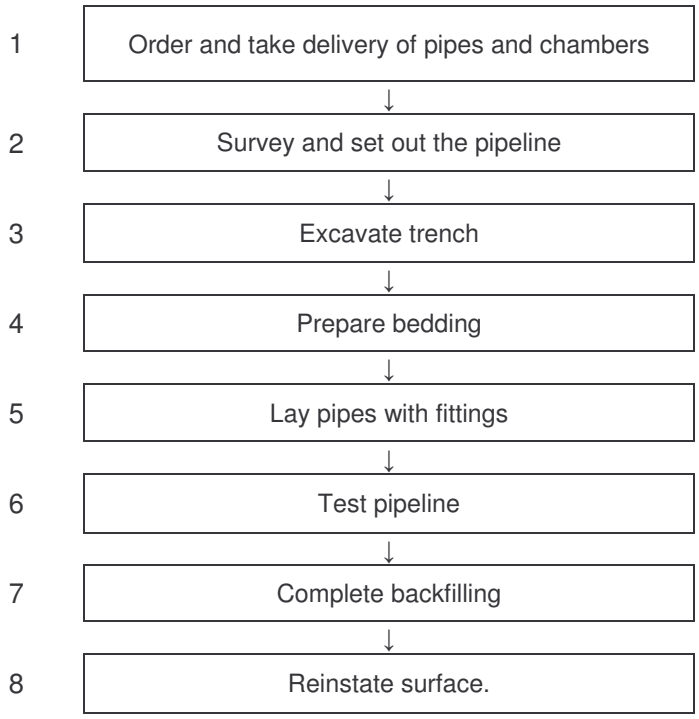
The movement of all vehicles, labour and plant shall be restricted to Road Reserves, the necessary servitudes, as required by the Environmental authorisation and as agreed with the various landowners. The construction working reserve will be approximately 8m wide. The stacking of materials will only be done in approved locations. Bedding material is to be obtained from approved sources. Unsuitable or excess material will be spoiled on designated and approved spoil areas on the Waterfall Junction site or off site.

Sequence of the Works

The following sequence of works shall apply to the excavation, pipe-laying and fill operation. Service utilities within the pipeline route shall be identified, exposed and surveyed.

- On approval of the pipeline drawings the works will be set out in terms of approved survey practice, referencing control beacons.
- The excavation of the trenches will proceed, placing the excavated material adjacent to the trench. Where trenches are deeper than 1,5 metres, an assessment of the soil conditions will be made in conjunction with the Engineer.
- The responsible person for the excavations will inspect the trench as the work proceeds.
- The floor of the trench will be trimmed to level, and the bedding layer placed and compacted with a pedestrian roller. Any soft spots will be discussed with the Engineer and repaired as instructed.
- The pipelines and structures/chambers will be constructed and tested in accordance with the project specification.
- The trenches will be backfilled.
- Topsoil will be placed on all disturbed areas and watered to encourage growth of the same vegetation originally found in the area before the construction work started, so as to blend in with the existing vegetation.
- On completion of the pipeline the area will be cleaned and rehabilitated to the satisfaction of the ECO.

Step Operations



APPENDIX I

OTHER INFORMATION

Impact Assessment Criteria

ASSESSMENT CRITERIA
The assessment of the impacts has been conducted according to a synthesis of criteria required by the integrated environmental management procedure. (From DEAT Guideline Document)

NATURE OF IMPACT

This is an appraisal of the type of effect the proposed activity would have on the affected environmental component. It's description should include what is being affected, and how.

EXTENT

The physical and spatial size of the impact. This is classified as:

Local
The impacted area extends only as far as the activity, eg a foot print.
Site
The impact could affect the whole, or a measurable portion of the above mentioned properties.
Regional
The impact could affect the area including the neighbouring farms the transport routes and the adjoining towns.

DURATION

The lifetime of the impact; this is measured in the context of the life-time of the proposed base.

Short term
The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than any of the phases.
Medium term
The impact will last up to the end of the phases, whereafter it will be entirely negated.
Long term
The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter.
Permanent
The only class of impact which 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.

INTENSITY

Is the impact destructive, or benign. Does it destroy the impacted environment, alter it's functioning, or slightly alter it. These are rated as:

Low
The impact alters the affected environment in such a way that the natural processes or functions are not affected.

Medium
The affected environment is altered, but natural, cultural and social functions and processes continue, albeit in a modified way.

High
Natural, cultural and social functions or processes of the affected environment are altered to the extent where it will temporarily or permanently cease.

This will be a relative evaluation within the context of all the activities and the other impacts within the framework of the project.

PROBABILITY

This describes the likelihood of the impacts actually occurring. The impact may occur for any length of

time during the life cycle of the activity, and not at any given time. The classes are rated as follows:

Improbable
The possibility of the impact to materialise is very low, due either to the circumstances, design or experience.
Probable
There is a distinct possibility that the impact will occur
Highly probable
It is most likely that the impacts will occur
Definite
The impact will take place regardless of any prevention plans.

DETERMINATION OF SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.

The classes are rated as follows:

No significance
the impact does not influence the proposed development and/or environment in any way;

Low significance
the impacts will have a minor influence on the proposed development and/or the environment. These impacts do not require modification of the project design or alternatives modification.

Medium significance
the impacts will have a moderate influence on the proposed development and/or the environment. The impacts can be ameliorated by modification in the project design or implementation of effective mitigation measures.

High significance
the impacts will have a major influence on the proposed development and/or the environment. These impacts could have the “No-Go” implication on portions of the proposed development regardless of any mitigation measures that could be implemented.

Appendix 3: Specialist Reports

Appendix 3A: Wetland Assessment Report

REPORT

WETLAND HYDROPEDOLOGY ASSESSMENT AND MANAGEMENT REPORT:

LAND PARCEL 3 WATER PIPELINE ALIGNMENT, GAUTENG PROVINCE

14 September, 2016

Compiled by:

J.H. van der Waals
(PhD Soil Science, Pr.Sci.Nat.)
Registered with the South African Council for Natural Scientific Professions
(Registration number: 400106/08)
Member of:
Soil Science Society of South Africa (SSSSA)
Accredited member of:
South African Soil Surveyors Organisation (SASSO)

Declaration

I, Johan Hilgard van der Waals, declare that:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing
  - any decision to be taken with respect to the application by the competent authority; and
  - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

J.H. VAN DER WAALS

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WETLAND HYDROPEDOLOGY ASSESSMENT AND MANAGEMENT REPORT: LAND PARCEL 3 WATER PIPELINE ALIGNMENT, GAUTENG PROVINCE

1. INTRODUCTION

1.1 TERMS OF REFERENCE

Terra Soil Science was appointed by **Bokamoso** to conduct a wetland identification, impact assessment and rehabilitation and monitoring protocol for the proposed Land Parcel 3 Water Pipeline alignment in the Gauteng Province. The motivation for the investigation is the determination of wetland impacts associated with the construction and upgrading of the water pipeline infrastructure proposed for the LP3 development site.

1.2 AIM OF THIS REPORT

The aim of this report is to provide a detailed discussion of the findings and recommendations regarding the anticipated impacts of the water pipeline upgrading and construction activities on wetlands or watercourses within a 500 m radius from the pipeline alignment. This aim will be attained through the assessment of the alignment in terms of the current functioning of wetlands, the anticipated hydrological impacts on the site's hydropedology, and the making of recommendations regarding the management of water on the site post-development, the rehabilitation of the wetland areas and its integration with water quality and water supply objectives of DWS. The assessment is conducted within the context of specific soil, topography and geology conditions and aims specifically to address the drivers of the site's hydrology, the changes in the drivers compared to the reference state and the anticipated changes in response to the new drivers.

The specific aspects that will be addressed are:

1. Wetland/ Riparian identification and delineation of **all** wetlands within 500 m of the proposed development and any section of a watercourse where the proposed development is located within the 1:100 year flood line.
2. Present ecological state (PES) and ecological importance and sensitivity (EIS) where applicable.
3. Water quality analysis (where applicable).
4. Identification of impacts of the proposed upgrade on the various wetlands.
5. Mitigation measures for the abovementioned identified impacts.
6. Rehabilitation plan/strategy.
7. Monitoring protocol.

1.3 DISCLAIMER

This report was generated under the regulations of NEMA (National Environmental Management Act) that guides the appointment of specialists. The essence of the regulations is 1) independence, 2) specialisation and 3) duty to the regulator. The independent specialist has, in accordance with the regulations, a duty to the competent authority to disclose all matters related to the specific investigation should he be requested to do such (refer to declaration above).

It is accepted that this report can be submitted for peer review (as the regulations also allow for such). However, the intention of this report is not to function as one of several attempts by applicants to obtain favourable delineation outcomes. Rather, the report is aimed at addressing specific site conditions in the context of current legislation, guidelines and best practice with the ultimate aim of ensuring the conservation and adequate management of the water resource on the specific site.

Due to the specific legal liabilities wetland specialists face when conducting wetland delineations and assessments this author reserves the right to, in the event that this report becomes part of a delineation comparison exercise between specialists, submit the report to the competent authorities, without entering into protracted correspondence with the client, as an independent report.

1.4 METHODOLOGY

The report was generated through:

1. The collection and presentation of baseline land type and topographic data for the site;
2. The thorough consideration of the statutory context of wetlands and the process of wetland delineation;
3. The identification of water related landscape parameters (conceptual and real) for the site;
4. Aerial photograph interpretation of the site;
5. Assessment of historical impacts and changes on the site through the accessing of various historical aerial photographs and topographic maps;
6. Focused soil and site survey in terms of soil properties as well as drainage feature properties;
7. Assessment of the functioning, status, hydropedology and drivers of the wetlands on the site; and
8. Presentation of the findings of the various components of the investigation.

2. SITE LOCALITY AND DESCRIPTION

2.1 SURVEY AREA BOUNDARY

The site lies between 26° 01’ 55’’ and 26° 03’ 46’’ south and 28° 08’ 11’’ and 28° 10’ 38’’ east immediately south of Tembisa along Allandale Road in the Gauteng Province (**Figure 1**).

Figure 1 Locality of the survey site

2.2 LAND TYPE DATA

Land type data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC). The land type data is presented at a scale of 1:250 000 and entails the division of land into land types, typical terrain cross sections for the land type and the presentation of dominant soil types for each of the identified terrain units (in the cross section). The soil data is classified according to the Binomial System (MacVicar et al., 1977). The soil data was interpreted and re-classified according to the Taxonomic System (Soil Classification Working Group, 1991).

The pipeline alignment falls into the **Bb1** and **Ab11** land types (Land Type Survey Staff, 1972 - 2006) with **Figure 2** providing the land type distribution for the site. The **Bb1** land type is restricted to the Halfway House Granite Dome with the typical bleached sandy soils and the **Ab11** land type is dominated by serpentine (greenstone), schist and gneiss with subsequent finer textured soils. (details provided later in the report).

2.3 TOPOGRAPHY

The topography of the site and general area is undulating with distinct drainage features surrounding the site. Large areas around the site have been built up and sealed through paving, roads and roofs. The contour map for the site is provided in **Figure 3**. From the contour data a digital elevation model (DEM) (**Figure 4**) was generated. From the contour data a topographic wetness index (TWI) (**Figure 5**) was generated for the site. The TWI provides a very accurate indication of water flow paths and areas of water accumulation that are often correlated with wetlands. This is a function of the topography of the site and ties in with the dominant water flow regime in the soils and the landscape (refer to previous section where the concept of these flows was elucidated). Areas in blue indicate concentration of water in flow paths with lighter shades of blue indicating areas of regular water flows in the soils and on the surface of the wetland / terrestrial zone interface.

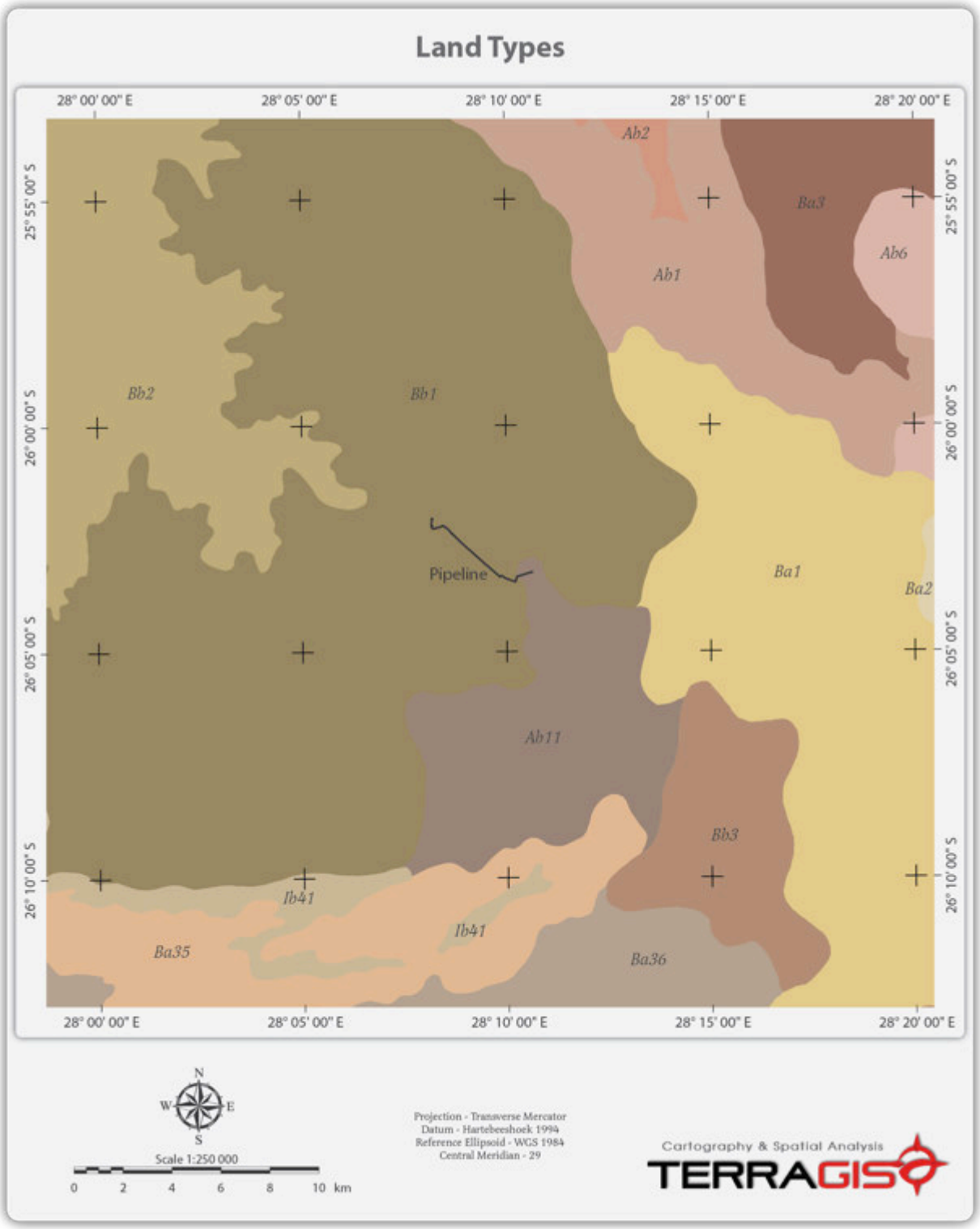

Figure 2 Land type map of the survey site and surrounding area

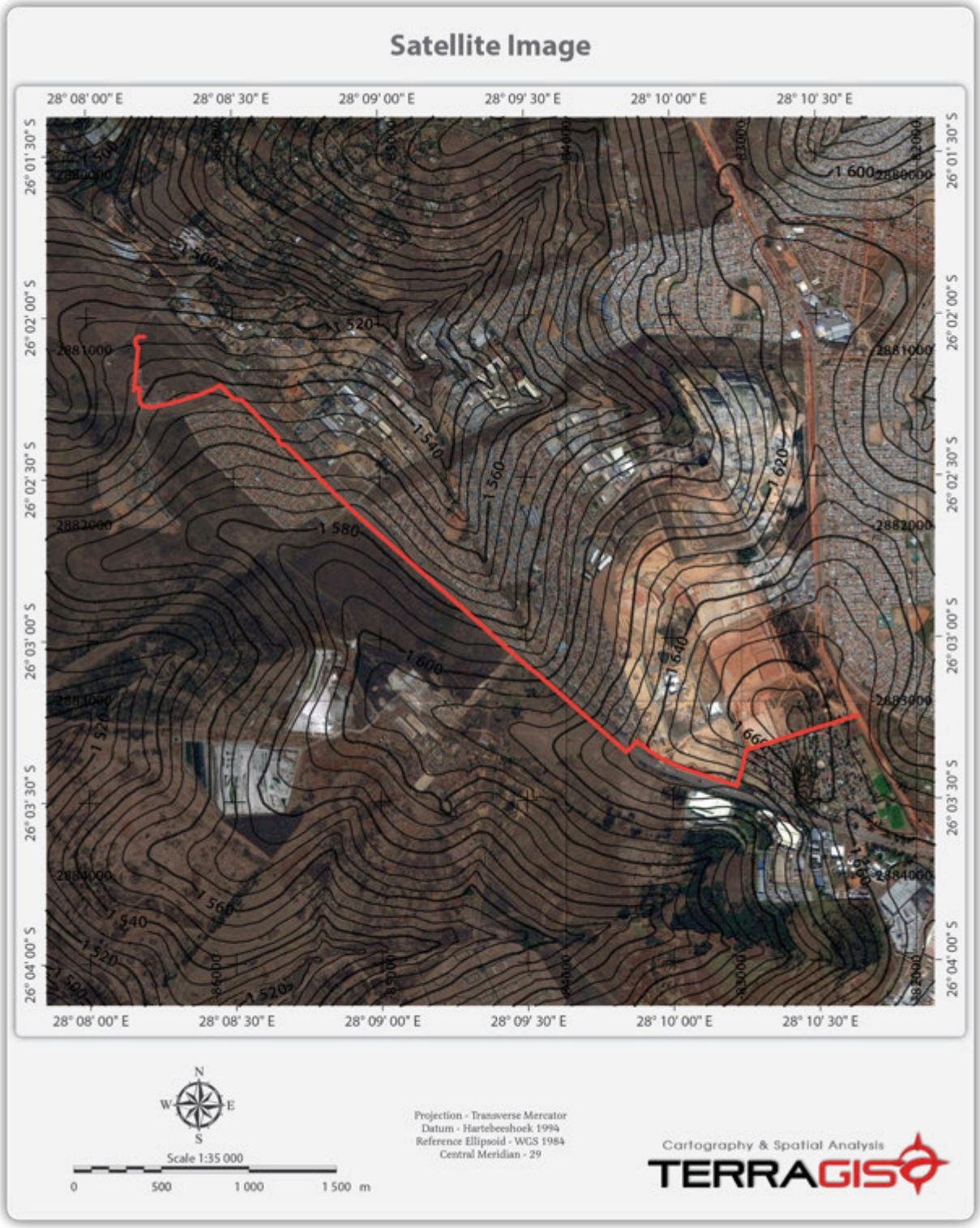

Figure 3 Contours of the survey area imposed on a satellite image

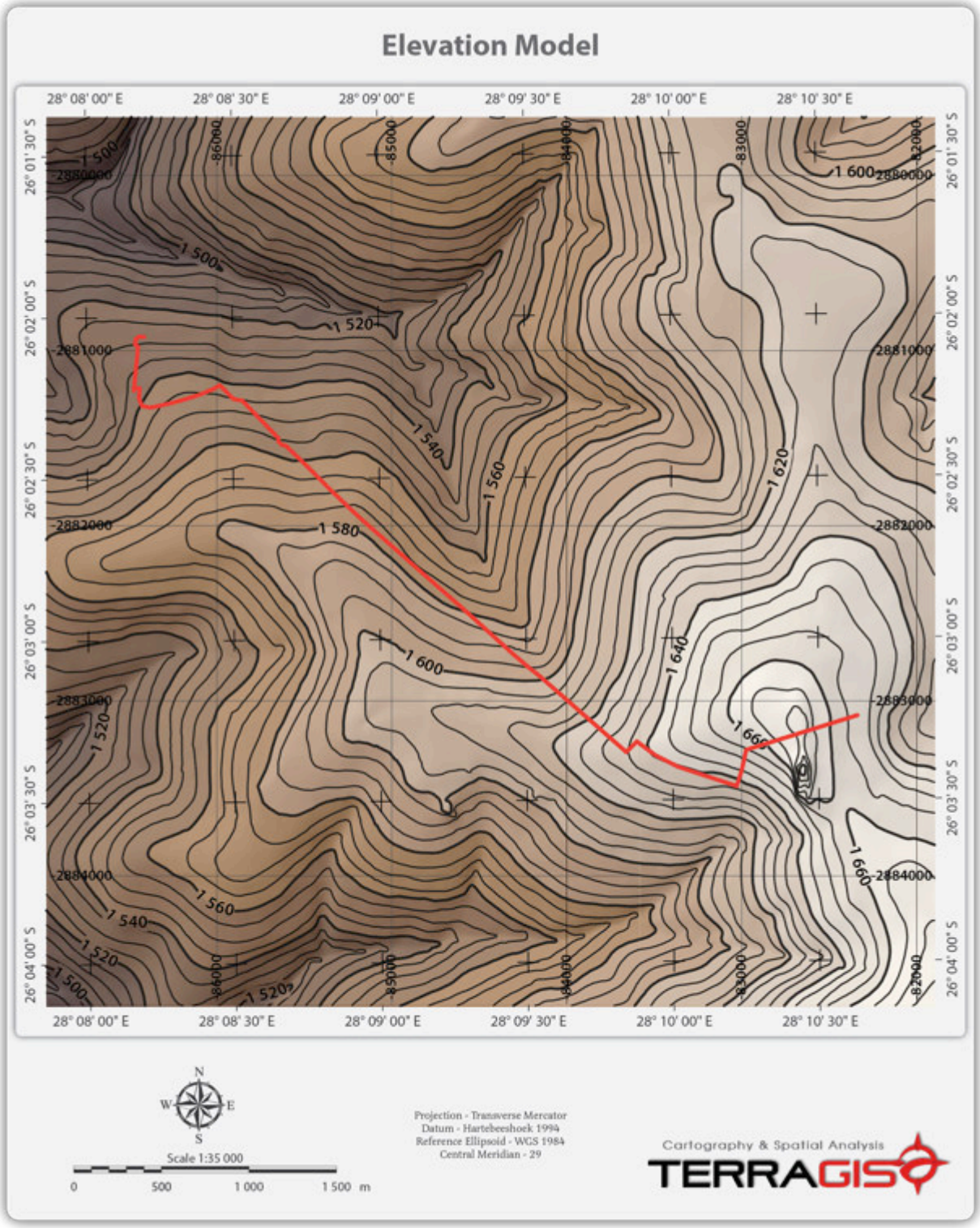

Figure 4 DEM of the survey site

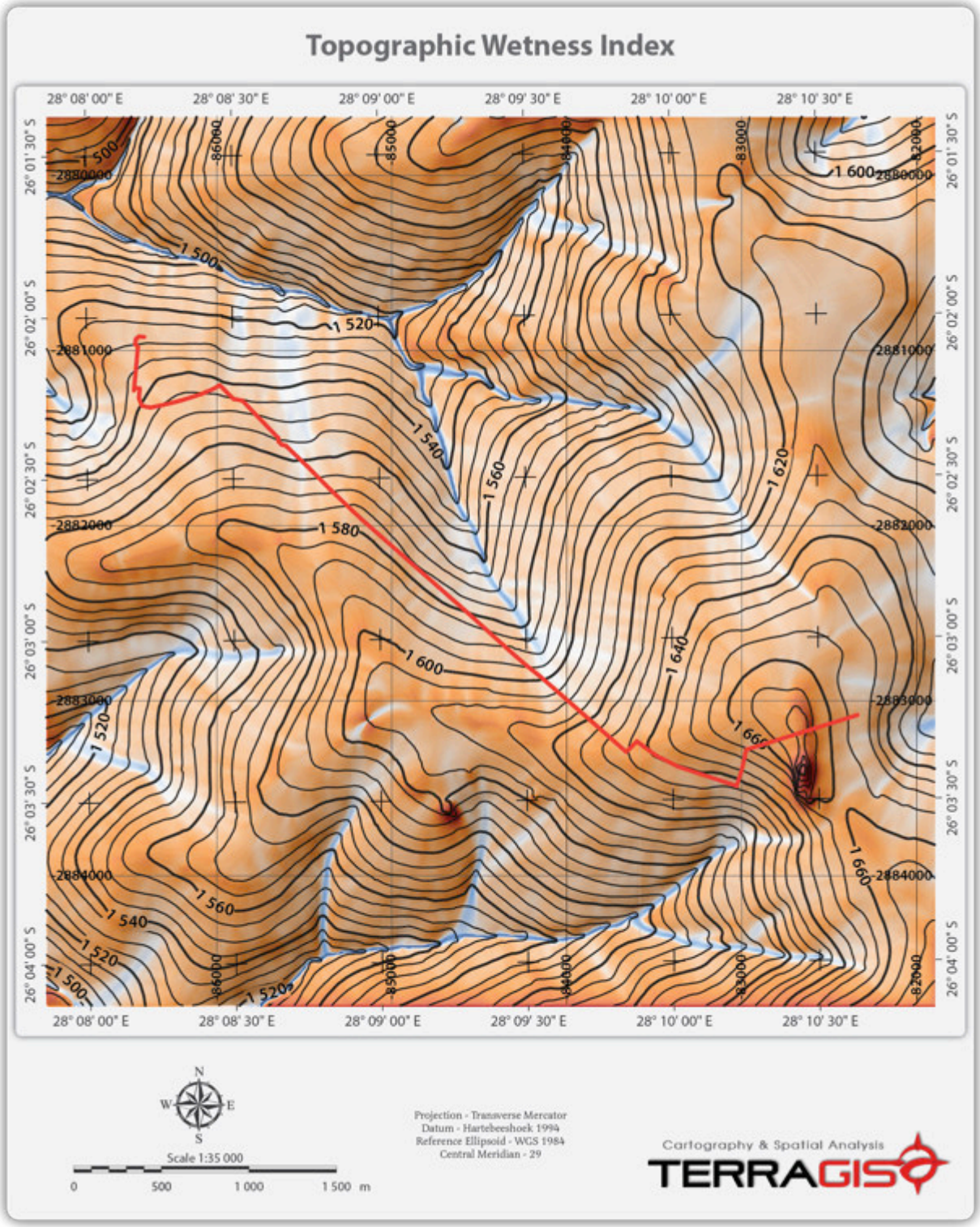

Figure 5 TWI of the survey site

3. PROBLEM STATEMENT

The delineation of wetlands in the HHGD area is challenging due to a range of factors that lead to difficulty in distinguishing between wetland and terrestrial zones. One of the main factors contributing to the difficulty is the specific geological context of the HHGD. From a soil form and wetness perspective the specific land type exhibits some form of "wetland" characteristic, according to the present wetland delineation guidelines (DWAF, 2005), in at least 75 % of the landscape. This aspect has led to significant challenges and friction regarding the interpretation of the guidelines as well as the specific soils in the area. A compounding factor is the extensive alteration of landscape hydrology through urban infrastructure and the development of numerous vegetation related wetland signatures as a result of the altered hydrological drivers. The following section provides a perspective regarding the statutory as well as biophysical context of wetland delineation in the HHGD area. This investigation will therefore focus on the identification of the wetland features based on soil hydromorphy, landscape hydrology as well as various historical modifiers through a dedicated assessment and elucidation of hydropedological processes and drivers experienced in the general area and specifically on the site.

4. STATUTORY CONTEXT

The following is a brief summary of the statutory context of wetland delineation and assessment. Where necessary, additional comment is provided on problematic aspects or aspects that, according to this author, require specific emphasis.

4.1 WETLAND DEFINITION

Wetlands are defined, in terms of the National Water Act (Act no 36 of 1998) (NWA), as:

"Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."

4.2 WATERCOURSE DEFINITION

"Catchment" is defined, in terms of the National Water Act (Act no 36 of 1998) (NWA), as:

"…, in relation to a watercourse or watercourses or part of a watercourse, means the area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through surface flow to a common point or common points;"

"Watercourse" is defined, in terms of the National Water Act (Act no 36 of 1998) (NWA), as:

"*(a)* a river or spring;
(b) a natural channel in which water flows regularly or intermittently;
(c) a wetland, lake or dam into which, or from which, water flows; and

(d) any collection of water which the Minister may, by notice in the *Gazette*, declare to be a water course,
and a reference to a watercourse includes, where relevant, its bed and banks;"

4.3 THE WETLAND DELINEATION GUIDELINES

In 2005 the Department of Water Affairs and Forestry published a manual entitled "A practical field procedure for identification and delineation of wetland and riparian areas" (DWAF, 2005). The "…manual describes field indicators and methods for determining whether an area is a wetland or riparian area, and for finding its boundaries." The definition of a wetland in the guidelines is that of the NWA and it states that wetlands must have one or more of the following attributes:

- "**Wetland (hydromorphic) soils** that display characteristics resulting from prolonged saturation"
- "The presence, at least occasionally, of **water loving plants (hydrophytes)**"
- "A **high water table** that results in saturation at or near the surface, leading to anaerobic conditions developing in the top 50cm of the soil."

The guidelines further list four indicators to be used for the finding of the outer edge of a wetland. These are:

- Terrain Unit Indicator. The terrain unit indicator does not only identify valley bottom wetlands but also wetlands on steep and mild slopes in crest, midslope and footslope positions.
- Soil Form Indicator. A number of soil forms (as defined by MacVicar et al., 1991) are listed as indicative of permanent, seasonal and temporary wetland zones.
- Soil Wetness Indicator. Certain soil colours and mottles are indicated as colours of wet soils. The guidelines stipulate that this is the primary indicator for wetland soils. (Refer to the guidelines for a detailed description of the colour indicators.) In essence, the reduction and removal of Fe in the form of "bleaching" and the accumulation of Fe in the form of mottles are the two main criteria for the identification of soils that are periodically or permanently wet.
- Vegetation Indicator. This is a key component of the definition of a wetland in the NWA. It often happens though that vegetation is disturbed and the guidelines therefore place greater emphasis on the soil form and soil wetness indicators as these are more permanent whereas vegetation communities are dynamic and react rapidly to external factors such as climate and human activities.

The main emphasis of the guidelines is therefore the use soils (soil form and wetness) as the criteria for the delineation of wetlands. The applicability of these guidelines in the context of the survey site will be discussed in further detail later in the report.

Due to numerous problems with the delineation of wetlands there are a plethora of courses being presented to teach wetland practitioners and laymen the required techniques. Most of the courses and practitioners focus on ecological or vegetation characteristics of landscapes and soil characteristics are often interpreted incorrectly due to a lacking soil science background of these

practitioners. As such this author regularly presents, in conjunction with a colleague (Prof. Cornie van Huysteen) from the University of the Free Sate, a course on the aspects related to soil classification and wetland delineation.

4.4 THE RESOURCE DIRECTED MEASURES FOR PROTECTION OF WATER RESOURCES

The following are specific quotes from the different sections of the "Resource Directed Measures for Protection of Water Resources." as published by DWAF (1999).

4.4.1 The Resource Directed Measures for Protection of Water Resources: Volume 4: Wetland Ecosystems.

From the Introduction:

"This set of documents on Resource Directed Measures (RDM) for protection of water resources, issued in September 1999 in Version 1.0, presents the procedures to be followed in undertaking **preliminary determinations of the class, Reserve and resource quality objectives for water resources**, as specified in sections 14 and 17 of the South African National Water Act (Act 36 of 1998).

The development of procedures to determine RDM was initiated by the Department of Water Affairs and Forestry in July 1997. Phase 3 of this project will end in March 2000. Additional refinement and development of the procedures, and development of the full water resource classification system, will continue in Phase 4, until such time as the detailed procedures and full classification system are ready for publication in the Government Gazette.

It should be noted that until the final RDM procedures are published in the Gazette, and prescribed according to section 12 of the National Water Act, all determinations of RDM, whether at the rapid, the intermediate or the comprehensive level, will be considered to be preliminary determinations."

4.4.2 The Resource Directed Measures for Protection of Water Resources: Generic Section "A" for Specialist Manuals – Water Resource Protection Policy Implementation Process

"Step 3: Determine the reference conditions of each resource unit"

"What are reference conditions?"

"The determination of reference conditions is a very important aspect of the overall Reserve determination methodology. Reference conditions describe the natural unimpacted characteristics of a water resource. Reference conditions quantitatively describe the ecoregional type, specific to a particular water resource."

4.4.3 The Resource Directed Measures for Protection of Water Resources: Appendix W1 (Ecoregional Typing for Wetland Ecosystems)

Artificial modifiers are explained namely:

"Many wetlands are man-made, while others have been modified from a natural state to some degree by the activities of humans. Since the nature of these alterations often greatly influences the character of such habitats, the inclusion of modifying terms to accommodate human influence is important. In addition, many human modifications, such as dam walls and drainage ditches, are visible in aerial photographs and can be easily mapped. The following Artificial Modifiers are defined and can be used singly or in combination wherever they apply to wetlands:

Farmed: the soil surface has been physically altered for crop production, but hydrophytes will become re-established if farming is discontinued

Artificial: substrates placed by humans, using either natural materials such as dredge spoils or synthetic materials such as concrete. Jetties and breakwaters are examples of Non-vegetated Artificial habitats

Excavated: habitat lies within an excavated basin or channel

Diked/Impounded: created or modified by an artificial barrier which obstructs the inflow or outflow of water

Partially Drained: the water level has been artificially lowered, usually by means of ditches, but the area is still classified as wetland because soil moisture is sufficient to support hydrophytes."

4.4.4 The Resource Directed Measures for Protection of Water Resources: Appendix W4 IER (Floodplain Wetlands) Present Ecological Status (PES) Method

In Appendix W4 the methodology is provided for the determination of the present ecological status (PES) of a palustrine wetland.

The present ecological state (PES) of the wetland was determined according to the method described in "APPENDIX W4: IER (FLOODPLAIN WETLANDS) PRESENT ECOLOGICAL STATUS (PES) METHOD" of the "Resource Directed Measures for Protection of Water Resources. Volume 4: Wetland Ecosystems" as published by DWAF (1999). However, the PES methodology already forms an adaptation from the methodology to assess palustrine wetlands. Hillslope seepage wetlands have a range of different drivers and as such some modification of the criteria has been made by this author to accommodate the specific hydropedology drivers of hillslope seepage wetlands.

The criteria as described in Appendix 4 is provided below with the relevant modification or comment provided as well.

The summarised tasks in the PES methodology are (for detailed descriptions refer to the relevant documentation):

1. Conduct a literature review (review of available literature and maps) on the following:
    a. Determine types of development and land use (in the catchment in question).
    b. Gather hydrological data to determine the degree to which the flow regime has been modified (with the "virgin flow regime" as baseline). The emphasis is predominantly on surface hydrology and hydrology of surface water features as well as the land uses, such as agriculture and forestry, that lead to flow modifications. Important Note: The hydropedology of landscapes is not explicitly mentioned in the RDM documentation and this author will make a case for its consideration as probably the most important component of investigating headwater systems and seepage wetlands and areas.
    c. Assessment of the water quality as is documented in catchment study reports and water quality databases.
    d. Investigate erosion and sedimentation parameters that address aspects such as bank erosion and bed modification. Important Note: The emphasis in the RDM documentation is again on river and stream systems with little mention of erosion of headwater and seepage zone systems. Again a case will be made for the emphasis of such information generation.
    e. Description of exotic species (flora and fauna) in the specific catchment in question.
2. Conduct and aerial photographic assessment in terms of the parameters listed above.
3. Conduct a site visit and make use of local knowledge.
4. Assess the criteria and generate preliminary PES scores.
5. Generation of report.

Table 1 presents the scoresheet with criteria for the assessment of habitat integrity of palustrine wetlands (as provided in the RDM documentation).

Scoring guidelines per attribute:
natural, unmodified = 5; Largely natural = 4, Moderately modified = 3; largely modified = 2; seriously modified = 1; Critically modified = 0.
Relative confidence of score:
Very high confidence = 4; High confidence = 3; Moderate confidence = 2; Marginal/low confidence = 1.

Important Note: The present ecological state (PES) determination is, as discussed earlier in the report, based on criteria originally generated for palustrine and floodplain wetlands. Seepage wetlands very rarely have the same degree of saturation or free water and consequently often do not have permanent wetland zones. These wetlands are therefore often characterised by seasonal or temporary properties and as such a standard PES approach is flawed. The existing criteria is provided below as is a comment on the applicability as well as proposed improvements.

Table 1 "Table W4-1: Scoresheet with criteria for assessing Habitat Integrity of Palustrine Wetlands (adapted from Kleynhans 1996)"

Criteria and attributes	**Relevance**	**Score**	**Confidence**
Hydrologic			
Flow modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime (timing, duration, frequency), volumes, velocity which affect inundation of wetland habitats resulting in floristic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.		
Permanent Inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.		
Water Quality			
Water Quality Modification	From point or diffuse sources. Measure directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland		
Sediment load modification	Consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.		
Hydraulic/Geomorphic			
Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.		
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railwaylines and other substrate disruptive activities which reduces or changes wetland habitat directly or through changes in inundation patterns.		
Biota			
Terrestrial Encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant speciesdue to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.		
Indigenous Vegetation Removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.		
Invasive plant encroachment	Affect habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).		
Alien fauna	Presence of alien fauna affecting faunal community structure.		
Overutilisation of biota	Overgrazing, Over-fishing, etc		
TOTAL MEAN			

Criteria

Hydrological Criteria

- "Flow modification: Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime (timing, duration, frequency), volumes, velocity which affect inundation of wetland habitats resulting in floristic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland." Comment: Although the description is wide it is very evident that seepage or hillslope wetlands do not become inundated but rather are fed by hillslope return flow processes. The main criterion should therefore be the surface and subsurface hydrological linkages expressed as a degree of alteration in terms of the surface, hydropedology and groundwater hydrology.
- "Permanent inundation: Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota." Comment: Mostly not applicable to hillslope seepage wetlands.

Water Quality Criteria

- "Water quality modification: From point or diffuse sources. Measure directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland." Comment: Water quality in this context applies generally but cognisance should be taken of seepage water quality that can be natural but significantly different to exposed water bodies. The main reason for this being the highly complex nature of many redox processes within the hillslope.
- "Sediment load modification: Consequence of reduction due to entrapment by impoundments or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats." Comment: This is a very relevant concept but on hillslopes should be linked to erosivity of the soils as well as the specific land use influences.

Hydraulic / Geomorphic Criteria

- "Canalisation: Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage." Comment: Again this is a very relevant concept but on hillslopes should be linked to erosivity of the soils as well as the specific land use influences. This concept does however not address the influences on the hydropedology of the hillslope. These aspects should be elucidated and contextualised.
- "Topographic Alteration: Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railwaylines and other substrate disruptive activities which reduces or changes wetland habitat directly or through changes in inundation patterns." Comment: Again this is a very relevant concept but on hillslopes should be linked to erosivity of the soils as well as the specific land use influences. This concept does however not address the influences on the hydropedology of the hillslope. These aspects should be elucidated and contextualised.

Biological Criteria

- "Terrestrial encroachment: Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from

wetland to terrestrial habitat and loss of wetland functions." Comment: Again this is a very relevant concept but on hillslopes should be linked to erosivity of the soils as well as the specific land use influences. This concept does however not address the influences on the hydropedology of the hillslope. These aspects should be elucidated and contextualised.

- "Indigenous vegetation removal: Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion."
- "Invasive plant encroachment: Affect habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading)."
- "Alien fauna: Presence of alien fauna affecting faunal community structure."
- "Overutilisation of biota: Overgrazing, Over-fishing, etc."

Scoring Guidelines
Scoring guidelines per attribute:
Natural, unmodified = 5
Largely natural = 4
Moderately modified = 3
Largely modified = 2
Seriously modified = 1
Critically modified = 0

Relative confidence of score:
Very high confidence = 4
High confidence = 3
Moderate confidence = 2
Marginal/low confidence = 1

4.4.5 The Resource Directed Measures for Protection of Water Resources: Appendix W5 IER (Floodplain Wetlands) Determining the Ecological Importance and Sensitivity (EIS) and the Ecological Management Class (EMC)

In Appendix W5 the methodology is provided for the determination of the ecological importance and sensitivity (EIS) and ecological management class (EMC) of floodplain wetlands.

"Ecological importance" of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. "Ecological sensitivity" refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. The Ecological Importance and sensitivity (EIS) provides a guideline for determination of the Ecological Management Class (EMC)." Please refer to the specific document for more detailed information.

The following primary determinants are listed as determining the EIS:

1. Rare and endangered species

2. Populations of unique species
3. Species / taxon richness
4. Diversity of habitat types or features
5. Migration route / breeding and feeding site for wetland species
6. Sensitivity to changes in the natural hydrological regime
7. Sensitivity to water quality changes
8. Flood storage, energy dissipation and particulate / element removal

The following modifying determinants are listed as determining the EIS:

1. Protected status
2. Ecological integrity

4.5 LACK OF CLARITY IN ON REFERENCE STATE AND MAN-MADE WETLANDS

The current legislation and guidelines are not clear on the differentiation between natural wetlands and man-made wetlands and how to deal with these differences in an urban development context where hydrological drivers are altered extensively on a catchment and local scale. This lack of clarity often translates into decisions being made by the regulator (metropolitan authority, provincial authority or national authority) that may vary significantly between different levels of decision making and that may often be perceived as either an "erring on the side of caution" approach or a complete abdication and releasing of wetlands / watercourses for alteration or destruction. A specific case is where the provincial competent authority, upon being informed that a wetland / watercourse area at the N1/N4 interchange in Tshwane showed signs of extensive human impact, released the area for development, contrary to the recommendations in the specialist report, without any dedicated hydrological management measures. This author is of the conviction that even highly impacted wetlands and watercourses should be managed hydrologically and that the competent authorities should emphasize this need even though the ecological characteristics of a wetland / watercourse area has been degraded significantly. This is especially relevant in urban areas where urban hydrological signatures abound and where wetlands / watercourses / storm water flows have led to a gradual change in the original reference state conditions. However, as this aspect is difficult to conceptualise in the current legislation and authorisation processes it is recommended that specific and focussed guidelines and procedures be generated to deal with the urban hydrological and ecological challenges.

4.6 SUMMARY AND PROPOSED APPROACH

When working in environments where the landscape and land use changes are significant (such as urban and mining environments) it is important to answer the following critical questions regarding the assessment and management planning for wetlands:

1. What is the reference condition?
2. What is the difference between the reference condition and the current condition and how big is this difference from a hydrological driver perspective?

3. What are the hydrological drivers (as a function of geology, topography, rainfall and soils) and what are the relative contributions of these drivers to the functioning of the wetland system?
4. What is the intended or planned land use in the wetland as well as terrestrial area and how will these developments impact on the hydrology of the landscape and wetlands?
5. How can the intended land use be plied to secure the best possible hydrological functioning of the landscape in terms of storm water attenuation, erosion mitigation and water quality?

The key to the generation of adequate information lies in the approach that is to be followed. In the next section an explanation about and motivation in favour of will be provided for a hydropedology assessment approach. Due to the detailed nature of the information that can be generated through such an approach it is motivated that all wetland assessments be conducted with the requirements of criminal law in mind. The main reason for this is the fact that many well-meaning administrative exercises often yield not tangible results due to the gap in terms of information that is required should there be a compliance process followed.

To Summarise:

During wetland assessments and delineations it is important to provide a perspective on assessment tools, the original or reference state of the wetland, the assessment process and outcome as well as the intended or possible state of the wetland and site post development. Urban and mining developments are good examples of cases where surrounding developments and land use changes have significant effects on wetland integrity and water quality emanating from the site.

5. CHALLENGES REGARDING WETLAND DELINEATION ON THE HALFWAY HOUSE GRANITE DOME

Disclaimer: The following section represents a discussion that I use as standard in describing the challenges regarding wetland delineation and management in the Halfway House Granite Dome (HHGD) area. This implies that the section is verbatim the same as in other reports provided to clients and the authorities. Copyright is strictly reserved.

In order to discuss the procedures followed and the results of the wetland identification exercise it is necessary at the outset to provide some theoretical background on the differences between wetland responses and drivers, soil forming processes, soil wetness indicators, water movement in soils and topographical sequences of soil forms (catena).

5.1 WETLAND DRIVERS AND ECOLOGICAL RESPONSES

At the outset it is important to distinguish between wetland responses and the drivers of wetland conditions and characteristics. Wetland responses are usually measured in the form of ecological

properties of a specific wetland or landscape. These relate to a host of living organisms that indicate the status and quality of the wetland with values assigned by specialists to these indicators. The wetland specialist therefore provides a snapshot of the condition of the wetland and this snapshot indicates the characteristics or “value” that will be lost once the wetland is impacted.

However, the ecological response is entirely dependent on the hydrological drivers of the wetland system. The drivers are numerous and include the following:

1. Surface hydrology of the landscape: This parameter determines flow dynamics of water with subsequent accumulation zones that correspond to depressions and low points. This driver is accounted for in the terrain unit indicator (wetland delineation guidelines) on a landscape scale but is often overlooked on a much more localised scale in furrows, erosion features and micromorphological features encountered in many landscapes. The typical responses to these features relate to the well-established knowledge on wetland ecology in that wetter zones will indicate ecological signatures associated with the degree and duration of wetness. It therefore follows that surface runoff characteristics of a landscape, when altered, will alter the responses accordingly. Examples include road, paving or roof surfaces that seal the soil or complete alteration of landscape surfaces through cut and fill operations. The typical response to these operations are reflected in storm water signatures related to wetland vegetation establishment in culverts / channels, erosion of unstable soils and materials, and/or rapid filling of depressions with water following rainfall events.
2. Interflow or hillslope hydrology: This parameter is described in much more detail below and is a function of a number of soil, geology and landscape characteristics. The essence is that interflow or hillslope water can manifest in any position in the landscape and surface or near surface water will elicit an ecological response that can be measured and assessed. If however the soil, geological or landscape characteristics are altered the seepage pathways will also be altered and the wet ecological response may vary from disappearing in the areas that have become drier or being amplified in areas that have become wetter. Alteration of the surface, as discussed above, may also impede or increase infiltration with a subsequent increase in interflow and wet ecological response.
3. Groundwater hydrology: This parameter is influenced by both of the parameters described above and constitutes the water resource that is often accessed through boreholes or deep wells. Groundwater can in some cases intercept the land surface and in such conditions it will elicit a wet ecological response. If the water level changes the response will change accordingly.
4. Water quality: This parameter is a significant driver of the specific wet ecological response in that different organisms will provide distinct perspectives on the chemical signature of the water that manifests near or on land surfaces. However, this parameter can also be altered to varying degrees by the above parameters and their alteration and it therefore also constitutes a response to the above three.

It is critically important to note here that the natural landscape condition, with its equilibrium in terms of surface, hillslope, groundwater and water quality characteristics, forms the reference state for the assessment of ecological and hydrological parameters. Any alteration in these parameters would elicit altered responses that may be desirable or not. This also forms the philosophical and practical basis for integrated storm water management, wetland rehabilitation and artificial wetland design and construction.

5.2 SOIL AS A TOOL FOR LANDSCAPE CONTEXT AND HYDROLOGICAL DRIVER DESCRIPTION

The relevance of soils as tools for the elucidation and description of landscape context and hydrological drivers is discussed in detail below. It is however important to emphasize the differences that are evident in South African soils when these are compared to the soils of countries where wetland assessment processes based on the identification of hydric soil indicators are used in administrative and legal compliance processes. One such example is the large body of knowledge underpinning the identification, assessment, management and protection of wetlands in the USA that served as a motivation for the processes followed in South Africa.

Laker (2003) describes three main soil regions in the world namely 1) soils of the high latitudes and continental land masses in the northern hemisphere, 2) the soils of the humid and subhumid tropics around the equator and 3) the soils of the southern hemisphere lying between 20 and 35 degrees south. The first regions is characterised by cooler to cold climates and have experienced relatively recent glaciation. The soils are therefore indicative of the cold weather in that they contain significant organic carbon and the soils also exhibit signs of youthful age when compared to older tropical soils. The second region is characterised by older and very pronounced pedogenesis. Both the aforementioned groups have been studied extensively and are adequately accommodated in several local and international soil classification systems. The third region is characterised by hard geology, old age and moderate to low rainfall leading to the development of very distinct soils that are not always comfortably accommodated in international classification systems. The South African Taxonomic System therefore accommodates the soils in a structure that is somewhat different to the well-known international systems (USDA Soil Taxonomy and WRB).

The benefit of the above third soil region is that the soils are found on predominantly stable and old land surfaces with the consequence that the soil morphology clearly indicates the hydrological functioning in the expression of redox morphology. This aspect therefore leads to a very distinct redox morphology foundation for wetland delineation. The extension of this argument is that the soil morphology, described within a distinct geological, topographical and climate context provides an excellent tool for the elucidation of landscape hydrological process. The hydrological drivers of wetland conditions can therefore be elucidated through a dedicated assessment of the soils and the weathered zone of the land surface. This argument forms the basis for the discussion to follow as well as the foundation for the determination of the “reference state” as required for ecological assessment techniques.

5.3 PEDOGENESIS

Pedogenesis is the process of soil formation. Soil formation is a function of five (5) factors namely (Jenny, 1941):

- Parent material;
- Climate;
- Topography;
- Living Organisms; and
- Time.

These factors interact to lead to a range of different soil forming processes that ultimately determine the specific soil formed in a specific location. Central to all soil forming processes is water and all the reactions (physical and chemical) associated with it. The physical processes include water movement onto, into, through and out of a soil unit. The movement can be vertically downwards, lateral or vertically upwards through capillary forces and evapotranspiration. The chemical processes are numerous and include dissolution, precipitation (of salts or other elements) and alteration through pH and reduction and oxidation (redox) changes. In many cases the reactions are promoted through the presence of organic material that is broken down through aerobic or anaerobic respiration by microorganisms. Both these processes alter the redox conditions of the soil and influence the oxidation state of elements such as Fe and Mn. Under reducing conditions Fe and Mn are reduced and become more mobile in the soil environment. Oxidizing conditions, in turn, lead to the precipitation of Fe and Mn and therefore lead to their immobilization. The dynamics of Fe and Mn in soil, their zones of depletion through mobilization and accumulation through precipitation, play an important role in the identification of the dominant water regime of a soil and could therefore be used to identify wetlands and wetland conditions.

5.4 WATER MOVEMENT IN THE SOIL PROFILE

In a specific soil profile, water can move upwards (through capillary movement), horizontally (owing to matric suction) and downwards under the influence of gravity.

The following needs to be highlighted in order to discuss water movement in soil:

- Capillary rise refers to the process where water rises from a deeper lying section of the soil profile to the soil surface or to a section closer to the soil surface. Soil pores can be regarded as miniature tubes. Water rises into these tubes owing to the adhesion (adsorption) of water molecules onto solid mineral surfaces and the surface tension of water.

  The height of the rise is inversely proportional to the radius of the soil pore and the density of the liquid (water). It is also directly proportional to the liquid's surface tension and the degree of its adhesive attraction. In a soil-water system the following simplified equation can be used to calculate this rise:

Height = 0.15/radius

Usually the eventual height of rise is greater in fine textured soil, but the rate of flow may be slower (Brady and Weil, 1999; Hillel, 1983).

- Matric potential or suction refers to the attraction of water to solid surfaces. Matric potential is operational in unsaturated soil above the water table while pressure potential refers to water in saturated soil or below the water table. Matric potential is always expressed as a negative value and pressure potential as a positive value.

  Matric potential influences soil moisture retention and soil water movement. Differences in the matric potential of adjoining zones of a soil results in the movement of water from the moist zone (high state of energy) to the dry zone (low state of energy) or from large pores to small pores.

  The maximum amount of water that a soil profile can hold before leaching occurs is called the field capacity of the soil. At a point of water saturation, a soil exhibits an energy state of 0 $J.kg^{-1}$. Field capacity usually falls within a range of -15 to -30 $J.kg^{-1}$ with fine textured soils storing larger amounts of water (Brady and Weil, 1999; Hillel, 1983).

- Gravity acts on water in the soil profile in the same way as it acts on any other body; it attracts towards earth's centre. The gravitational potential of soil water can be expressed as:

  Gravitational potential = Gravity x Height

  Following heavy rainfall, gravity plays an important part in the removal of excess water from the upper horizons of the soil profile and recharging groundwater sources below.

  Excess water, or water subject to leaching, is the amount of water that falls between soil saturation (0 $J.kg^{-1}$) or oversaturation (> 0 $J.kg^{-1}$), in the case of heavy rainfall resulting in a pressure potential, and field capacity (-15 to -30 $J.kg^{-1}$). This amount of water differs according to soil type, structure and texture (Brady and Weil, 1999; Hillel, 1983).

- Under some conditions, at least part of the soil profile may be saturated with water, resulting in so-called saturated flow of water. The lower portions of poorly drained soils are often saturated, as are well-drained soils above stratified (layers differing in soil texture) or impermeable layers after rainfall.

  The quantity of water that flows through a saturated column of soil can be calculated using Darcy's law:

  $$Q = Ksat.A.\Delta P/L$$

Where Q represents the quantity of water per unit time, Ksat is the saturated hydraulic conductivity, A is the cross sectional area of the column through which the water flows, ΔP is the hydrostatic pressure difference from the top to the bottom of the column, and L is the length of the column.

Saturated flow of water does not only occur downwards, but also horizontally and upwards. Horizontal and upward flows are not quite as rapid as downward flow. The latter is aided by gravity (Brady and Weil, 1999; Hillel, 1983).

- Mostly, water movement in soil is ascribed to the unsaturated flow of water. This is a much more complex scenario than water flow under saturated conditions. Under unsaturated conditions only the fine micropores are filled with water whereas the macropores are filled with air. The water content, and the force with which water molecules are held by soil surfaces, can also vary considerably. The latter makes it difficult to assess the rate and direction of water flow. The driving force behind unsaturated water flow is matric potential. Water movement will be from a moist to a drier zone (Brady and Weil, 1999; Hillel, 1983).

The following processes influence the amount of water to be leached from a soil profile:

- Infiltration is the process by which water enters the soil pores and becomes soil water. The rate at which water can enter the soil is termed infiltration tempo and is calculated as follows:

$$I = Q/A.t$$

Where I represents infiltration tempo ($m.s^{-1}$), Q is the volume quantity of infiltrating water (m^3), A is the area of the soil surface exposed to infiltration (m^2), and t is time (s).

If the soil is quite dry when exposed to water, the macropores will be open to conduct water into the soil profile. Soils that exhibit a high 2:1 clay content (swelling-shrinking clays) will exhibit a high rate of infiltration initially. However, as infiltration proceeds, the macropores will become saturated and cracks, caused by dried out 2:1 clay, will swell and close, thus leading to a decline in infiltration (Brady and Weil, 1999; Hillel, 1983).

- Percolation is the process by which water moves downward in the soil profile. Saturated and unsaturated water flow is involved in the process of percolation, while the rate of percolation is determined by the hydraulic conductivity of the soil.

During a rain storm, especially the down pouring of heavy rain, water movement near the soil surface mainly occurs in the form of saturated flow in response to gravity. A sharp boundary, referred to as the wetting front, usually appears between the wet soil and the underlying dry soil. At the wetting front, water is moving into the underlying soil in response to both matric and gravitational potential. During light rain, water movement at the soil surface may be ascribed to unsaturated flow (Brady and Weil, 1999; Hillel, 1983).

The fact that water percolates through the soil profile by unsaturated flow has certain ramifications when an abrupt change in soil texture occurs (Brady and Weil, 1999; Hillel, 1983). A layer of course sand, underlying a fine textured soil, will impede downward movement of water. The macropores of the coarse textured sand offer less attraction to the water molecules than the macropores of the fine textured soil. When the unsaturated wetting front reaches the coarse sand, the matric potential is lower in the sand than in the overlying material. Water always moves from a higher to a lower state of energy. The water can, therefore, not move into the coarse textured sand. Eventually, the downward moving water will accumulate above the sand layer and nearly saturate the fine textured soil. Once this occurs, the water will be held so loosely that gravitational forces will be able to drag the water into the sand layer (Brady and Weil, 1999; Hillel, 1983).

A coarse layer of sand in an otherwise fine textured soil profile will also inhibit the rise of water by capillary movement (Brady and Weil, 1999; Hillel, 1983).

Field observations and laboratory based analysis can aid in assessing the soil-water relations of an area. The South African soil classification system (Soil Classification Working Group, 1991.) comments on certain field observable characteristics that shed light on water movement in soil. The more important of these are:

- Soil horizons that show clear signs of leaching such as the E-horizon – an horizon where predominantly lateral water movement has led to the mobilisation and transport of sesquioxide minerals and the removal of clay material;
- Soil horizons that show clear signs of a fluctuating water table where Fe and Mn mottles, amongst other characteristics, indicate alternating conditions of reduction and oxidation (soft plinthic B-horizon);
- Soil horizons where grey colouration (Fe reduction and redox depletion), in an otherwise yellowish or reddish matrix, indicate saturated (or close to saturated) water flow for at least three months of the year (Unconsolidated/Unspecified material with signs of wetness);
- Soil horizons that are uniform in colouration and indicative of well-drained and aerated (oxidising) conditions (e.g. yellow brown apedal B-horizon).

5.5 WATER MOVEMENT IN THE LANDSCAPE

Water movement in a landscape is a combination of the different flow paths in the soils and geological materials. The movement of water in these materials is dominantly subject to gravity and as such it will follow the path of least resistance towards the lowest point. In the landscape there are a number of factors determining the paths along which this water moves. **Figure 6** provides a simplified schematic representation of an idealised landscape (in “profile curvature”. The total precipitation (rainfall) on the landscape from the crest to the lowest part or valley bottom is taken as 100 %. Most geohydrologists agree that total recharge, the water that seeps into the underlying geological strata, is less than 4 % of total precipitation for most geological settings. Surface runoff varies considerably according to rainfall intensity and distribution, plant cover and soil characteristics but is taken as a realistic 6 % of total precipitation for our idealised landscape.

The total for surface runoff and recharge is therefore calculated as 10 % of total precipitation. If evapotranspiration (from plants as well as the soil surface) is taken as a very high 30 % of total precipitation it leaves 60 % of the total that has to move through the soil and/or geological strata from higher lying to lower lying areas. In the event of an average rainfall of 750 mm per year it results in 450 mm per year having to move laterally through the soil and geological strata. In a landscape there is an accumulation of water down the slope as water from higher lying areas flow to lower lying areas.

To illustrate: If the assumption is made that the area of interest is 100 m wide it follows that the first 100 m from the crest downwards has 4 500 m^3 (or 4 500 000 litres) of water moving laterally through the soil (100 m X 100 m X 0.45 m) per rain season. The next section of 100 m down the slope has its own 4 500 m^3 of water as well as the added 4 500 m^3 from the upslope section to contend with, therefore 9 000 m^3. The next section has 13 500 m^3 to contend with and the following one 18 000 m^3. It is therefore clear that, the longer the slope, the larger the volume of water that will move laterally through the soil profile.

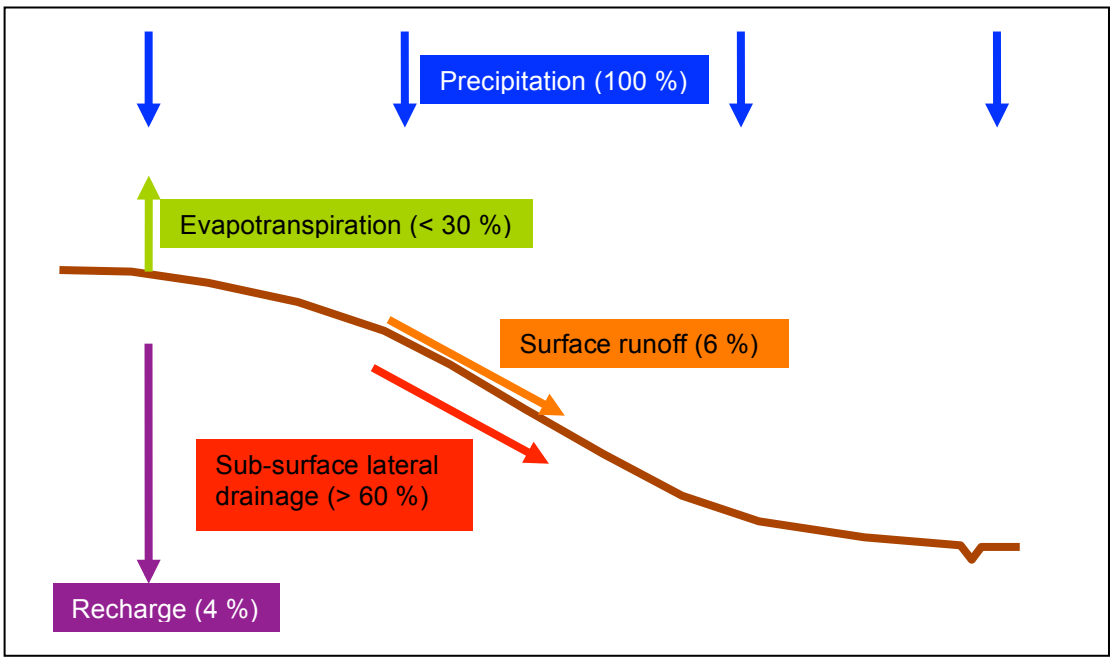

Figure 6 Idealised landscape with assumed quantities of water moving through the landscape expressed as a percentage of total precipitation (100 %).

Flow paths through soil and geological strata, referred to as “interflow” or “hillslope water”, are very varied and often complex due to difficulty in measurement and identification. The difficulty in identification stems more from the challenges related to the physical determination of these in soil profile pits, soil auger samples and core drilling samples for geological strata. The identification of the morphological signs of water movement in permeable materials or along planes of weakness (cracks and seams) is a well-established science and the expression is mostly referred to as “redox morphology”. In terms of the flow paths of water large variation exists but these can be grouped into a few simple categories. **Figure 7** provides a schematic representation of the different

flow regimes that are usually encountered. The main types of water flow can be grouped as 1) recharge (vertically downwards) of groundwater; 2) lateral flow of water through the landscape along the hillslope (interflow or hillslope water); 3) return flow water that intercepts the soil/landscape surface; and 4) surface runoff. Significant variation exists with these flow paths and numerous combinations are often found. The main wetland types associated with the flow paths are: a) valley bottom wetlands (fed by groundwater, hillslope processes, surface runoff, and/or in-stream water); b) hillslope seepage wetlands (fed by interflow water and/or return flow water); and wetlands associated with surface runoff, ponding and surface ingress of water anywhere in the landscape.

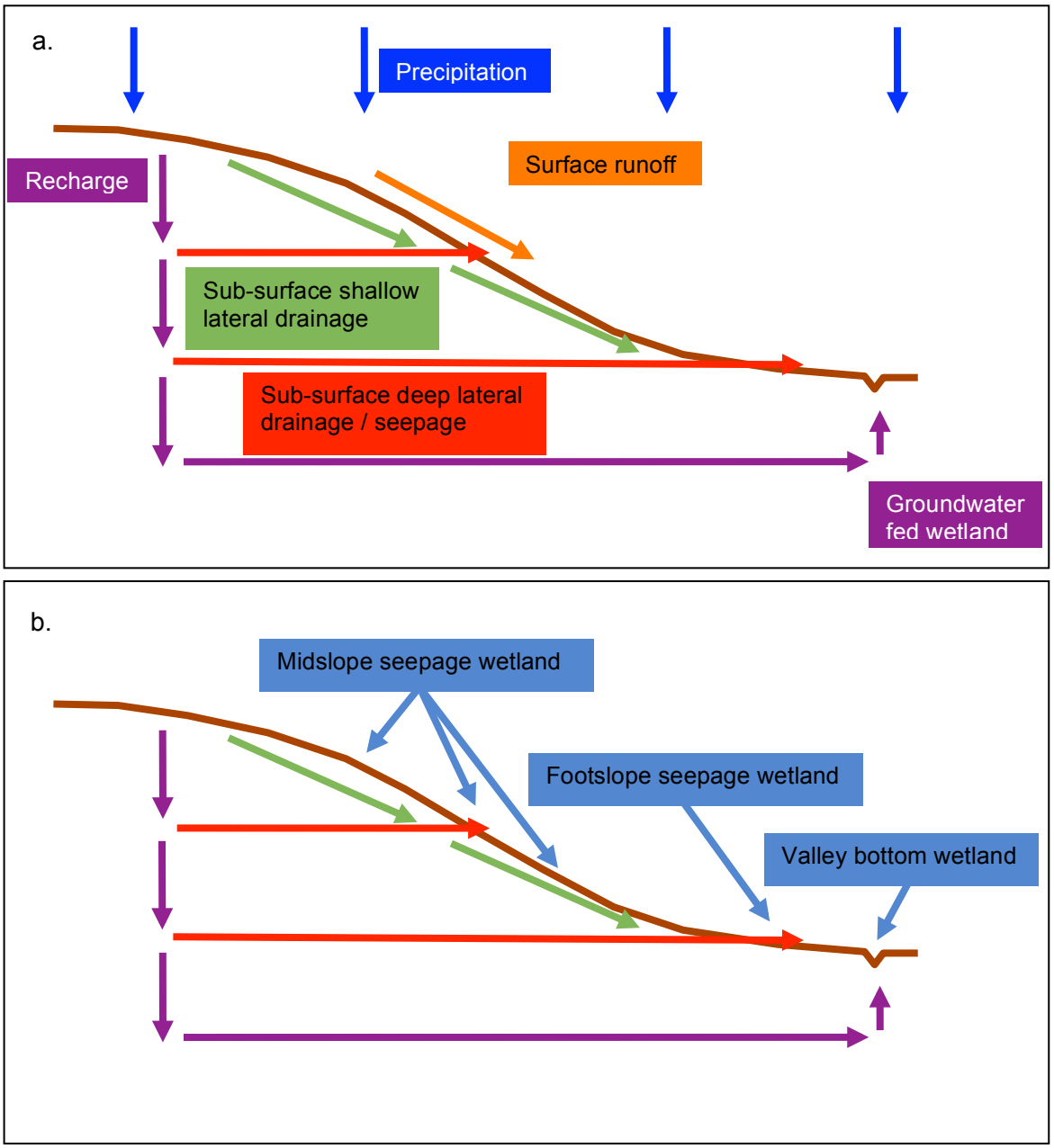

Figure 7 Different flow paths of water through a landscape (a) and typical wetland types associated with the water regime (b)

Amongst other factors, the thickness of the soil profile at a specific point will influence the intensity of the physical and chemical reactions taking place in that soil. **Figure 8** illustrates the difference between a dominantly thick and a dominantly thin soil profile. If all factors are kept the same except for the soil profile thickness it can be assumed with confidence that the chemical and physical reactions associated with water in the landscape will be much more intense for the thin soil profile than for the thick soil profile. Stated differently: The volume of water moving through the soil per surface area of an imaginary plane perpendicular to the direction of water flow is much higher for the thin soil profile than for the thick soil profile. This aspect has a significant influence on the expression of redox morphology in different landscapes of varying soil/geology/climate composition.

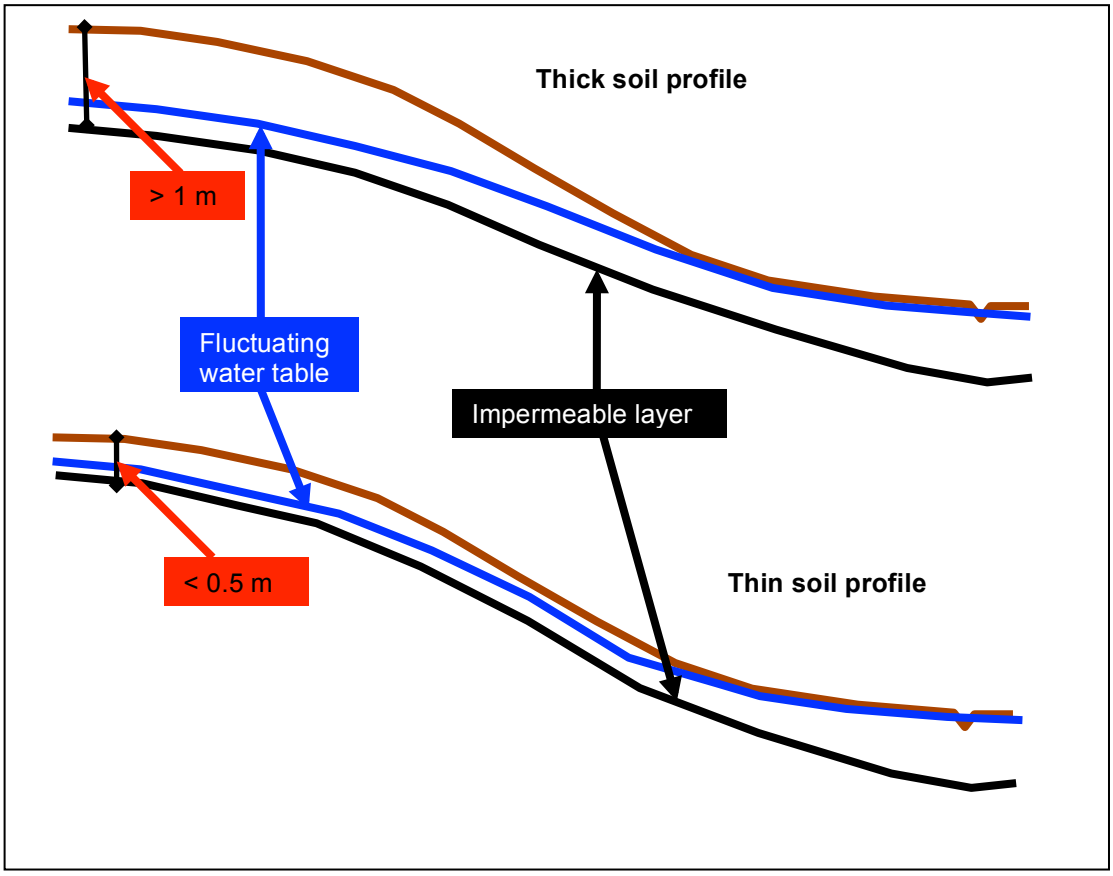

Figure 8 The difference in water flow between a dominantly thick and dominantly thin soil profile.

5.6 THE CATENA CONCEPT

Here it is important to take note of the "catena" concept. This concept is one of a topographic sequence of soils in a homogenous geological setting where the water movement and presence in the soils determine the specific characteristics of the soils from the top to the bottom of the topography. **Figure 9** illustrates an idealised topographical sequence of soils in a catena for a quartz rich parent material. Soils at the top of the topographical sequence are typically red in colour (Hutton and Bainsvlei soil forms) and systematically grade to yellow further down the slope (Avalon soil form). As the volume of water that moves through the soil increases, typically in midslope

areas, periodic saturated conditions are experienced and consequently Fe is reduced and removed in the laterally flowing water. In the event that the soils in the midslope positions are relatively sandy the resultant soil colour will be bleached or white due to the colour dominance of the sand quartz particles. The soils in these positions are typically of the Longlands and Kroonstad forms. Further down the slope there is an accumulation of clays and leaching products from higher lying soils and this leads to typical illuvial and clay rich horizons. Due to the regular presence of water the dominant conditions are anaerobic and reducing and the soils exhibit grey colours often with bright yellow and grey mottles (Katspruit soil form). In the event that there is a large depositional environment with prolonged saturation soils of the Champagne form may develop (typical peat land). Variations on this sequence (as is often found on the Mpumalanga Highveld) may include the presence of hard plinthic materials instead of soft plinthite with a consequent increase in the occurrence of bleached soil profiles. Extreme examples of such landscapes are discussed below.

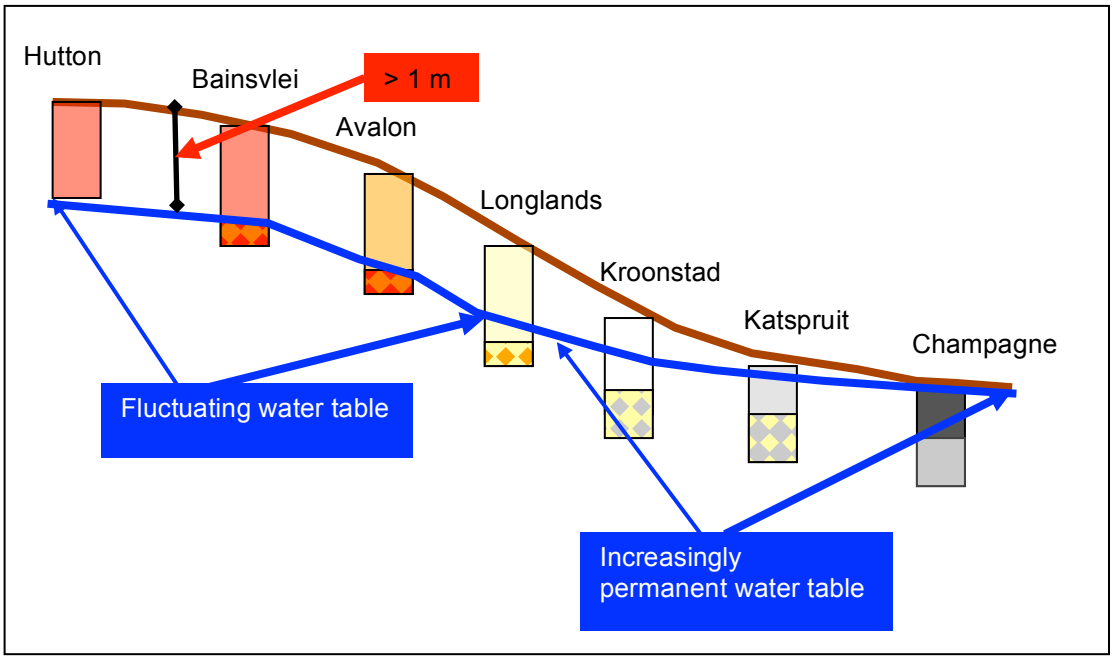

Figure 9 Idealised catena on a quartz rich parent material.

5.7 THE HALFWAY HOUSE GRANITE DOME CATENA

The Halfway House Granite Catena is a well-studied example of a quartz dominated Bb catena. As a result of the elucidation of the wetland delineation parameters and challenges in the specialist testimony in the matter between The State versus 1. Stefan Frylinck and 2. Mpofu Environmental Solutions CC (Case Number 14/1740/2010) it will be discussed in further detail here.

The typical catena that forms on the Halfway House granite differs from the idealised one discussed above in that the landscape is an old stable one, often with extensive subsoil ferricrete (or hard plinthic) layers where perched water tables occur. The parent material is relatively hard and the ferricrete layer is especially resistant to weathering. The quartz rich parent materials have a very low Fe content/"reserve", and together with the age of the material leads to the dominance

of bleached sandy soils. The implication is that the whole catena is dominated by bleached sandy soils with a distinct and shallow zone of water fluctuation. This zone is often comprised of a high frequency of Fe/Mn concretions and sometimes exhibits feint mottles. In lower lying areas the soils tend to be deeper due to colluvial accumulation of sandy soil material but then exhibit more distinct signs of wetness (and pedogenesis). **Figure 10** provides a schematic representation of the catena.

The essence of this catena is that the soils are predominantly less than 50 cm thick and as such have a fluctuating water table (mimicking rainfall events) within 50 cm of the soil surface. One of the main criteria used during wetland delineation exercises as stipulated by the guidelines (DWAF, 2005) is the presence of mottles within 50 cm of the soil surface (temporary and seasonal wetland zones). Even from a theoretical point of view the guidelines cannot be applied to the above described catena as soils at the crest of the landscape would already qualify as temporary wetland zone soils (upon request many such examples can be supplied). The practical implication of this statement as well as practical examples will be discussed in the next section.

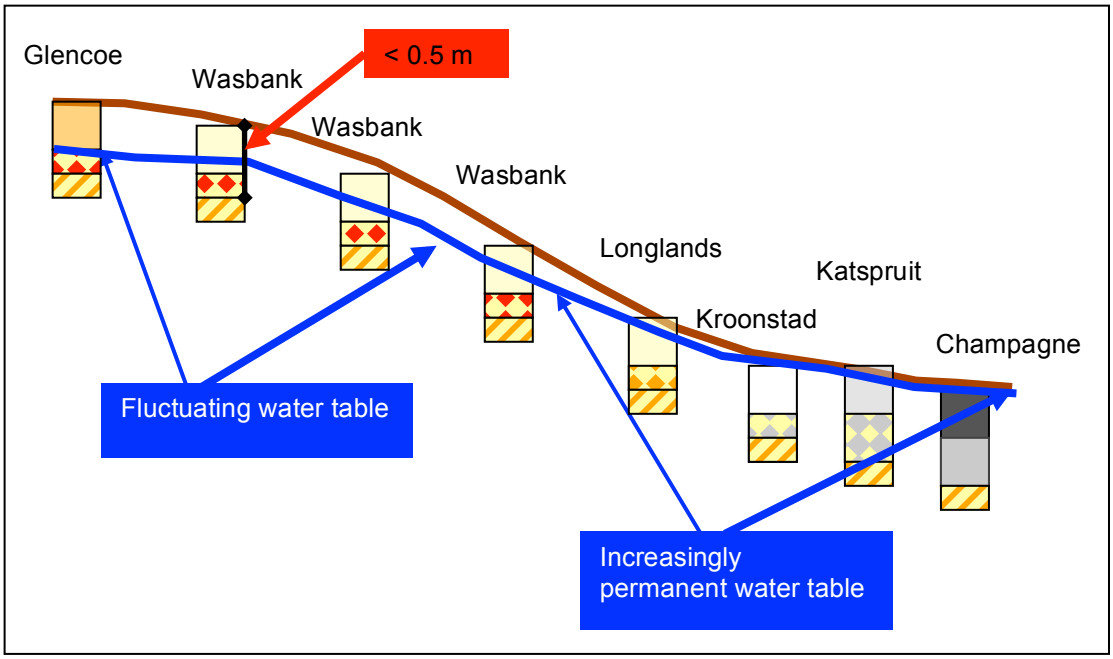

Figure 10 Schematic representation of a Halfway House Granite catena

5.8 CONVEX VERSUS CONCAVE LANDSCAPES IN THE HALFWAY HOUSE GRANITE CATENA

An additional factor of variation in all landscapes is the shape of the landscape along contours (referred to a “plan curvature”). Landscapes can be either concave or convex, or flat. The main difference between these landscapes lies in the fact that a convex landscape is essentially a watershed with water flowing in diverging directions with a subsequent occurrence of “dryer” soil conditions. In a concave landscape water flows in converging directions and soils often exhibit the wetter conditions of “signs of wetness” such as grey colours, organic matter and subsurface clay accumulation. **Figure 11** presents the difference between these landscapes in terms of typical soil forms encountered on the Halfway House granites. In the convex landscape the subsurface flow of

water removes clays and other weathering products (including Fe) in such a way that the midslope position soils exhibit an increasing degree of bleaching and relative accumulation of quartz (E-horizons). In the concave landscapes clays and weathering products are transported through the soils into a zone of accumulation where soils start exhibiting properties of clay and Fe accumulation. In addition, coarse sandy soils in convex environments tend to be thinner due to the removal of sand particles through erosion and soils in concave environments tend to be thicker due to colluvial accumulation of material transported from upslope positions. Similar patterns are observed for other geological areas with the variation being consistent with the soil variation in the catena.

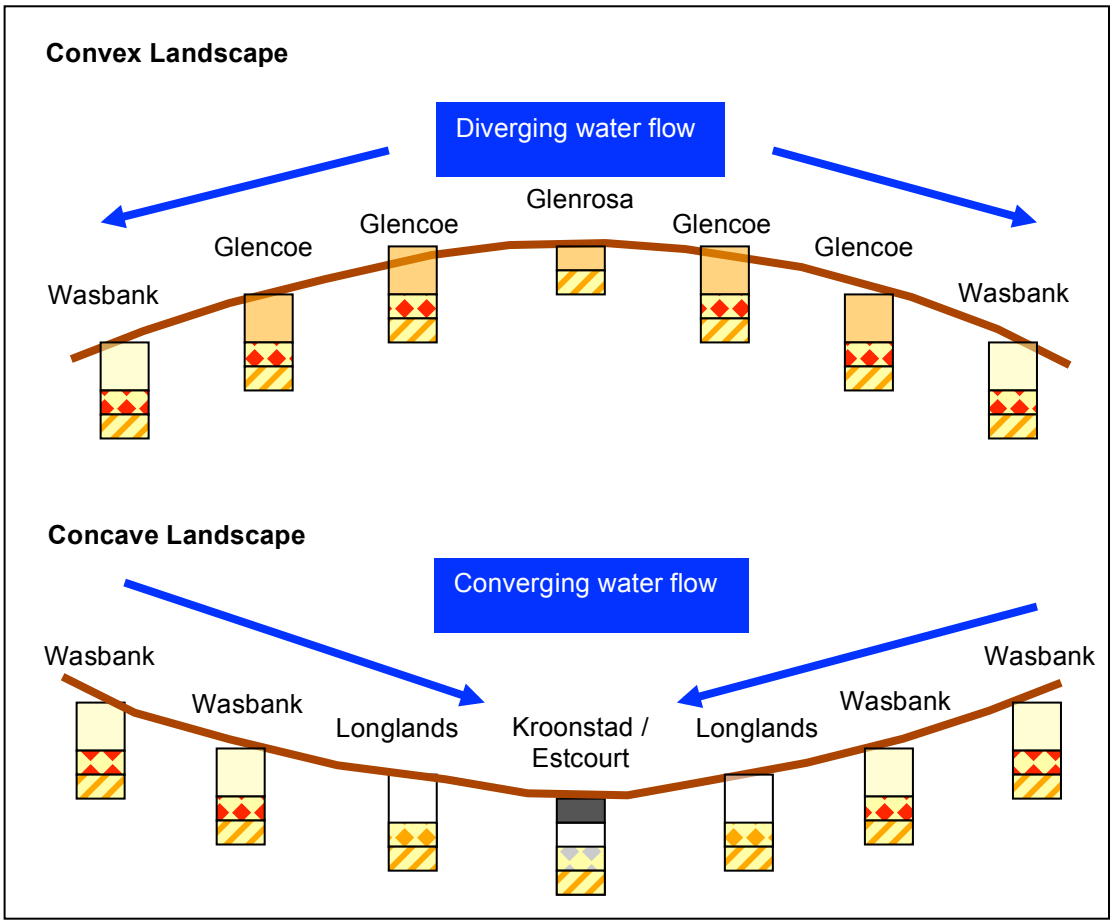

Figure 11 Schematic representation of the soils in convex and concave landscapes in the Halfway House Granite catena.

Often these concave and convex topographical environments occur in close proximity or in one topographical sequence of soils. This is often found where a convex upslope area changes into a concave environment as a drainage depression is reached (**Figure 11**). The processes in this landscape are the same as those described for the convex and concave landscapes above.

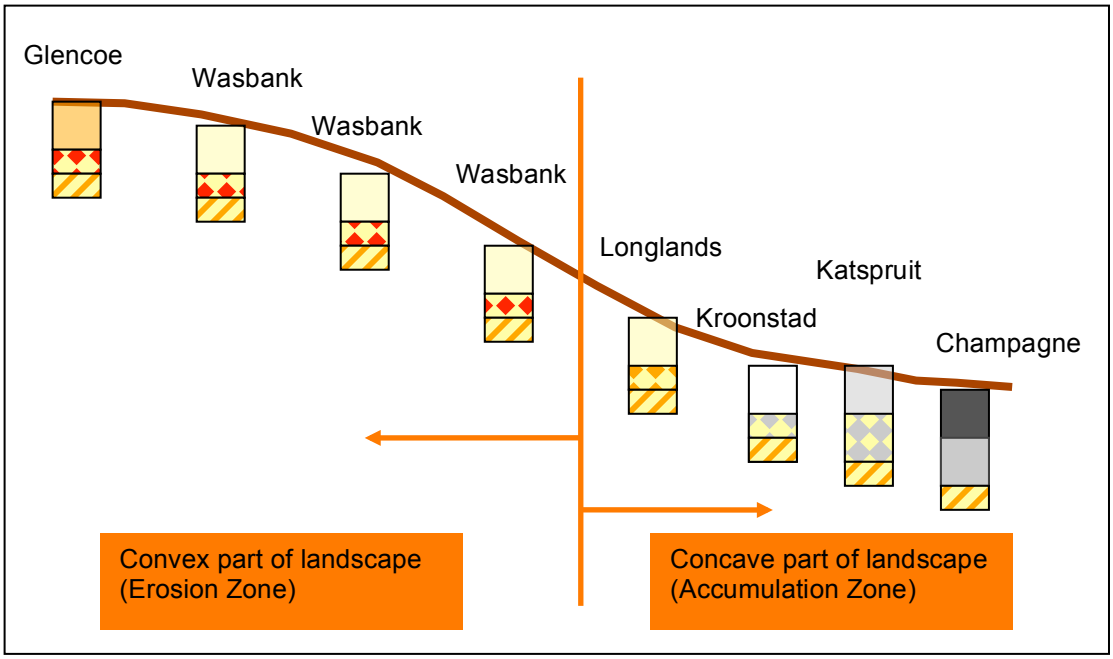

Figure 12 Schematic representation of the soils in a combined convex and concave landscape in the Halfway House Granite catena.

5.9 IMPLICATIONS FOR WETLAND DELINEATION AND APPLICATION OF THE GUIDELINES

When the 50 cm criterion is used to delineate wetlands in the HHGD environment, the soils in convex positions often "qualify" as temporary wetland soils due to their relatively thin profile and the presence of concretions (often weathering to yield "mottles") within this zone. In conjunction with a low Fe content in the soils and subsequent bleached colours (as defined for E-horizons) in the matrix a very large proportion of the landscape "qualifies" as temporary wetland zones. On the other hand, the soils in the concave environments, especially in the centre of the drainage depression, tend to be thicker and the 50 cm criterion sometimes does not flag these soils as being wetland soils due to the depth of the signs of wetness (mottles) often occurring only at depths greater than 80 cm. Invariably these areas are always included in wetland delineations due to the terrain unit indicator flagging it as a wetland area and drainage feature.

The strict application of the wetland delineation guidelines in the Halfway House Granite area often leads to the identification of 70 % or more of a landscape as being part of a wetland. For this reason a more pragmatic approach is often followed in that the 50 cm criterion is not applied religiously. Rather, distinctly wet horizons and zones of clay accumulation within drainage depressions are identified as distinct wetland soils. The areas surrounding these are assigned to extensive seepage areas that are difficult to delineate and on which it is difficult to assign a realistic buffer area. The probable best practice is to assign a large buffer zone in which subsurface water flow is encouraged and conserved to lead to a steady but slow recharge of the wetland area, especially following rainfall events. In the case where development is to take place within this large buffer area it is preferred that a "functional buffer" approach be followed. This implies that development can take place within the buffer area but then only within strict guidelines regarding

storm water management and mitigation as well as erosion prevention in order to minimise sediment transport into stream and drainage channels and depressions.

5.10 IMPLICATIONS FOR WETLAND CONSERVATION IN URBAN ENVIRONMENTS

Whether an area is designated a wetland or not loses some of its relevance once drastic influences on landscape hydrology are considered. If wetlands are merely the expression of water in a landscape due to proximity to the land surface (viz. the 50 cm mottle criterion in the delineation guidelines) it follows that potentially large proportions of the water moving in the landscape could fall outside of this sphere – as discussed in detail above. **Figures 13** and **14** provide schematic representations (as contrasted with **Figure 7**) of water dynamics in urban environments with distinct excavations and surface sealing activities respectively.

Through the excavation of pits (**Figure 13**) for the construction of foundations for infrastructure or basements for buildings the shallow lateral flow paths in the landscape are severed. As discussed above these flow paths can account for up to 60 % of the volume of water entering the landscape in the form of precipitation. These severed flow paths often lead to the ponding of water upslope from the structure with a subsequent damp problem developing in buildings. Euphemistically we have coined the term “wet basement syndrome” (WBS) to describe the type of problem experienced extensively on the HHGD. A different impact is experienced once the surface of the land is sealed through paving (roads and parking areas) and the construction of buildings (in this case the roof provides the seal) (**Figure 14**). In this case the recharge of water into the soil and weathered rock experienced naturally is altered to an accumulation and concentration of water on the surface with a subsequent rapid flowing downslope. The current approach is to channel this water into storm water structures and to release it in the nearest low lying position in the landscape. These positions invariable correlate with drainage features and the result is accelerated erosion of such features due to a drastically altered peak flow regime.

The result of the above changes in landscape hydrology is the drastic alteration of flow dynamics and water volume spikes through wetlands. This leads to wetlands that become wetter and that experience vastly increased erosion pressures. The next section provides a perspective on the erodibility of the soils of the HHGD. It is important to note the correlation between increasing wetness, perching of water and erodibility.

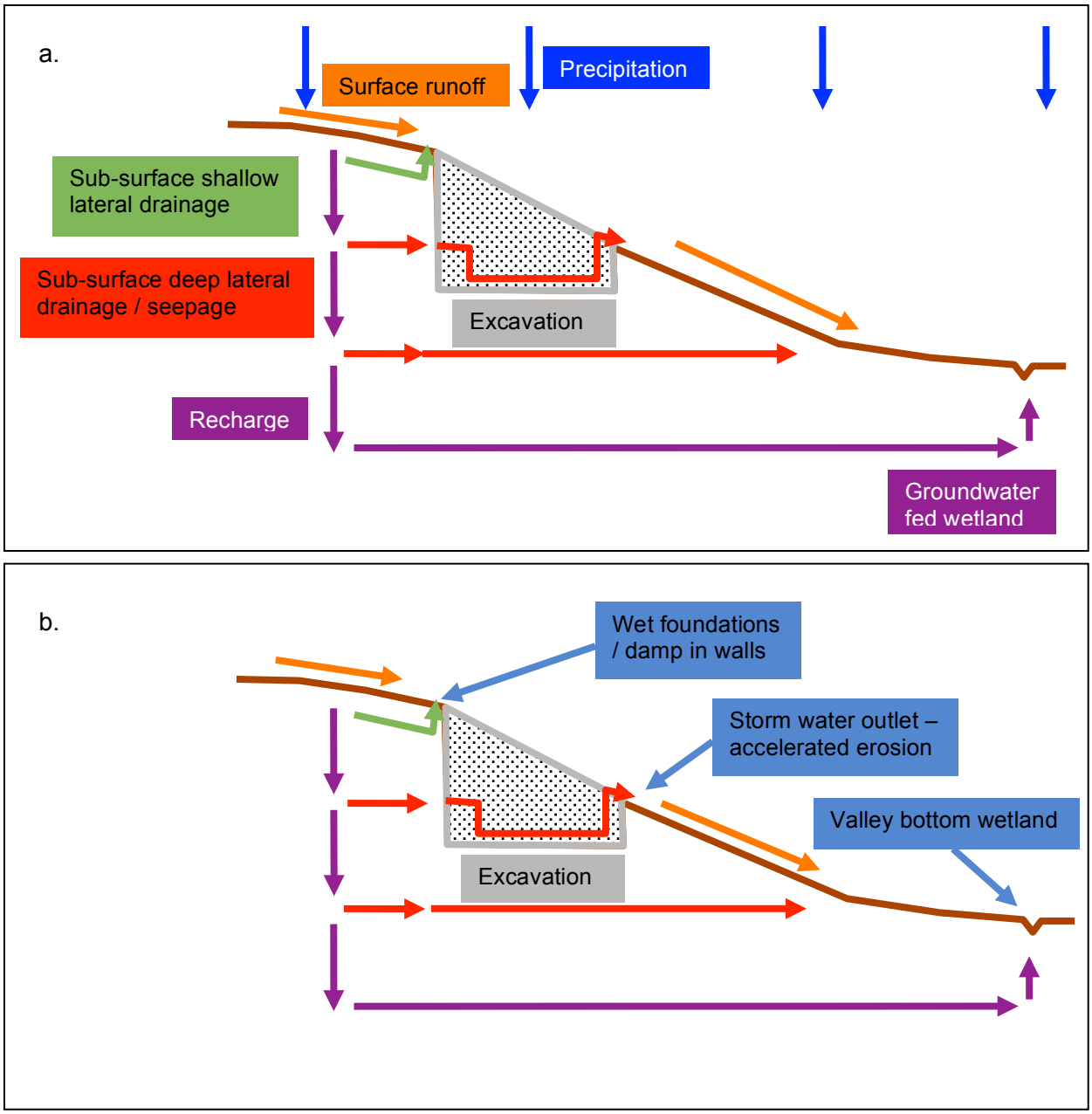

Figure 13 Different flow paths of water through a landscape with an excavated foundation (a) and typical wetland types associated with the altered water regime (b)

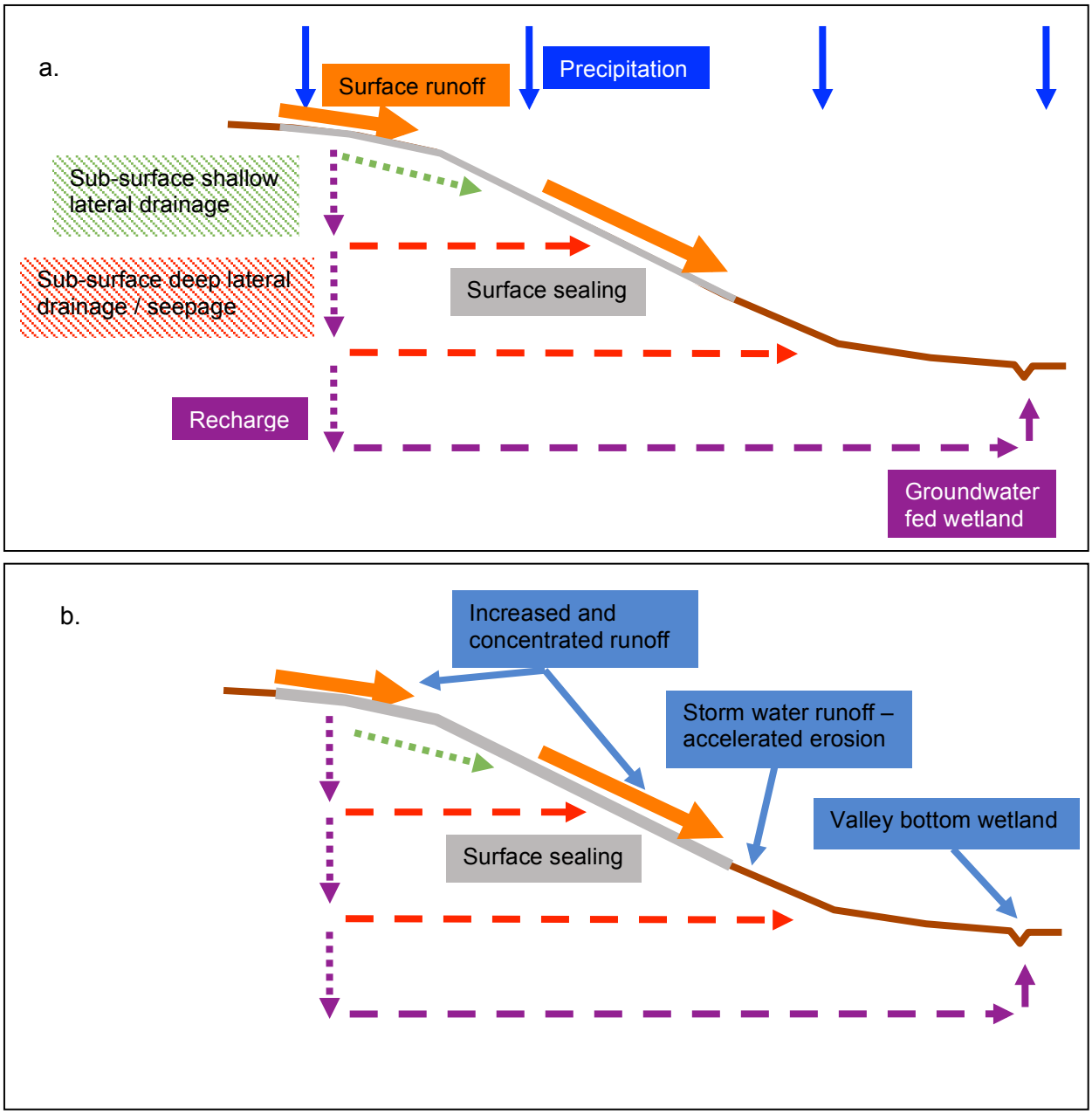

Figure 14 Different flow paths of water through a landscape with surface sealing (buildings and paving) (a) and typical wetland types associated with the altered water regime (b)

5.11 Implications for Downstream Wetlands, Watercourses and Landscapes

An impact that is very often overlooked in urban drainage systems is the increase in water volume flowing through the catchment. Water is pumped from dams and reservoirs into “new” areas that have not had such volumes under pre-human impact conditions. In the event that all the water that is pumped into an urban area is removed through sewers and storm water infrastructure there is barely a perceptible increase in water in surface water structures. However, as the area serviced increases in size with storm water and sewer infrastructure releasing water into surface water bodies within the area the volume of water increases above the natural background volumes.

Additionally, changes in water runoff volumes through land surface sealing and runoff timing considerations lead to increased wetness and spikes in water volumes in drainage features. The main contrast in the landscape is evident in comparing infiltration and slow percolation with associated lateral flow spread over months versus rapid and immediate runoff from extensive and linked hard surfaces with runoff occurring within minutes and hours. The drastic temporal difference is mainly due to a diversion of water from slow subsurface lateral seepage pathways to rapid surface channelling routes. Even though total volumes may therefore be the same, in some cases, to the pre-development volumes the energy in the system is completely different in terms experienced water volumes in specific areas.

The above discussion is simplified in the sense that it does not take into account the numerous water interception zones in the form of slow but constant water uptake by plants and increased evaporative losses due to slow water movement through soils near to the surface. The implication is therefore that urban systems are consequently wetter (both perceived and actual) than pre-development landscapes. The increased degree of wetness, linked with the diversion of water from subsoils flow pathways to surface pathways, has a direct bearing on the ecological response in the wetland / watercourse system. Apart from the ecological response there is often also a physical response to the increased water volumes and flow rates in the form of watercourse degradation and erosion that is exacerbated by erosion sensitive soils.

5.12 SOIL EROSION ON THE HALFWAY HOUSE GRANITE DOME

Infiltration of water into a soil profile and the percolation rate of water in the soil are dependent on a number of factors with the dominant one being the soil's texture (**Table 2**). Permeability and the percolation of water through the soil profile are governed by the least permeable layer in the soil profile. The implication of this is that soil horizons that overlie horizons of low permeability (i.e. hard rock, hard plinthite, G-horizon) are likely to become saturated with water relatively quickly - particularly if the soil profile is shallow and a large amount of water is added. Another impermeable layer is one that is saturated with water and such a layer acts the same way as the ones mentioned earlier. In cases where internal drainage is hampered by an impermeable layer such as hard rock (the Dresden or Wasbank soil forms) evaporation and lateral water movement are the only processes that will drain the soil profile of water.

Infiltration of water into a soil profile is dependent on the factors leading to the downward movement of water. In cases where impermeable layers exist water will infiltrate into the profile until it is saturated. Once this point is reached water infiltration will cease and surface runoff will become the dominant water flow mechanism. A similar situation will develop if a soil has a slow infiltration rate of water due to fine texture, hardened or compacted layers and low hydraulic conductivity. When these soils are subjected to large volumes and rates of rainfall the rate of infiltration will be exceeded and excess water will flow downslope on the soil surface.

The texture, permeability and presence of impeding layers are some of the main determinants of soil erosion. Wischmeier, Johnson and Cross (1971) compiled a soil erodibilty nomograph from soil

analytical data (**Figure 15**). The nomograph uses the following parameters that are regarded as having a major effect on soil erodibility:

- The mass percentage of the fraction between 0.1 and 0.002 mm (very fine sand plus silt) of the topsoil.
- The mass percentage of the fraction between 0.1 and 2.0 mm diameter of the topsoil.
- Organic matter content of the topsoil. This "content" is obtained by multiplying the organic carbon content (in g/100 g soil – Walkley Black method) by a factor of 1.724.
- A numerical index of soil structure.
- A numerical index of the soil permeability of the soil profile. The least permeable horizon is regarded as horizon that governs permeability.

Box 1 describes the procedure to use the nomograph.

As part of a different study 45 soil samples were collected from 19 points on the HHGD. The samples were described in terms of soil form and analysed with respect to texture (6 fractions) and organic carbon content of the A-horizons (data not presented here but available upon request). The erodibility index and maximum stable slope were calculated for each horizon (according to the method discussed above) in both an unsaturated and saturated soil matrix (data not presented here but available upon request).

Table 2 Infiltration/permeability rates for soil textural classes (Wischmeier, Johnson & Cross 1971)

Texture class	Texture	Permeability Rate (mm/hour)	Permeability Class
Coarse	Gravel, coarse sand	>508	Very rapid
	Sand, loamy sand	152 – 508	Rapid
Moderately coarse	Coarse sandy loam Sandy loam Fine sandy loam	51 - 152	Moderately rapid
Medium	Very fine sandy loam Loam Silt loam Silt	15 – 51	Moderate
Moderately fine	Clay loam Sandy clay loam Silty clay loam	5.1 – 15.2	Moderately slow
Fine	Sandy clay Silty clay Clay (>60%)	1.5 – 5.1	Slow
Very fine	Clay (>60%) Clay pan	< 1.5	Very slow

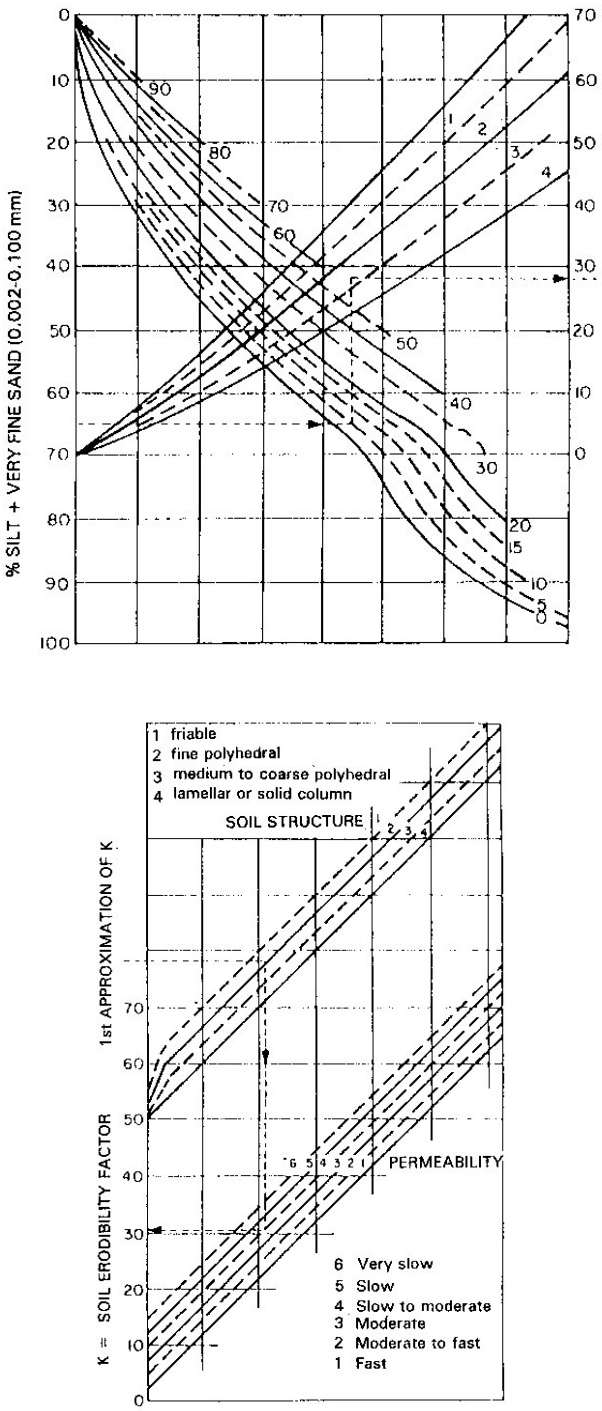

Figure 15 The nomograph by Wischmeier, Johnson and Cross (1971) that allows a quick assessment of the K factor of soil erodibility.

The erosion risk is based on the product of the slope (in percentage) and the K-value of erodibility (determined from the Wischmeier, Johnson and Cross (1971) nomograph). This product should not exceed a value of 2.0 in which case soil erosion becomes a major concern. The K-value allows for a “hard” rainfall event but is actually based on scheduled irrigation that allows for infiltration and percolation rates and so-called “normal” rainfall intensity. Soil erosion potential increases with an increase in the very fine sand plus silt fraction, a decrease in the organic matter content, an increase in the structure index and a decrease in permeability. Water quality is assumed not to be a problem for the purposes of the erosion hazard calculations.

Box 1: Using the nomograph by Wischmeier, Johnson and Cross (1971)
In examining the analysis of appropriate surface samples, enter on the left of the graph and plot the percentage of silt (0.002 to 0.1 mm), then of sand (0.10 to 2 mm), then of organic matter, structure and permeability in the direction indicated by the arrows. Interpolate between the drawn curves if necessary. The broken arrowed line indicates the procedure for a sample having 65% silt + very fine sand, 5% sand, 2.8% organic matter, 2 of structure and 4 of permeability. Erodibility factor K = 0,31.

Note: The erodibility factor increase due to saturation was also calculated. These results indicated an increase in erodibiity of a factor predominantly between 3 and 4 for saturated soil conditions.

5.13 SUSTAINABLE URBAN DRAINAGE CONSIDERATIONS

5.13.1 SuDS Philosophy and Options

A relatively new approach to the management of urban water is known as sustainable drainage systems (SuDS) (Armitage et al., 2013). The SuDS philosophy states that there are three options namely:

1. Source controls: management of storm water as close to as possible on the property (eg: green roofs, rainwater harvesting, soakaways, permeable pavements);
2. Local controls: management of storm water as a "second line of defence" in public areas such as roadway reserves and parks (eg: filter strips, swales, infiltration trenches, bio-retention areas, sand filters); and
3. Regional controls: management of storm water as a "last line of defence" in the form of large-scale interventions constructed on municipal land (detention ponds, retention ponds, constructed wetlands).

These options are not prescriptive but provide an indication of the variation in storm water management approach that can be considered on specific sites.

5.13.2 SuDS – Practical Considerations in the HHGD Area

Although this document does not aim to address SuDS in detail some very practical considerations apply to the HHGD. These are:

1. The use of permeable paving or processes to ensure water infiltration into soil is of limited benefit in soils and landscapes where the water flows laterally in shallow profiles through the bulk of the landscape. The main restriction is that the soil volume available for water storage and transport is limited with the effect that it saturates rapidly. Once a soil is saturated it cannot accommodate more water and the consequence is that surface ponding or runoff starts. In such cases unprotected soils become more susceptible to erosion, especially if surface water has a high energy due to slopes or concentration through channelling.

2. Forced and augmented infiltration leads to an increase in lateral water flow volumes with an increased risk of intercept by structures excavated into the soil profile (**Figure 16**). Under increased infiltration it has been observed that damp problems in foundations, walls and basements occur more frequently with increased damage if these structures are not protected.
3. The construction of pipelines leads to the "breaking" of the hard plinthite aquaclude (**Figure 17**) that keeps most of the water close to the soil surface. The fill material has a significantly higher bulk density when compared to the natural soil of the E horizon and this leads to a significantly lower hydraulic conductivity within the fill. With the lateral drainage of water through the landscape's soils this leads to a ponding effect immediately upslope of the fill in the trench (**Figure 18**). Due to the ponding that results from the lower transmissivity of the fill material it is often observed that areas where pipelines have been installed exhibit an increase in surface ponding on the upslope side of the structure with a subsequent colonisation of pioneer wetland species. In cases such as these it is important not to artificially increase infiltration upslope of the structure and rather to allow water from the upslope areas to flow over the in-filled trench in a controlled manner with stabilisation measures to prevent erosion and ponding.
4. The ecological response of plants and animals to lateral flowing water is not a universal one. The specific ecological response depends on the aeration state of the water as well as its quality. Often forced lateral flow is touted as a solution to urban water impacts but this is a highly simplified assumption. Lateral flowing water in undisturbed landscapes can have a range of redox states (depending on the amount of oxygen dissolved in the water). Specific plant species are adapted to certain of these varying conditions and specific wetland plants colonise various seepage zones related to their preference (in terms of oxygen content of the water). The mimicking of lateral flow through anthropogenic means does not mean the desired ecological response will be evident and this aspect has to be emphasised during rehabilitation and SuDS planning processes.
5. The most realistic option for the HHGD is to bring water to the surface and deal with this water in a dedicated manner there. The drawback of this solution is that the water on the surface will elicit an ecological response limited to the aerated nature of the water. The typical plant species will be plants that colonise open water systems or soils of which the aeration state is relatively good. Plants adapted to anoxic seepage zones will not colonise such systems. In this regard the specific vegetation response will determine the macro invertebrate and animal response.

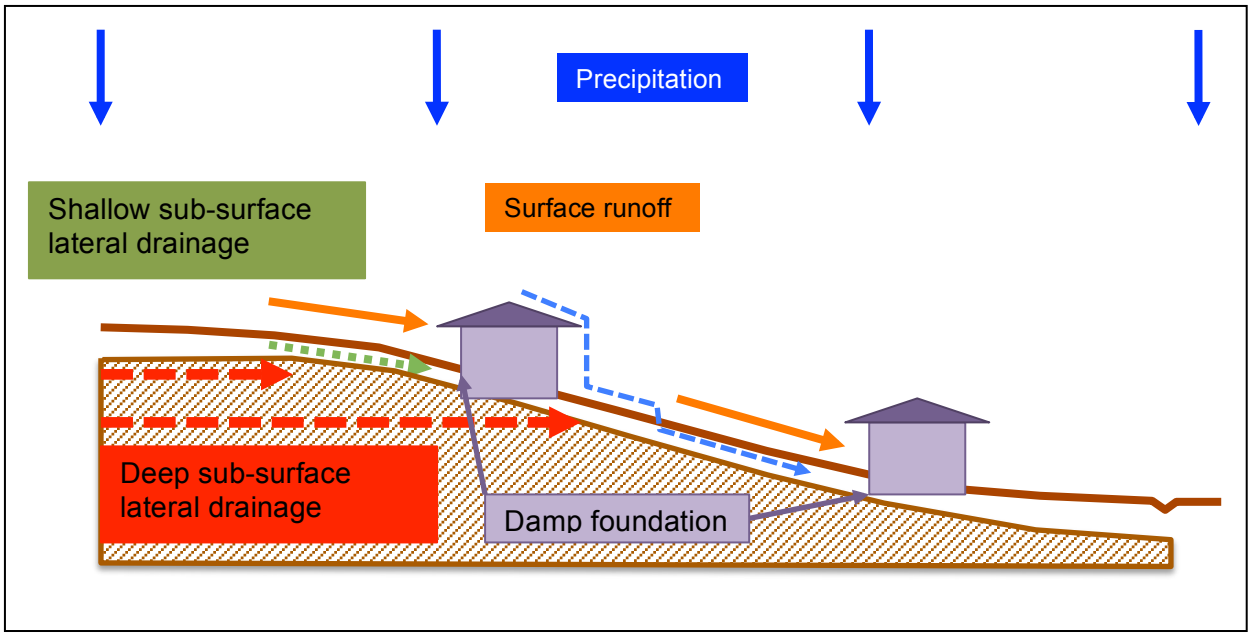

Figure 16 Challenges regarding infiltration SuDS approaches on the HHGD with its shallow lateral water flow zones

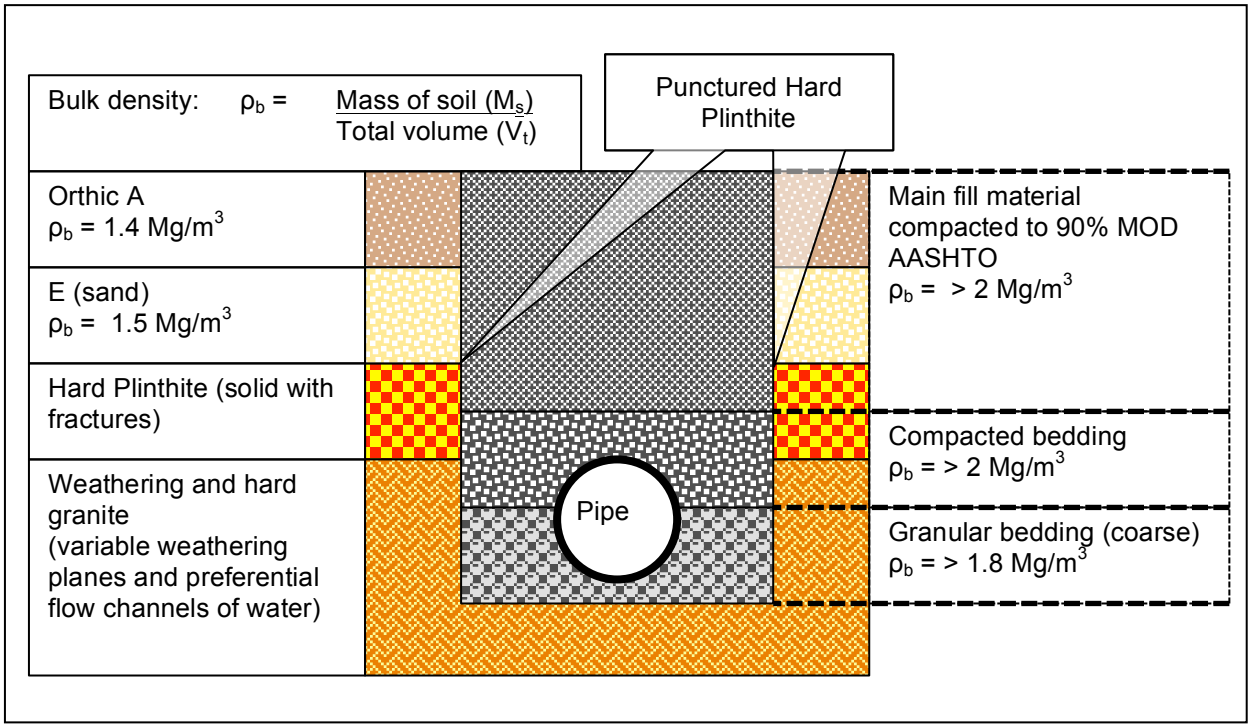

Figure 17 Typical pipeline trench fill and natural soil profile (with punctured hard plinthite aquaclude) with different soil and fill material bulk densities on the HHGD

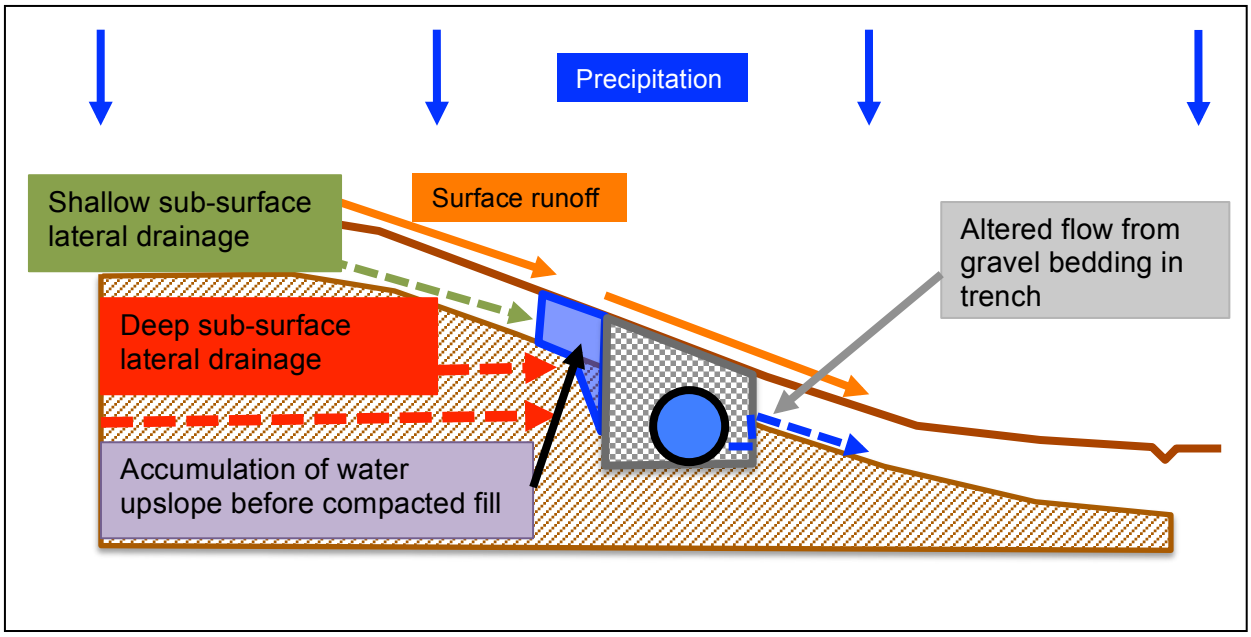

Figure 18 Challenges regarding SuDS approaches and pipeline construction on the HHGD with its shallow lateral water flow zones and areas of water ponding

5.14 Detailed Soil Characteristics – Summarising Conclusions

The following general conclusions can be made regarding the soil characteristics of the HHGD (and the catchment):

1. The site (and catchment) is dominated by shallow to moderately deep sandy soils with deep soils occurring in the drainage features only ;
2. The soils are dominantly coarse sandy in texture;
3. On the bulk of the site the soils are underlain by a hard plinthic layer (ferricrete) that acts as an aquaclude under natural conditions;
4. The bulk of the water movement on the site occurs within 50 cm of the soil surface on top of the ferricrete layer in the absence of human impacts;
5. Wetland delineation is a challenging exercise on the HHGD; and
6. The soils of the HHGD, as those of the site, are highly erodible, especially when saturated with water.

5.15 Recommended Assessment Approach – Hydropedology Investigation

5.15.1 Hydropedology Background

The identification and delineation of wetlands rest on several parameters that include topographic, vegetation and soil indicators. Apart from the inherent flaws in the wetland delineation process, as discussed earlier in this report, the concept of wetland delineation implies an emphasis on the wetlands themselves and very little consideration of the processes driving the functioning and presence of the wetlands. One discipline that encompasses a number of tools to elucidate landscape hydrological processes is “hydropedology” (Lin, 2012). The crux of the understanding of

hydropedology lies in the fact that pedology is the description and classification of soil on the basis of morphology that is the result of soil and landscape hydrological, physical and chemical processes. But, the soils of which the morphology are described, also take part in and intimately influence the hydrology of the landscape. Soil is therefore both an indicator as well as a participator in the processes that require elucidation.

Wetlands are merely those areas in a landscape where the morphological indicators point to prolonged or intensive saturation near the surface to influence the distribution of wetland vegetation. Wetlands therefore form part of a larger hydrological entity that they cannot be separated from.

5.15.2 Hydropedology – Proposed Approach

In order to provide detailed pedohydrological information both detailed soil surveys and hydrological investigations are needed. In practice these intensive surveys are expensive and very seldom conducted. However, with the understanding of soil morphology, pedology and basic soil physics parameters as well as the collection and interpretation of existing soil survey information, assessments at different levels of detail and confidence can be conducted. In this sense four levels of investigation are proposed namely:

1. Level 1 Assessment: This level includes the collection and generation of all applicable remote sensing, topographic and land type parameters to provide a “desktop” product. This level of investigation rests on adequate experience in conducting such information collection and interpretation exercises and will provide a broad overview of dominant hydropedological parameters of a site. Within this context the presence, distribution and functioning of wetlands will be better understood than without such information.
2. Level 2 Assessment: This level of assessment will make use of the data generated during the Level 1 assessment and will include a reconnaissance soil and site survey to verify the information as well as elucidate many of the unknowns identified during the Level 1 assessment.
3. Level 3 Assessment: This level of assessment will build on the Level 1 and 2 assessments and will consist of a detailed soil survey with sampling and analysis of representative soils. The parameters to be analysed include soil physical, chemical and mineralogical parameters that elucidate and confirm the morphological parameters identified during the field survey.
4. Level 4 Assessment: This level of assessment will make use of the data generated during the previous three levels and will include the installation of adequate monitoring equipment and measurement of soil and landscape hydrological parameters for an adequate time period. The data generated can be used for the building of detailed hydrological models (in conjunction with groundwater and surface hydrologists) for the detailed water management on specific sites.

For most wetland delineation exercises a Level 2 or Level 3 assessment should be adequate. For this investigation a Level 2 assessment was conducted with a reconnaissance soils survey and field work. Analysis of soils was not conducted but data from other sites with highly similar soils was also used to illustrate the challenges faced on the site and in the broader area.

The process of the hydropedology assessment entails the aspects listed in the methodology description below. These items also correspond with the proposed PES assessment methodology discussed in section 4.4.4. The results of the assessment will therefore be structured under the headings as provided below.

6. METHOD OF WETLAND INVESTIGATION AND DELINEATION

6.1 WETLAND CONTEXT DETERMINATION

For the purpose of the investigation the context of the wetlands / watercourses were determined through the interpretation of land type data. This was done through the thorough consideration of the geological, topographical, climatic, hydropedological and catchment context of the site. Due to the position of the site the position and contribution of recharge areas (headwater areas) was assessed to determine the functionality and broad hydrological functioning of the wetlands and watercourses.

In addition, previous wetland delineation and assessment reports in Terra Soil Science's possession that pertain to specific sections of the site were perused and used as a guide in the determination of the site conditions.

6.2 WETLAND / WATERCOURSE IDENTIFICATION FROM TWI

The wetlands and watercourses within 500 m of the proposed pipeline alignment were identified using the TWI that was generated for the site. Due to the strong correlation between the TWI data and the presence of wetlands and watercourses this aspect was used as the primary indictor of such.

6.3. PHOTOGRAPH INTERPRETATION

An aerial photograph interpretation exercise was conducted through the use of historical aerial photographs and Google Earth images of the site. This data was used to obtain an indication of the extent of the wetlands on the site as well as to provide an indication of the artificial modifiers evident on the site and in the catchment.

6.4 SOIL FORM AND SOIL WETNESS INDICATORS

The soil form and wetness indicators were assessed on the site through a dedicated reconnaissance soil survey within the context of the description of the HHGD as provided in

sections 5.7 to 5.9. During the soil survey areas of significance were identified and soil auger profile description activities conducted for the specific areas.

Historical impacts were identified as the impacts on the soils are very distinct. Soil characteristics could therefore be used to provide a good indication of the historical impacts on the grounds of a forensic approach. In areas where soil impacts are limited the standard approach in terms of identification of soil form and soil wetness indicators was used.

6.5 VEGETATION INDICATOR

Due to the extent of the historical impacts as well as timing of the investigation a dedicated vegetation survey for the purpose of wetland delineation was not conducted. Vegetation parameters were noted and these are addressed in the report where relevant.

6.6 ARTIFICIAL MODIFIERS AND ALTERED HYDROLOGICAL DRIVERS

Artificial modifiers of the landscape and wetland area were identified during the different components of the investigation and are addressed in the context of the wetland management plan. The altered hydrological drivers on the site were identified and elucidated in terms of the expected change in wetland response signatures.

7. SITE SURVEY RESULTS AND DISCUSSION

7.1 WETLAND CONTEXT

The land type, topography and geological setting of the site have been elucidated in section 2 of this document. In this regard the bulk of the pipeline traverses granite geology associated with the HHGD. In this instance the wetland delineation determinants as discussed in section 5 apply. A small portion traverses serpentine and lava dominated geology that is characterised by terrestrial soils.

7.2 WETLAND / WATERCOURSE IDENTIFICATION FROM TWI

The TWI for the site with the identified wetlands and watercourse is provided in **Figure 19**. Four sites / drainage depressions were identified for further investigation. These sites are:

1. Site 1: The headwaters of a tributary stream of the Modderfonteinspruit south of the eastern leg of the alignment.
2. Site 2: The headwaters of a tributary stream of the Jukskei River north of the central section of the alignment.
3. Site 3: A concave depression that seems to form the headwaters of a seepage zone feeding the tributary stream of the Jukskei River north of the central section of the alignment.

4. Site 4: The headwaters of a tributary stream of the Jukskei River west of the western leg of the alignment.

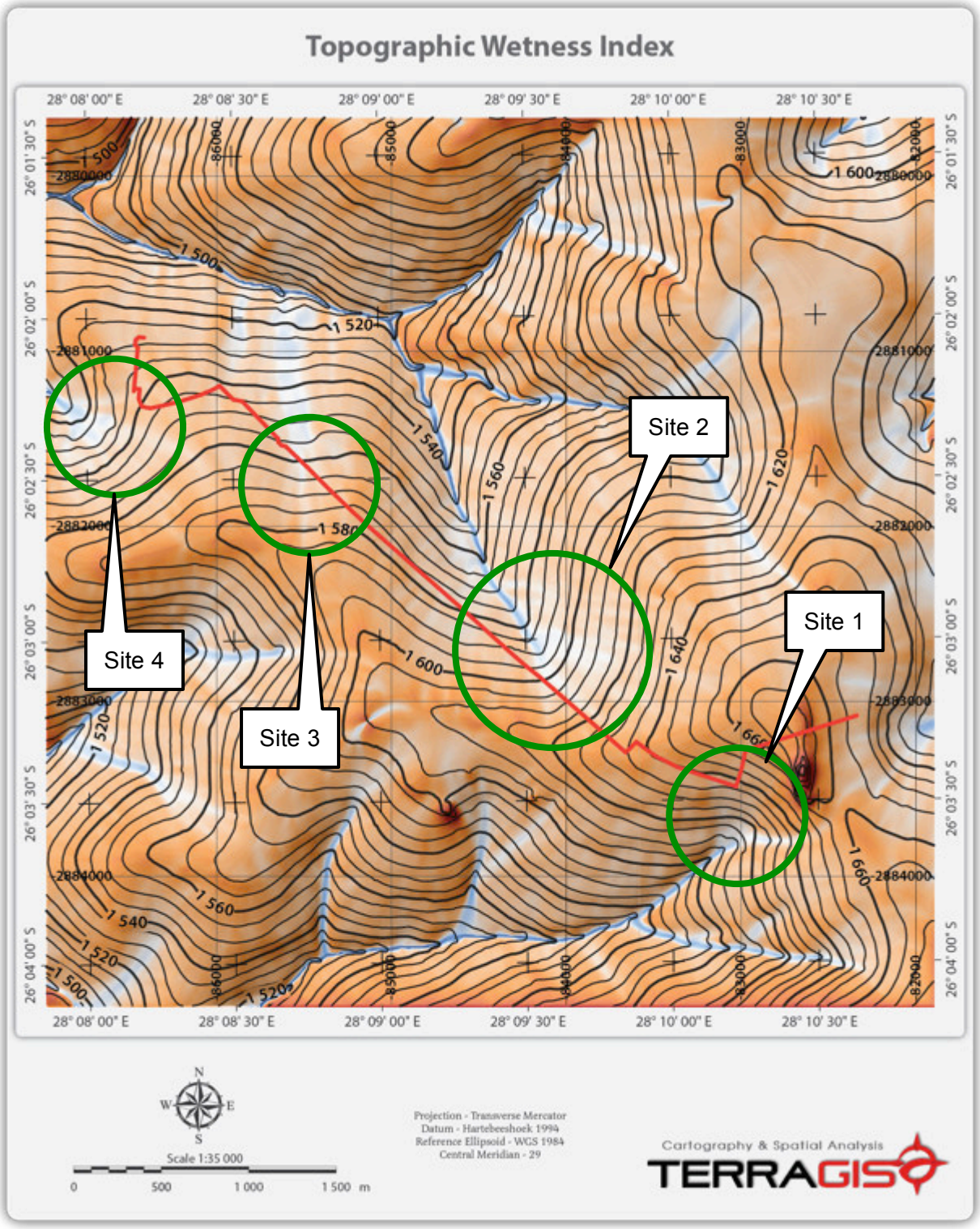

Figure 19 Pipeline alignment with identified wetlands and watercourses within a 500 m distance from the alignment

7.2 AERIAL PHOTOGRAPH INTERPRETATION

7.2.1 Site 1

The Google Earth images of Site 1 from 2003 and 2015 are provided in **Figure 20**. The watercourse has been developed extensively and includes the Allandale Road developments with associated storm water infrastructure. No natural wetland areas remain near the pipeline.

Figure 20 Google Earth images from 2003 (top) and 2015 (bottom) indicating the drainage feature

7.2.2 Site 2

The drainage depression on the south-western section of Site 2 is indicated in Figure 21. This depression has been cut in half by the Allandale Road development and its associated storm water infrastructure. North of Allandale Road the watercourse has been channelled artificially and it has been encroached by urban developments.

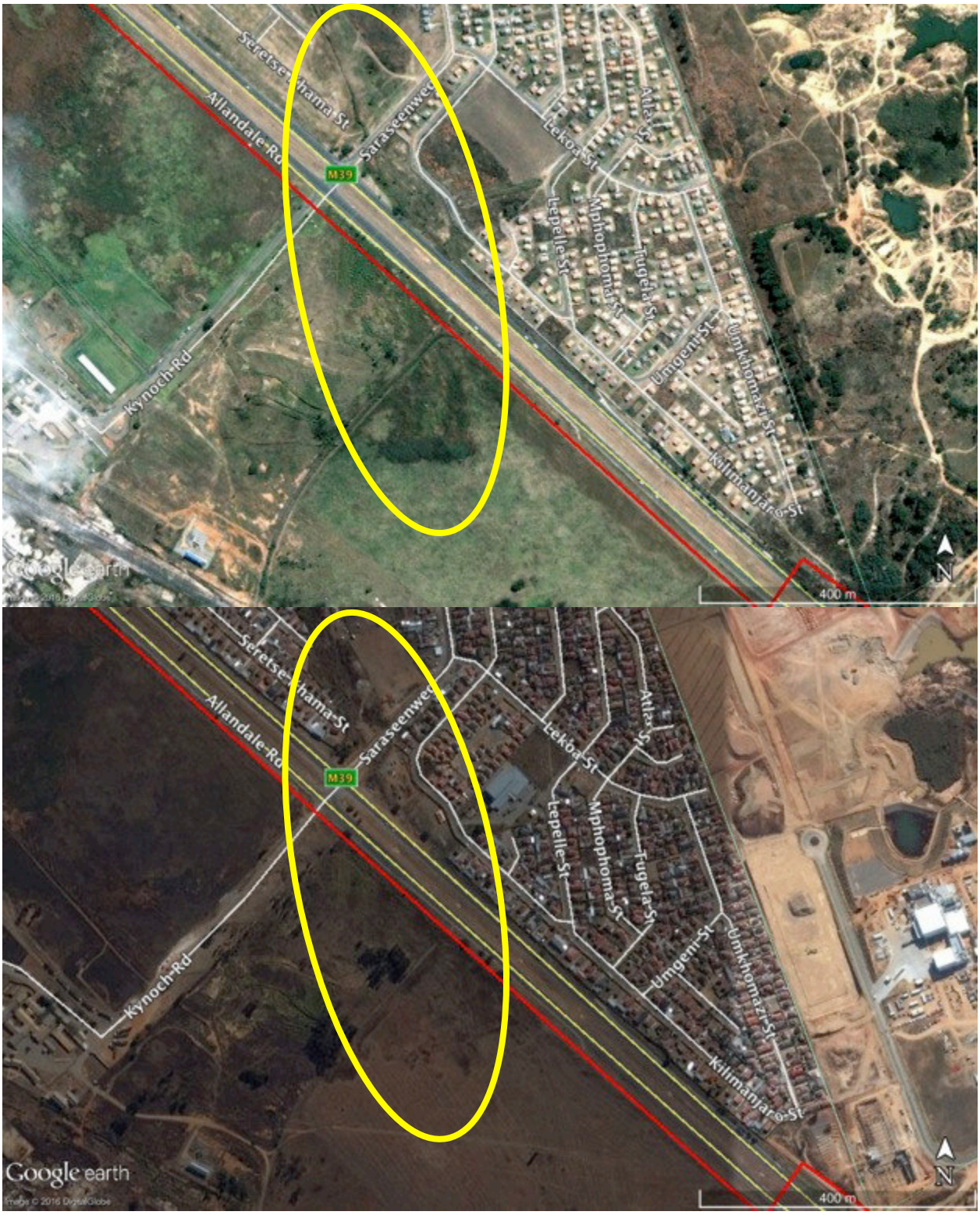

Figure 21 Google Earth images from 2003 (top) and 2015 (bottom) indicating the drainage feature