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Geotechnical, Environmental & Earth Science Consultants

Draft Basic Assessment Report

PROPOSED CONSTRUCTION OF A POTABLE WATER GRAVITY PIPELINE AND APPURTENANT WORKS FROM BRAKFONTEIN FARM TO LADYSMITH WATER TREATMENT WORKS, EMNAMBITHI / LADYSMITH MUNICIPALITY KWAZULU-NATAL.

September 2015

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DRAFT BASIC ASSESSMENT REPORT

PROPOSED CONSTRUCTION OF A POTABLE WATER GRAVITY PIPELINE AND APPURTENANT WORKS FROM BRAKFONTEIN FARM TO LADYSMITH WATER TREATMENT WORKS, EMNAMBITHI / LADYSMITH MUNICIPALITY KWAZULU-NATAL.

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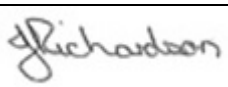
QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO9001: 2008 which has been independently certified by DEKRA Certification under certificate number 90906882

Verification	Capacity	Name	Signature	Date
By Author	Environmental Scientist	J. Richardson		14/09/2015
Checked by	Environmental Scientist	L. Dralle		14/09/2015
Authorised by	Executive Associate	M. van Rooyen		14/09/2015

Executive Summary

Terratest (Pty) Ltd has been appointed by WMN Consultancy (Pty) Ltd, on behalf of the uThukela District Municipality, to undertake the environmental services required for the proposed construction of a new 900-1200mm diameter (ø) bulk gravity water pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works, Emnambithi / Ladysmith Municipality, KwaZulu-Natal. This project forms the first phase of a Department of Water & Sanitation Regional Bulk Water Infrastructure Upgrade for the uThukela District Municipality. The purpose of the overall project is to address current water supply constraints experienced within the Ladysmith / Ezakheni areas.

This portion of the overall regional water supply project has been fast tracked to alleviate the immediate supply constraints to the Ladysmith Water Treatment Works. The second phase of the regional water supply project, which will form part of a separate Basic Assessment Application, will include the establishment of a command reservoir and regional water treatment works which will treat water, abstracted from Spioenkop Dam.

The proposed route has been assessed based on a corridor of disturbance, with a varying width of 70m – 350m to allow for unforeseen construction deviations should these be required during the construction phase of the project. The length of the corridor and hence pipeline, is approximately 25km.

The Public Participation Process involves consultation with the relevant authorities, non-government organisations (NGO's), neighbouring landowners, community members and other identified Interested and Affected Parties (IAPs). Newspaper advertisements were published at the outset of the project to inform the general public of the BA Process. An advertisement was published in English on 18 September 2015 in the Ladysmith Gazette newspaper and in isiZulu on 18 September 2015 in the Eyethu UThukela newspaper. Site notices were erected along the proposed corridor & notification letters have been either distributed via post and email where necessary.

A Geotechnical Investigation was undertaken by Terratest (Pty) Ltd to determine the conditions of the local geology; a Heritage Impact Assessment was undertaken by Umlando: Archaeological Surveys and Heritage Survey cc. to determine if any items of cultural or historical value will be impacted on during construction; a Wetland and Riparian Assessment was undertaken by Terratest (Pty) Ltd to determine the impact that the proposed construction would have on surrounding watercourses; a Terrestrial Biodiversity Assessment was undertaken by Eco-Pulse to determine the impact that the proposed construction would have on the surrounding flora and fauna. No fatal flaws were identified by any of the Specialist Studies. Furthermore, a Water Use Licence Application is being conducted as the proposed construction will intercept various watercourses, which will result in the excavation of the beds and banks of the identified systems.

The Draft Basic Assessment (BA) Report and Environmental Management Programme (EMPr) have been circulated to IAPs for review and comment. Comments received on the Draft BA Report and EMPr will be consolidated and included into a Final BA Report, which will be submitted to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (EDTEA) for a decision on Environmental Authorisation.

This BA Report has been drafted in accordance with the EIA Regulations, 2014 and adheres to the requirements contained in Appendix 1 of GNR 982, as noted in Table 1.

TABLE 1: Content of a BA Report (2014 EIA Regulations)

2014 EIA Regulations	Description of EIA Regulations Requirements for BA Reports	Location in the BAR
Appendix 1, Section 3 (a)	Details of – (i) The EAP who prepared the report; and the expertise of the EAP; and (ii) The expertise of the EAP, including a curriculum vitae.	Section 2 & Appendix 1

2014 EIA Regulations	Description of EIA Regulations Requirements for BA Reports	Location in the BAR
Appendix 1, Section 3 (b)	The location of the activity, including – (i) The 21 digit Surveyor General code of each cadastral land parcel; (ii) Where available, the physical address and farm name; (iii) Where the required information in items (i) and (ii) is not available, coordinates of the boundary of the property or properties	Section 3 & Appendix 2
Appendix 1, Section 3 (c)	A plan which locates the proposed activity or activities applied for at an appropriate scale, or, if it is – (i) A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) On land where the property has not been defined, the coordinates within which the activity is to be undertaken.	Section 3 & Appendix 3
Appendix 1, Section 3 (d)	A description of the scope of the proposed activity, including – (i) All listed and specified activities triggered; (ii) A description of the activities to be undertaken, including associated structures and infrastructure.	Section 4 & 5
Appendix 1, Section 3 (e)	A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process.	Section 6
Appendix 1, Section 3 (f)	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location.	Section 7
Appendix 1, Section 3 (h)	A full description of the process followed to reach the proposed preferred activity, site and location within the site, including- (i) Details of all alternatives considered; (ii) Details of the Public Participation Process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs; (iii) A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them; (iv) The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (v) The impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration, and probability of the impacts, including the degree to which the impacts- (aa) Can be reversed; (bb) May cause irreplaceable loss of resources; and (cc) Can be avoided, managed, or mitigated. (vi) The methodology used in deterring and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (vii) Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographic, physical, biological, social, economic, heritage and cultural aspects; (viii) The possible mitigation measures that could be applied and level of residual risk; (ix) The outcome of the site selection matrix; (x) If no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such and; (xi) A concluding statement indicating the preferred alternatives, including preferred location of the activity.	 Section 8 Section 9 Section 9 Section 10 & 11 Section 12 Section 12 Section 13 Section 14 Section 14 Section 14 Section 14
Appendix 1, Section 3 (i)	A full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including- (i) A description of all environmental issues and risks that were identified during the environmental impact assessment process; and (ii) An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	Section 12
Appendix 1, Section 3 (j)	An assessment of each identified potentially significant impact and risk, including- (i) Cumulative impacts; (ii) The nature, significance and consequences of the impact and risk; (iii) The extent and duration of the impact and risk; (iv) The probability of the impact and risk occurring; (v) The degree to which the impact and risk can be reversed; (vi) The degree to which the impact and risk may cause irreplaceable loss of resources; and (vii) The degree to which the impact and risk can be avoided, managed or mitigated.	Section 13 & 14
Appendix 1, Section 3 (k)	Where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report.	Section 11
Appendix 1, Section 3 (l)	An environmental impact statement which contains- (i) A summary of the key findings of the environmental impact assessment; (ii) A map at an appropriate scale which superimposes the proposed activity and its	Section 15

2014 EIA Regulations	Description of EIA Regulations Requirements for BA Reports	Location in the BAR
	associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and (iii) A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	
Appendix 1, Section 3 (m)	Based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr.	Section 16
Appendix 1, Section 3 (n)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	Section 16
Appendix 1, Section 3 (o)	A description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	-
Appendix 1, Section 3 (p)	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	Section 16
Appendix 1, Section 3 (q)	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised.	Section 17
Appendix 1, Section 3 (r)	An undertaking under oath or affirmation by the EAP in relation to- (i) The correctness of the information provided in the report; (ii) The inclusion of the comments and inputs from stakeholders and interested and affected parties; (iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and (iv) Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties.	Section 19
Appendix 1, Section 3 (s)	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.	-
Appendix 1, Section 3 (t)	Where applicable, any specific information required by the Competent Authority.	-
Appendix 1, Section 3 (u)	Any other matter required in terms of section 24(4) (a) and (b) of the Act.	-

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APPENDICES

1 INTRODUCTION

Terratest (Pty) Ltd has been appointed by WMN Consultancy (Pty) Ltd, on behalf of the uThukela District Municipality, to undertake the environmental services required for the proposed construction of a new 900-1200mm diameter (ø) bulk gravity water pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works, Emnambithi / Ladysmith Municipality, KwaZulu-Natal. This project forms the first phase of a Department of Water & Sanitation Regional Bulk Water Infrastructure Upgrade for the uThukela District Municipality. The purpose of the overall project is to address current water supply constraints experienced within the Ladysmith / Ezakheni areas.

This portion of the overall regional water supply project has been fast tracked to alleviate the immediate supply constraints to the Ladysmith Water Treatment Works. The second phase of the regional water supply project, which will form part of a separate Basic Assessment Application, will include the establishment of a command reservoir and regional water treatment works which will treat water abstracted from Spioenkop Dam.

The proposed bulk pipeline is required to replace an existing bulk main which is aging and estimated to be losing approximately 50 - 70% of the volumes of water it is currently transporting. The proposed bulk pipeline will not follow the same alignment as the existing pipeline and will initially serve as a raw water pipeline to improve supply to, and reliability of, the Ladysmith Water Treatment Works during winter months.

The proposed route has been assessed based on a corridor of disturbance, with a varying width of 70m – 350m to allow for unforeseen construction deviations should these be required during the construction phase of the project. The length of the corridor and hence pipeline, is approximately 25km.

As per GN R982 of the EIA Regulations, 2014, a Basic Assessment (BA) Process must be undertaken in such a manner that the environmental outcomes, impacts and residual risks of the proposed listed activity being applied for are noted in the BA Report and assessed accordingly by the Environmental Assessment Practitioner (EAP). In this regard, the requirements of the BA Process are noted in the EIA Regulations (2014), Listing Notice 1, Appendix 1 of GNR 982 and are consequently adhered to in this report (please refer to Table 1 of the Executive Summary). For reference purposes it is important to note that the Listed Activities in terms of GN R983 of the EIA Regulations, 2014, applicable to this proposed project pertain only to the “development” / construction of infrastructure associated with the bulk pipeline. In this regard this Basic Assessment Report focuses only on construction phase impacts and mitigation measures.

Ultimately, the outcome of the BA Process is to provide the Competent Authority, the Department of Economic Development, Tourism and Environmental Affairs (EDTEA), with sufficient information to provide a decision on the Application in terms of an Environmental Authorisation (EA), in order to avoid or mitigate any detrimental impacts that the construction phase of the activity may inflict on the receiving environment.

2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

As noted previously, Terratest (Pty) Ltd has been appointed by WMN Consultancy (Pty) Ltd to undertake the BA Process for the proposed bulk water pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works, Emnambithi / Ladysmith Municipality, KwaZulu-Natal. Details of the EAP responsible for undertaking the BA Process is noted in Table 2 and his Curriculum Vitae (CV) is attached in Appendix 1.

TABLE 2: Details of the EAP

EAP	Qualifications & Professional affiliations	Experience at environmental assessments	Contact details
Mr J. Richardson Environmental Scientist	BSc. Hons Environmental Management IAIAsa KZN Branch Chairman	9 years	Terratest (Pty) Ltd Tel: (033) 343 6789 Cell: 072 508 0906 Email: richardsonj@terratest.co.za

3 LOCATION OF THE ACTIVITY

The proposed project is located within Wards 11, 13 and 25 of the Emnambithi / Ladysmith Local Municipality. The 21 digit Surveyor General (SG) code for each cadastral land parcel, as well as property details through which the water pipeline corridor is proposed to run, are attached as Appendix 2.

The corridor of assessment is approximately 70m – 350m wide, varying in width based on environmental attributes and identified items of heritage significance. The length of the corridor is approximately 25km long and will primarily be located adjacent to the road reserves of the R600, N11 and R103. Construction activities will require a working servitude of approximately 25 metres within the corridor during the construction phase of the pipeline.

Co-ordinates of the corridor, plotted at 500m intervals, are provided in Table 3.

TABLE 3: Pipeline corridor co-ordinates

Point Number	Kilometre Point	Latitude (S)	Longitude (E)
Starting Point 1	0.0 km	28°38'39.65"S	29°34'25.82"E
2	0.5km	28°38'24.39 S	29°34'39.73 S
3	1km	28°38'16.38 S	29°34'55.64 S
4	1.5km	28°38'8.21 S	29°35'11.29 S
5	2.0km	28°37'58.66 S	29°35'26.14 S
6	2.5km	28°37'48.02 S	29°35'40.05 S
7	3km	28°37'37.45 S	29°35'54.02 S
8	3.5km	28°37'26.88 S	29°36'8 S
9	4km	28°37'16.32 S	29°36'21.98 S
10	4.5km	28°37'5.9 S	29°36'36.07 S
11	5km	28°36'54.83 S	29°36'49.32 S
12	5.5km	28°36'44.94 S	29°37'3.79 S
13	6km	28°36'34.78 S	29°37'18.03 S
14	6.5km	28°36'25.1 S	29°37'32.79 S
15	7km	28°36'16.51 S	29°37'48.41 S
16	7.5km	28°36'7.99 S	29°38'4.08 S
17	8km	28°35'59.7 S	29°38'19.9 S
18	8.5km	28°35'51.22 S	29°38'35.59 S

19	9km	28°35'42.63 S	29°38'51.21 S
20	9.5km	28°35'36.42 S	29°39'8.07 S
21	10km	28°35'30.07 S	29°39'24.7 S
22	10.5km	28°35'27.35 S	29°39'42.83 S
23	11km	28°35'26.38 S	29°40'1.2 S
24	11.5km	28°35'25.39 S	29°40'19.56 S
25	12km	28°35'25.53 S	29°40'37.94 S
26	12.5km	28°35'27.08 S	29°40'56.26 S
27	13km	28°35'27.88 S	29°41'14.63 S
28	13.5km	28°35'29.91 S	29°41'32.88 S
29	14km	28°35'32.2 S	29°41'51.1 S
30	14.5km	28°35'34.48 S	29°42'9.31 S
31	15km	28°35'33.42 S	29°42'27.52 S
32	15.5km	28°35'30.86 S	29°42'45.69 S
33	16km	28°35'24.63 S	29°43'2.4 S
34	16.5km	28°35'22.81 S	29°43'20.68 S
35	17km	28°35'20.96 S	29°43'38.92 S
36	17.5km	28°35'17.61 S	29°43'56.31 S
37	18km	28°35'9.53 S	29°44'10.78 S
38	18.5km	28°34'57.79 S	29°44'23.48 S
39	19km	28°34'46.18 S	29°44'35.78 S
40	19.5km	28°34'33.3 S	29°44'46.99 S
41	20km	28°34'18.94 S	29°44'53.85 S
42	20.5km	28°34'3.17 S	29°44'54.43 S
43	21km	28°33'47.57 S	29°44'49.31 S
44	21.5km	28°33'31.57 S	29°44'48.86 S
45	22km	28°33'15.59 S	29°44'48.38 S
End Point 46	22.5km	28°33'4.27"S	29°44'52.74"E

Figures 1 & 2 provide a general Locality Plan and Aerial Photograph of the proposed pipeline corridor from Brakfontein Farm to Ladysmith Water Treatment Works. A3 Corridor Layout Plans and a Locality Map are attached in Appendix 3 for further reference purposes.

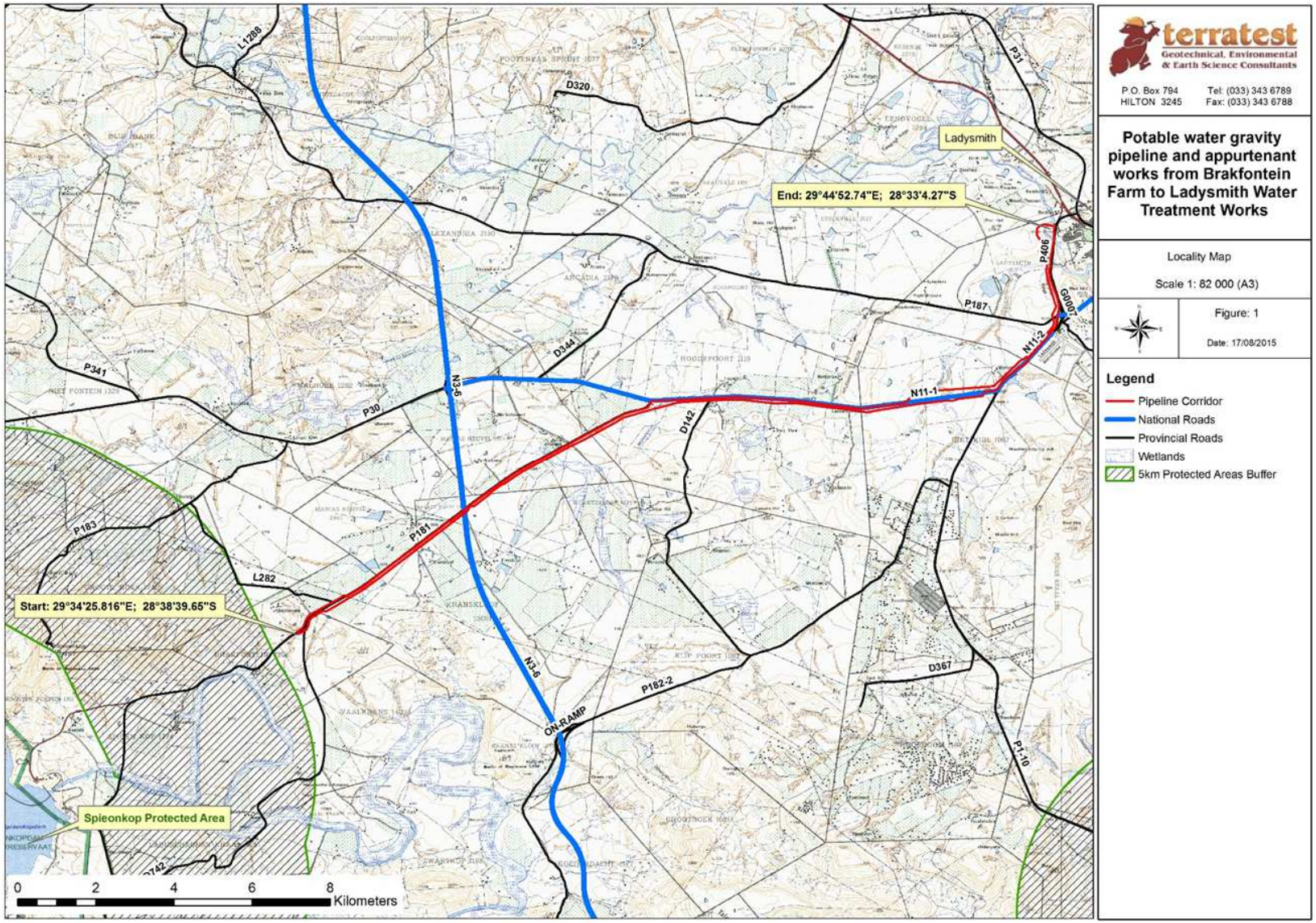


Figure 1: Locality Map

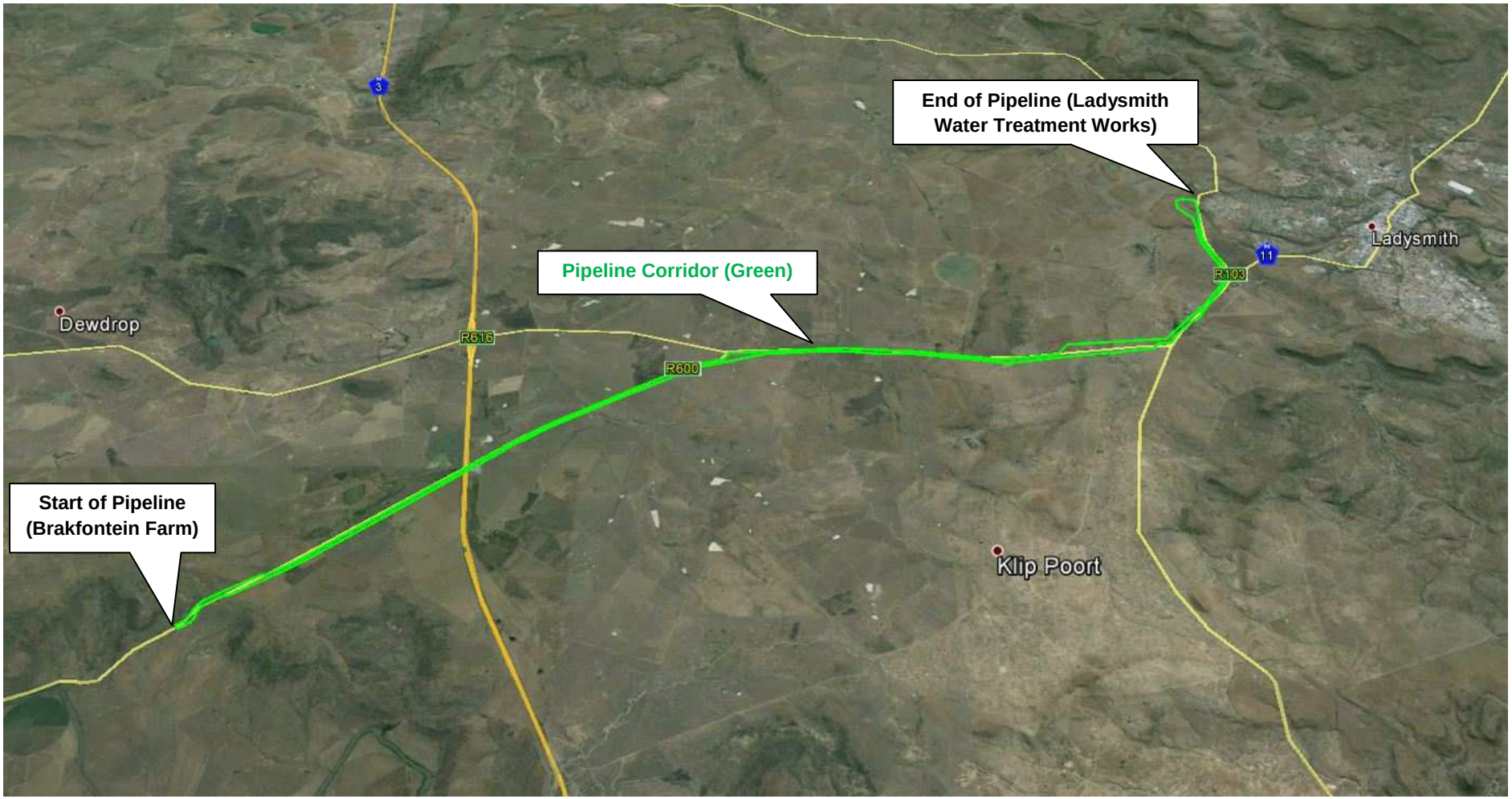


Figure 2: Aerial Map

4 ACTIVITY DESCRIPTION

4.1 APPLICABLE LISTED ACTIVITIES

In terms of the Environmental Impact Assessment (EIA) Regulations (2014), promulgated in terms of the National Environmental Management Act, 1998 (NEMA), certain Listed Activities are specified for which either a Basic Assessment (GN R 983 and 985) or a full Scoping and EIA (GN R 984) is required.

The following Listed Activities in Government Notice (GN) R 983 (Listing Notice 1), requiring a Basic Assessment (BA) Process will be applicable to the proposed bulk pipeline construction:

- **GNR 983, Item 09:** "The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or stormwater (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more."

This Listed Activity is relevant as the proposed pipeline will be longer than 1 000 metres and will have an internal diameter of more than 0,36 metres and a throughput of more than 120 litres per second i.e. the pipeline will be approximately 25km in length and will have an internal diameter of between 0.9 & 1.2 metres and a throughput capacity of approximately 1736 litres per second.

- **GNR 983, Item 12**: "The development of (iii) bridges exceeding 100m^2 in size; (xii) infrastructure or structures with a physical footprint of 100m^2 or more where such development occurs (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves."

This Listed Activity is relevant as portions of the proposed corridor route will require the construction of infrastructure for the crossing of watercourses which exceeds 100m^2 within a watercourse, or be within 32 metres thereof, which doesn't occur within an existing road or road reserve, and which the majority of it is located in a rural area.

- **GNR 983, Item 19**: "The infilling or depositing of any material of more than 5m^3 into, or dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5m^3 from (i) a watercourse."
  - *This Listed Activity is relevant as the proposed bulk water pipeline construction will involve the movement of more than 5m^3 of soil from the banks of watercourses and wetlands during construction and/or the deposition of 5m^3 of material or more into watercourses.*

Based on the above proposed activities a Basic Assessment EIA Process is required. The associated Environmental Authorisation (EA) Application form is attached to this Report as Appendix 4 and an organogram of the Basic Assessment EIA Process is provided in Figure 3 below for reference purposes.

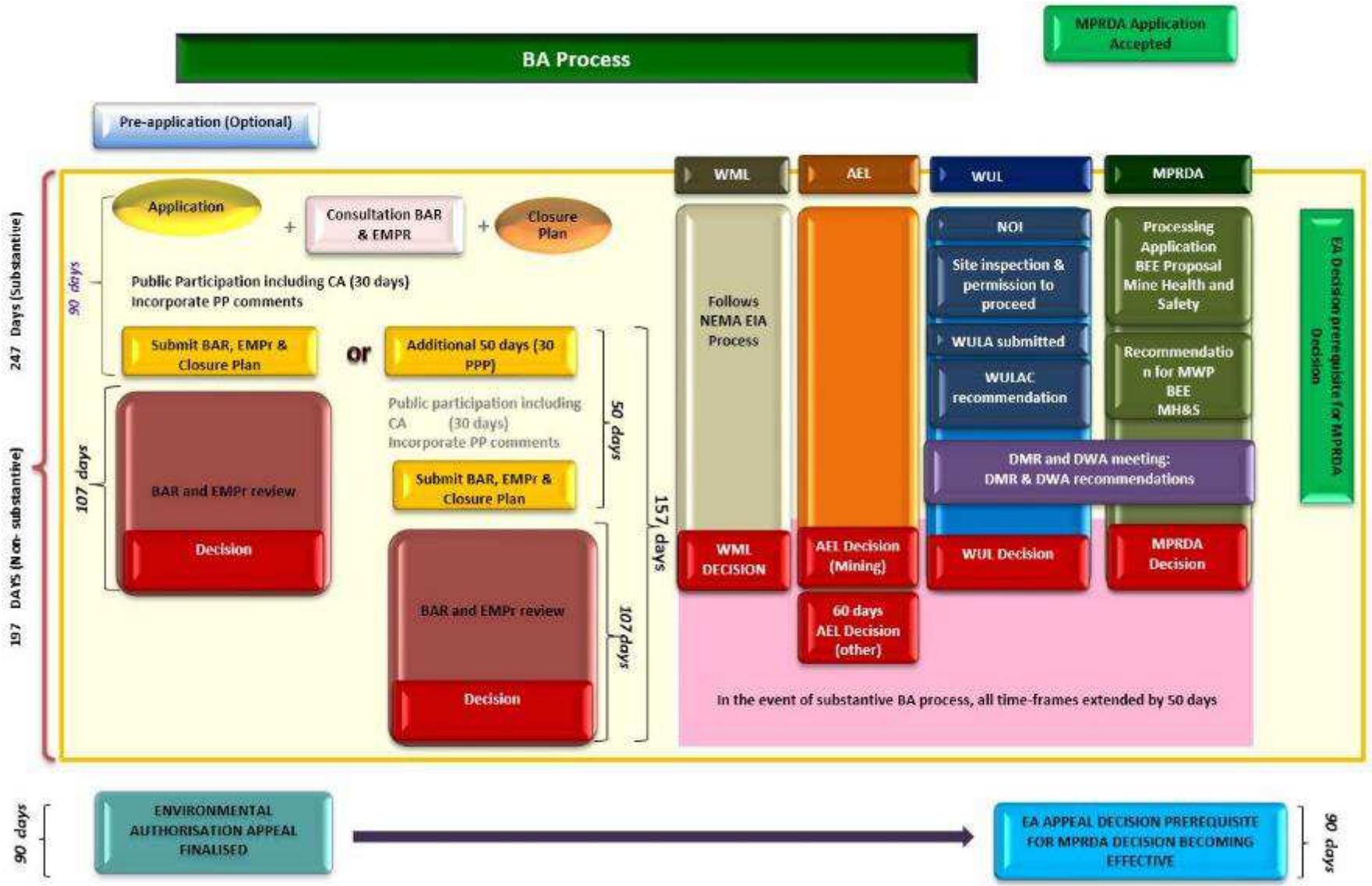


Figure 3: Basic Assessment EIA Process Organogram

4.2 DESCRIPTION OF THE ACTIVITY

4.2.1 Background to the Ezakheni / Emnambithi Bulk Water Infrastructure Upgrade Project

This specific project forms part of a larger initiative being undertaken by the uThukela District Municipality, entitled the "Ezakheni / Emnambithi Bulk Water Infrastructure Upgrade Project". The Ezakheni / Emnambithi Bulk Water Infrastructure Upgrade Project entails the provision of bulk infrastructure, which is to address the current supply constraints in the area, as well as to improve the internal water conservation and demand management initiatives. This has been undertaken in order to improve the sustainability of the system and to address the unacceptably high physical water losses within Ladysmith / Ezakheni. Ultimately, the strategy is aimed to reduce the current high water loss (~50% to 70%) to a target water loss of 25% of demand. This achievement would meet the projected 2040 water demand, inclusive of population growth at 1% per annum and improve the level of service (Appendix 5: Engineering Report).

4.2.2 Project Overview

This specific project forms the first phase of a Department of Water & Sanitation (DWS) funded Regional Bulk Water Infrastructure Upgrade for the uThukela District Municipality which has been fast tracked to alleviate the immediate supply constraints to the Ladysmith Water Treatment Works.

The proposed development comprises the installation of a new 900 – 1 200mm ø bulk gravity water pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works, Emnambithi / Ladysmith Municipality, KwaZulu-Natal. The proposed pipeline is approximately 25 kilometres long and will primarily be located adjacent to the road reserves of the R600, N11 and R103. The proposed bulk pipeline will have a capacity of approximately 1736 litres per second.

The purpose of the overall project is to address current water supply constraints experienced within the Ladysmith / Ezakheni areas and reduce the approximately 50-70% water losses being experienced in the supply system. The proposed bulk pipeline is therefore required to replace an existing bulk main which is aging and estimated to be losing approximately 30% of the volumes of water it is currently transporting. The proposed bulk pipeline will not follow the same alignment as the existing pipeline and will initially serve as a raw water pipeline to temporarily improve supply to, and reliability of, the Ladysmith Water Treatment Works during winter months. The second phase of the regional water supply project, which will form part of a separate Basic Assessment Application, will include the establishment of a command reservoir and regional water treatment works which will treat water abstracted from Spioenkop Dam. Once this has been approved, the proposed bulk pipeline forming part of this Basic Assessment Application will be utilised as a potable water bulk pipeline.

The proposed alignment crosses a number of minor watercourses and includes one major crossing of the Klip River, located close to the existing Ladysmith Water Treatment works. The majority of the alignment falls within agricultural lands with a small portion falling within the urban edge of Ladysmith. The consulting engineers and EAP have extensively discussed the proposed routing of the pipeline with the members of the Ladysmith Farmers Association and other landowners who are potentially directly affected by the alignment. The proposed alignment for this project has therefore been put forward based on the outcomes of these ongoing discussions.

This environmental assessment has been undertaken based on a corridor of disturbance with a varying corridor width of 70m – 350m to allow for unforeseen construction deviations should these be required

during the construction phase of the project. An A3 Locality Map and proposed Corridor Layout Plan are attached in Appendix 3.

4.2.3 Project Objectives

As detailed above the purpose of the overall project is to address current water supply constraints experienced within the Ezakheni / Emnambithi area. A key cause of the supply constraint is excessive water losses within the current bulk and distribution systems and the unreliable supply of raw water to the Ladysmith Water Treatment Works from existing supply / abstraction sources. Current raw water sources for the Ladysmith Water Treatment Works includes abstraction form the Klip River which is unreliable during the winter months, and a temporary bulk pipeline from Spioenkop Dam which is beyond its design lifespan and currently subject to high water losses.

The water supply constraints for the region are further exacerbated by ineffective / unsound water district zoning. As a result, the current demands on the Ladysmith Water Works are over extended, offering no spare capacity for any development growth until such time as the bulk water upgrades from Spioenkop Dam have been fully realized.

The Ladysmith Water Treatment Works (30 Ml/d treatment capacity) is currently supply constrained and this constraint typically becomes acute in the winter months when abstraction from the Klip River is not viable. Under these conditions, the works is totally reliant upon the unreliable raw water pipeline supply from Spioenkop Dam which has a 19 Ml/d capacity, thus effectively reducing potable water production to <19Ml/d.

In light of the above, this specific project has the following key objectives:

1. To provide a new and more reliable bulk pipeline from Brakfontein Farm to Ladysmith Water Treatment Works which will act as a temporary raw water provision pipeline until such time regional bulk supply scheme has been completed.
2. Once the regional bulk supply scheme[1] has been completed the pipeline will act as a bulk supply line transporting potable water from the regional water treatment works and associated command reservoir to Ladysmith, where it will be distributed to various supply nodes.

4.2.4 Construction Project Specifics

The following is proposed to be constructed for the bulk gravity water pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works in order to meet the objectives detailed in Section 4.2.3:

- Approximately 25Km, 900-1200mm diameter (Ø) bulk gravity water pipeline and associated appurtenant works. The 1200mm Ø pipeline will run from Brakfontein Farm to the Maidens Castle Reservoir offtake at which point it will reduce in diameter to a 900mm Ø pipeline until its termination near the existing Ladysmith Water Treatment Works.
- Air valve chambers at highpoints but not exceeding a spacing of 600m along the route;
- Scour valve chambers at all low points of the pipeline;
- Six river crossings and nine drainage / channel crossings of minor watercourses;
- Four wetland and several small dam crossings; and
- A pipe bridge or alternatively an open cut excavation crossing of the Klip River.

[1] *Please note that the overall regional bulk supply scheme will include raw water transfer scheme from Spioenkop dam to a 150 Ml/d Water Treatment Works which is currently in the process of being investigated under a separate EIA process due to the complexities surrounding features of heritage significance at proposed reservoir and treatment works sites which have been identified.*

5 ENGINEERING DETAILS AND CONSTRUCTION METHODOLOGY

All information provided in this Section has been extracted from the Engineering Report, attached as Appendix 5.

5.1 CONSTRUCTION MATERIALS AND DESIGN CONSIDERATIONS

The diameter of the pipeline for the section of pipeline from Brakfontein Farm to the Maidens Castle Reservoir offtake is 1200mm, at which point it reduces in diameter to 900mm and maintains this diameter up to its termination point near the existing Ladysmith Water Treatment Works. This section of the overall uThukela bulk water supply scheme comprises the majority of the gravity potable water main.

The entire pipeline is specified as continuously welded grade API X42 steel pipe with a D/t ratio of <= 120 and will be fabricated in accordance with DWS 1310 specifications. Pipeline construction will generally be in accordance with SABS 1200L except where more onerous requirements are deemed necessary. The pipeline will be epoxy lined (epoxy suitable for use on potable water applications) and the corrosion resistant coating will be either polyurethane or medium density polyethylene. All coatings and linings will comply with the DWS 9900 specification.

Provision will be made for the fitment of a temporary cathodic protection system during construction and a permanent cathodic protection system, probably of the impressed current type, will be provided.

All chambers will be fabricated either from precast concrete rings (airvalve chambers on the 900mm diameter pipe) or insitu reinforced concrete (airvalve chambers, scour and isolating valve chambers on the 1200mm diameter pipe).

Scour chambers will be located at all low points to allow drainage of the pipeline for occasional maintenance. A considerable portion of the route is located in dispersive soils and energy dissipation measures are provided at scour valve installations to mitigate erosion when scouring takes place.

Air valves are provided at high points but not exceeding a spacing of 600m to ensure hydraulic efficiency, and in-line isolating valves are provided at a spacing not exceeding 5m to ensure minimise wastage of water in the event that the pipeline is drained.

In terms of backfill and bedding material, it is anticipated that the excavated trench material will be suitable for backfill, if not suitable materials will be obtained from commercial sources.

5.2 CONSTRUCTION METHODOLOGY

5.2.1 General

The majority of this pipeline will be laid through farmland and the proposed route corridor has been subjected to extensive interrogation by stakeholders and is considered to be a sound solution taking due account of engineering, heritage and environmental considerations. All construction activities will be carried out in accordance with the Environmental Management Programme (EMPr) (Appendix 6), technical and safety requirements. Generally the working corridor will be fenced to mitigate the risk of cattle accidents. Firebreaks will be developed and maintained by the respective farmer during the fire season at cost to the contract.

The working corridor will be stripped of top soil to the minimum depth of 200mm and stockpiled as per the EMPr requirements (Appendix 6). The working corridor, which will be approximately 25m wide, has adequate provision for segregated stockpiling of topsoil and subsoil, stringing of pipes, stockpiling of bedding, side boom access for pipe laying and vehicle access along the pipe route. This working corridor will be reduced in sensitive riparian areas to a width of 14m as per the recommendations of the Wetland & Riparian Assessment (Appendix 7).

Individual pipes will be laid in the trench on the bedding material and welded insitu by coded welders to minimise the development of internal stresses. In order to mitigate potential leaks, all welds will be proved by proven non-destructive techniques. The preliminary geotechnical investigation has revealed that the soils are dispersive and where this is the case, backfill will be stabilised with lime or other approved stabiliser to mitigate the risk of erosion. Backfill will be reinstated in accordance with the EMPr (Appendix 6) and will be maintained for the duration of the defects liability period.

As this potable water pipeline will initially operate as a raw water pipeline, there will probably be no need for pipeline disinfection. However, should disinfection be required, the Project Service Providers have, in consultation with Umgeni Water's Process Department, developed a disinfection technique which requires a lower chlorine concentration which is maintained for a longer period to achieve disinfection. This minimises the risk of chlorine neutralisation using sodium thiosulphate which in itself can be harmful to the environment.

5.2.2 Minor watercourses

The facility illustrations of the minor watercourse crossings are provided in Annexure C of the Engineering Report (Appendix 5). The two types of watercourse crossings as specified are:

1) *No hard rock on the bed of the watercourse:* This detail requires that the pipe be laid at depth, concrete encased and erosion protection measures constructed above the pipe; and
2) *Hard rock on the bed of the watercourse:* This detail requires that the top of the pipe concrete encasement be flush with the stream bed. This presents minimum disruption to stream flow.

5.2.3 Major watercourses

The pipeline corridor crosses the Klip River, a major watercourse. Inspection of the pipe corridor in the vicinity of the Ladysmith Water Treatment Works reveals a bulbous expansion of the pipe corridor. This is to accommodate two possible options for the crossing of the Klip River viz:

1. A bridge crossing essentially parallel to the existing road bridge which is the preferred option. Preliminary details of the bridge crossing are given in Annexure D of the Engineering Report (Appendix 5).
2. An open cut excavation some 200m upstream of the road bridge crossing. This crossing being located in hard rock and the detail for the crossing would be similar to detail furnished in Annexure C of the Engineering Report (Appendix 5) – i.e. placing the top of concrete encasement flush with the hard rock. In addition the encasement would be dowelled into the rock. Should this option be adopted, the construction activity would take place in winter when the flow of the river typically ceases.

6 APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

Table 4 provides a list of all the applicable legislation, policies and/or guidelines of any sphere of government that are relevant to the application as contemplated in the EIA regulations.

TABLE 4: Applicable legislation, policies and/or guidelines.

Title of legislation, policy or guideline:	Administering authority:	Date:
National Environmental Management Act (Act 107 of 1998) – for its potential to cause degradation of the environment (Section 28).	Department of Environmental Affairs	1998
Environmental Conservation Act (Act 73) – for potential environmental degradation.	Department of Environmental Affairs	1989
National Water Act (Act 36 of 1998) – for potential to cause pollution of	Department of Water	1998

Title of legislation, policy or guideline:	Administering authority:	Date:
water resources defined under the Act (Section 19).	Affairs and Forestry	
Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) – for protection of agricultural resources and for control and removal of alien invasive plants.	National Department of Agriculture	1983
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) – for protection of biodiversity.	Department of Agriculture and Environmental Affairs & Ezemvelo KZN Wildlife	2004
The National Heritage Resources Act (Act No 25 of 1999 as amended) – for the identification and preservation of items of heritage importance.	Department of Arts and Culture (Amafa KwaZulu-Natal)	1999
Guideline 4: Public Participation in support of the EIA Regulations (2005)	Department of Environmental Affairs and Tourism	2006
Guideline 7: Detailed Guide to Implementation of the Environmental Impact Assessment Regulations (2006)	Department of Environmental Affairs and Tourism	2007
Emnambithi / Ladysmith Municipal By-Laws	Local Municipality	Updated accordingly

7 NEED AND DESIRABILITY

The current bulk supply system is not reliable and cannot meet the current and future demands of the region. The fast tracked provision of this specific section of the bulk gravity main will initially provide increased raw water supply to the Ladysmith Water Treatment Works to meet current demands. Once the scheme has been realised it will then act as a bulk potable water main to service the overall supply scheme which is designed to meet the 2040 demand projections for the region. As water is a basic human need, this initiative is considered to be of high priority. Further motivation has also been provided under Sections 4.2.1 – 4.2.3 above.

8 MOTIVATION FOR THE PREFERRED SITE, ACTIVITY AND TECHNOLOGY ALTERNATIVES

The proposed bulk pipeline triggers Listing Notice GNR 983, Activities 09, 12 and 19 of the EIA Regulations. As per GNR 982, Appendix 1(2)(b), alternatives for the proposed development are to be identified and considered. Chapter 1 of the EIA Regulations provides an interpretation of the word "alternatives", which is to mean "*in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the -*

a) Property on which or location where the activity is proposed to be undertaken;
b) Type of activity to be undertaken;
c) Design or layout of the activity;
d) Technology to be in the activity; or
e) Operational aspects of the activity;
And includes the option of not implementing the activity."

Based on the above, the following alternatives are presented for the proposed construction of the pipeline:

8.1 PREFERRED SITE ALTERNATIVE

The preferred site alternative is the construction of a 900 -1200mm ø bulk water pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works. The pipeline corridor is 70 - 350m wide, which will allow for any unforeseen construction deviations if necessary. The working pipeline servitude will be approximately 25m wide, with this being reduced to 14m in sensitive areas. The majority of the pipeline alignment is proposed to run adjacent to the R600, N11 and R103 road servitudes. An area of disturbance has already been partially created through the construction of these roads, therefore providing an existing area of disturbance for construction activities associated with the pipeline. Furthermore the proposed pipeline corridor route has been subjected to extensive pre-application interrogation by appropriate specialists, and by directly affected landowners, the majority of which have agreed to the proposed alignment. As such it is considered to be a sound solution taking due account of landowner requirements, engineering, heritage and environmental considerations.

As the pipeline has to tie into the existing raw water pipeline at Brakfontein Farm, and the fact that a reservoir and proposed regional water treatment works is proposed in the future in this vicinity, the starting point of the pipeline is restricted to this area (28°38'39.65"S; 29°34'25.82"E). Additionally the end point of the pipeline (28°33'4.27"S; 29°44'52.74"E) is restr icted to the location of the existing Ladysmith Water Treatment Works as the bulk pipeline will initially function as a raw water supply to the works.

The Klip River is a significant environmental feature which is unavoidable in the construction of the bulk pipeline and thus will require crossing, regardless of the identified crossing point. The corridor area identified for this crossing will take into consideration items of heritage significance identified in the Heritage Impact Assessment (HIA) Report (Appendix 8), as well the proposed crossing and mitigation measures recommended by the Wetland and Riparian Specialist (Appendix 7).

In summary the proposed corridor identified for construction takes into account items of heritage significance, ecological importance, and is acceptable to the majority of directly affected landowners. This site alternative is therefore considered to be preferred site alternative. No other site alternatives have been investigated as they would not meet the need and desirability of this application.

Plates 1 - 24 provide an overview of the site proposed for construction activities. The corresponding location of where the photographs were taken are noted in Figure 4.

SITE PHOTOGRAPHS: Plates 1 - 24

PLATE 1: Start of pipeline corridor on the left (Thornveld).

PLATE 2: Pipeline corridor to cross under the Eskom Power Lines.

PLATE 3: Pipeline corridor near entrance to Brakfontein.

PLATE 4: Pipeline corridor to cross under the Eskom Power Lines in maize lands.

PLATE 5: Pipeline corridor within grazing lands.

PLATE 6: Pipeline corridor within grazing lands.

PLATE 7: Pipeline corridor within grazing lands, looking back in a south westerly direction.

PLATE 8: Looking in a south westerly direction at the Pipeline corridor on opposite side of the Transnet Multi Purpose Pipeline in the vicinity of the pump station.

PLATE 9: Pipeline corridor within grazing lands.

PLATE 10: Pipeline corridor within grazing lands.

PLATE 11: Pipeline corridor in the vicinity of the D142 intersection.

PLATE 112: Pipeline corridor within grazing lands.

PLATE 13: Pipeline corridor within grazing lands. Area prone to erosion and dispersive soils.

PLATE 124: Pipeline corridor within grazing lands. Gully erosion evident in the foreground.

PLATE 15: Pipeline corridor, upstream crossing of the Flagstone river. Area prone to erosion and dispersive soils.

PLATE 136: Pipeline corridor at the N11 intersection approach to the peri-urban entrance to Ladysmith.

PLATE 17: Pipeline corridor approach to the peri-urban area of Ladysmith.

PLATE 148: Pipeline corridor in the vicinity of the RTI testing grounds.

PLATE 19: Pipeline corridor approach to the R103 offramp (grazing lands).

PLATE 20: Pipeline corridor on the R103 on ramp (grazing lands & heritage features to the left)

PLATE 21: Pipeline corridor approaching the second crossing of the Flagstone river.

PLATE 22: Pipeline corridor in the vicinity of the Klip River crossing (looking back in a southerly direction)

PLATE 23: Pipeline corridor the vicinity of the second Klip River crossing (upstream of the R103 crossing with sensitive riparian vegetation area in the foreground).

PLATE 24: Pipeline corridor the vicinity of the third Klip River crossing (upstream of the R103 and middle crossing point.

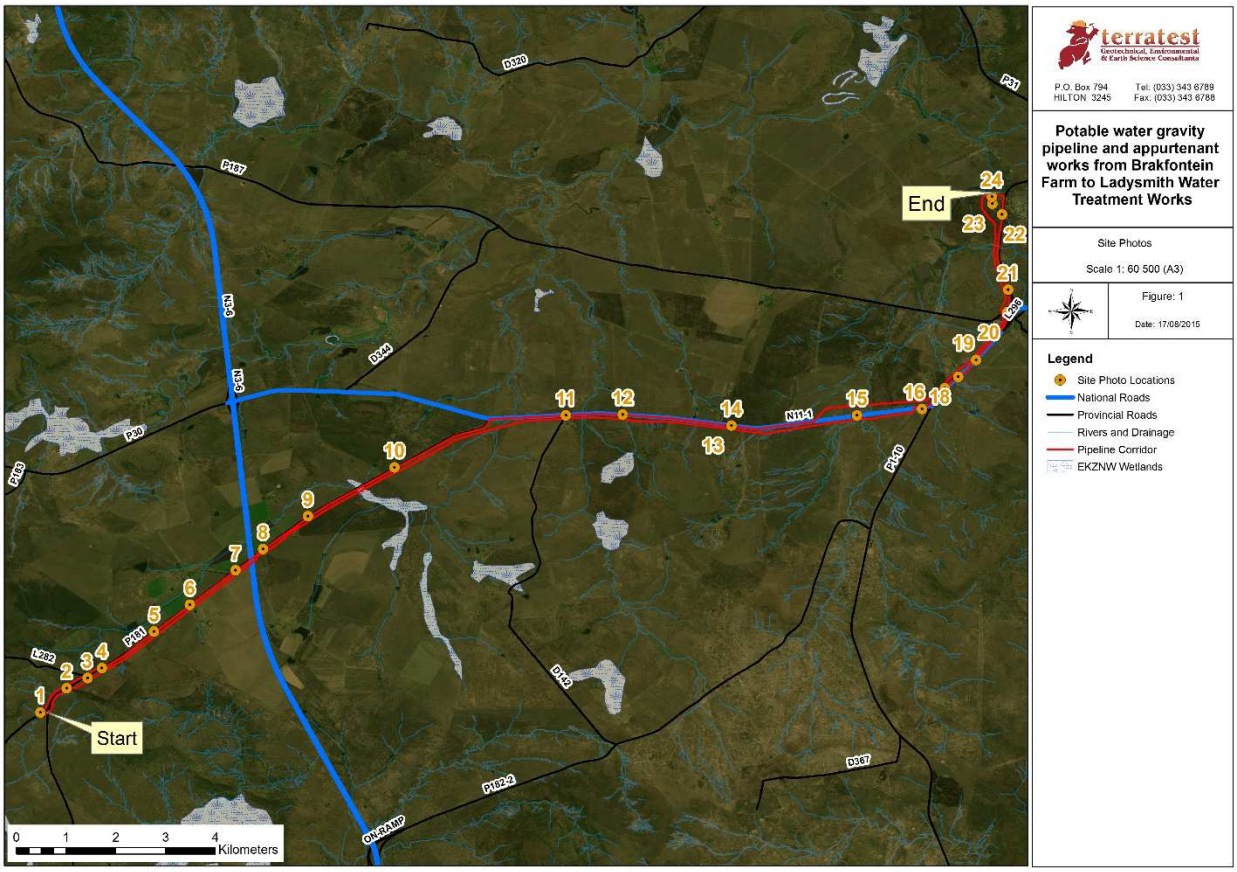


Figure 4: Location of Plates 1 – 24.

8.2 PREFERRED TECHNOLOGY ALTERNATIVE

The preferred technology alternative is to construct the entire pipeline of continuously welded grade API X 42 steel with a D/t ratio of <=120. The pipeline will be fabricated in accordance with the DWS 1310 specification. Pipeline construction will be in accordance with SABS 1200L except where more onerous requirements are deemed necessary. The pipeline will be epoxy lined (epoxy suitable for use on potable water applications) and the corrosion resistant coating will be either polyurethane or medium density polyethylene. All coatings and linings will comply with the DWS 9900 specification. Provision will be made for the fitment of a temporary cathodic protection system during construction and a permanent cathodic protection system, probably of the impressed current type, will be provided.

No other reasonable and / or practical technology alternative exists that would meet the need and desirability of this application.

8.3 NO-GO ALTERNATIVE

The No-go Alternative is to not to construct the proposed bulk pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works. As a result, the existing raw water abstraction and supply scheme will continue to operate, which is inefficient, unreliable and unable to meet current and future water demands for the region. Further, the UThukela District Municipality's Ezakheni / Emnambithi Infrastructure Masterplan / Upgrade Project will not be realised and the unacceptable loss of water will continue through the current water supply scheme.

9 PUBLIC PARTICIPATION

To fulfil the necessary public participation required as part of the BA Process, the following methods of stakeholder engagement were conducted by the EAP, as outlined below.

9.1 PRE-APPLICATION CONSULTATIONS AND ENGAGEMENT WITH DIRECTLY AFFECTED LANDOWNERS AND KEY STAKEHOLDERS

Since July 2013 the engineers and EAP have engaged with the Ladysmith Farmers Association and their members on several occasions for the overall bulk supply scheme to establish a suitable and acceptable alignments through affected farms. These engagements have taken place in the form of several meetings which have been facilitated at both the Ladysmith Country Club and Spionkop Lodge. Copies of the meeting minutes applicable to this component of the overall project have been included in Appendix 9 of this report.

Additionally the engineers have engaged with certain key stakeholders who are directly affected by the proposed corridor alignment, in this regard formal correspondence which has been received to date is attached in Appendix 10.

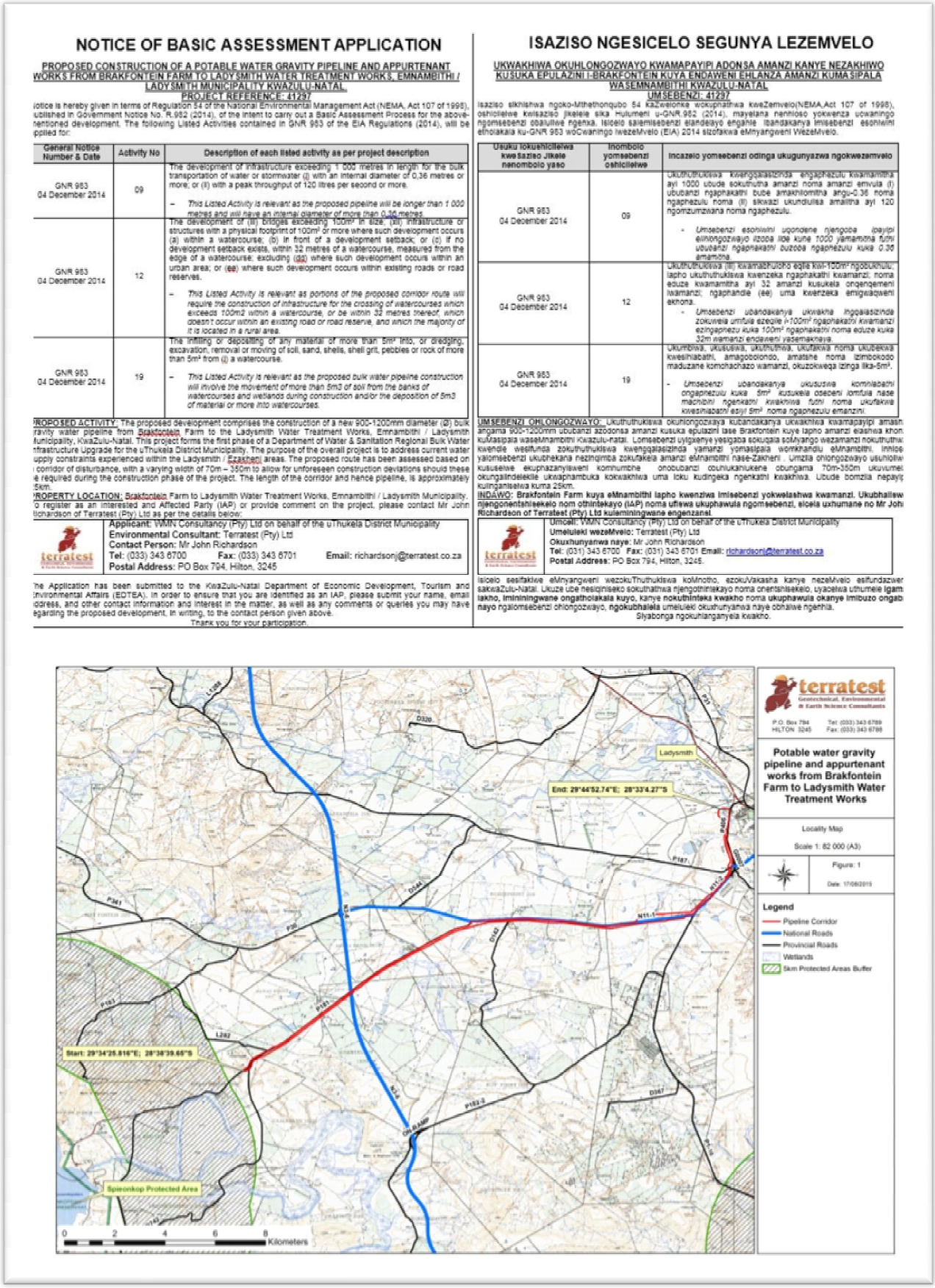
9.2 NEWSPAPER ADVERTISEMENT

Newspaper advertisements for the overall bulk supply scheme were originally published in the Ladysmith Gazette and Witness Newspaper at the outset of the project in April 2013 to inform the general public of the proposed BA Process. However due to unforeseen complications with respect to alignment considerations and project funding, this initial project application has subsequently been split into two applications, of which this application forms the first phase (see Section 4.2.2). As such this first phase of the project was re-advertised in English on 18 September 2015 in the Ladysmith Gazette newspaper, and in isiZulu on 18 September 2015 in the Eyethu UThukela newspaper.

9.3 SITE NOTICE BOARDS

As was the case with the newspaper advertisements detailed above, ten (10) site notice boards written in English and isiZulu for the overall bulk supply scheme were originally placed along the alignment in April 2013. As a result of the project implementation requirements detailed in the section above, the site notice boards detailing the revised project requirements for this specific phase were reposted along the route in English and isiZulu on the 11 September 2015. Figure 5 provides a copy of these site notices, while Figure 6 provides an illustration of the location of the notice boards as per the alignment.

The purpose of the notice boards was to inform neighbours, community members and passers-by of the proposed BA Application. The details of the EAP were also provided on the notices should any member of the public require additional information or wish to register as an IAP in the Application. Plates 25 - 35 provide proof that the notice boards were erected on site.



NOTICE OF BASIC ASSESSMENT APPLICATION

PROPOSED CONSTRUCTION OF A POTABLE WATER GRAVITY PIPELINE AND APPURTENANT WORKS FROM BRAKFONTEIN FARM TO LADYSMITH WATER TREATMENT WORKS: EMNAMBITHI / LADYSMITH MUNICIPALITY KWAZULU-NATAL
PROJECT REFERENCE: 41297

otice is hereby given in terms of Regulation 54 of the National Environmental Management Act (NEMA, Act 107 of 1998), ublished in Government Notice No. R.982 (2014), of the intent to carry out a Basic Assessment Process for the above-entioned development. The following Listed Activities contained in GNR 983 of the EIA Regulations (2014), will be pplied for:

General Notice Number & Date	Activity No	Description of each listed activity as per project description
GNR 983 04 December 2014	09	The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or stormwater (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more. – *This Listed Activity is relevant as the proposed pipeline will be longer than 1 000 metres and will have an internal diameter of more than 0,36 metres*
GNR 983 04 December 2014	12	The development of (ii) bridges exceeding 100m² in size; (iii) infrastructure or structures with a physical footprint of 100m² or more where such development occurs (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves. – *This Listed Activity is relevant as portions of the proposed corridor route will require the construction of infrastructure for the crossing of watercourses which exceeds 100m2 within a watercourse, or be within 32 metres thereof, which doesn't occur within an existing road or road reserve, and which the majority of it is located in a rural area.*
GNR 983 04 December 2014	19	The infilling or depositing of any material of more than 5m³ into, or dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5m³ from (i) a watercourse. – *This Listed Activity is relevant as the proposed bulk water pipeline construction will involve the movement of more than 5m3 of soil from the banks of watercourses and wetlands during construction and/or the deposition of 5m3 of material or more into watercourses.*

ROPOSED ACTIVITY: The proposed development comprises the construction of a new 900-1200mm diameter (Ø) bulk ravity water pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works, Emnambithi / Ladysmith unicipality, KwaZulu-Natal. This project forms the first phase of a Department of Water & Sanitation Regional Bulk Water nfrastructure Upgrade for the uThukela District Municipality. The purpose of the overall project is to address current water upply constraints experienced within the Ladysmith / Ezakheni areas. The proposed route has been assessed based on corridor of disturbance, with a varying width of 70m – 350m to allow for unforeseen construction deviations should these e required during the construction phase of the project. The length of the corridor and hence pipeline, is approximately 5km.

ROPERTY LOCATION: Brakfontein Farm to Ladysmith Water Treatment Works, Emnambithi / Ladysmith Municipality. o register as an Interested and Affected Party (IAP) or provide comment on the project, please contact Mr John ichardson of Terratest (Pty) Ltd as per the details below:

Applicant: WMN Consultancy (Pty) Ltd on behalf of the uThukela District Municipality
Environmental Consultant: Terratest (Pty) Ltd
Contact Person: Mr John Richardson
Tel: (033) 343 6700 **Fax:** (033) 343 6701 **Email:** richardsonj@terratest.co.za
Postal Address: PO Box 794, Hilton, 3245

he Application has been submitted to the KwaZulu-Natal Department of Economic Development, Tourism and nvironmental Affairs (EDTEA). In order to ensure that you are identified as an IAP, please submit your name, email ddress, and other contact information and interest in the matter, as well as any comments or queries you may have egarding the proposed development, in writing, to the contact person given above.
Thank you for your participation.

ISAZISO NGESICELO SEGUNYA LEZEMVELO

UKWAKHIWA OKUHLONGOZWAYO KWAMAPAYIPI ADONSA AMANZI KANYE NEZAKHIWO KUSUKA EPULAZINI I-BRAKFONTEIN KUYA ENDAWENI EHLANZA AMANZI KUMASIPALA WASEMNAMBITHI KWAZULU-NATAL
UMSEBENZI: 41297

Isaziso sikhishwa ngoko-Mthethonqubo 54 kaZwelonke wokuphathwa kweZemvelo(NEMA,Act 107 of 1998), oshicilelwe kwisaziso jikelele sika Hulumeni u-GNR.982 (2014), mayelana nenhloso yokwenza ucwaningo ngomsebenzi obalulwe ngenxa. Isicelo saliemisebenzi elandelayo engahle ibandakanya imisebenzi esohlwini etholakala ku-GNR 983 woCwaningo lwezeMvelo (EIA) 2014 sizofakwa eMnyangweni WezeMvelo.

Usuku lokuhlicilelwa kwesaziso jikele nenombolo yaso	Inombolo yomsebenzi oshicilelwe	Incazelo yomsebenzi odinga ukugunyazwa ngokwezemvelo
GNR 983 04 December 2014	09	Ukuthuthukiswa kwengqalasizinda engaphezulu kwamamitha ayi 1000 ubude sokuthutha amanzi noma amanzi emvula (i) ububanzi ngaphakathi bube amakhilomitha angu-0.36 noma ngaphezulu noma (ii) sikwazi ukundulisa amalitha ayi 120 ngomzumwana noma ngaphezulu. - *Umsebenzi esohlwini ugondene njengoba ipayipi elihongozwayo izoba lide kune 1000 yamamitha futhi ububanzi ngaphakathi buzoba ngaphezulu kuka 0.36 amamitha.*
GNR 983 04 December 2014	12	Ukuthuthukiswa (iii) kwamabhuloho egcile kwi-100m² ngobukhulu; lapho ukuthuthukiswa kwenzeka ngaphakathi kwamanzi; noma eduze kwamamitha ayi 32 amanzi kusukela ongenqemeni kwamanzi; ngaphandle (ee) uma kwenzeka emigwaqweni ekhona. - *Umsebenzi ubandakanya ukwakha ingqalasizinda zokuwela umfula ezegile i-100m² ngaphakathi kwamanzi ezingaphezu kuka 100m² ngaphakathi noma eduze kuka 32m wamanzi endaweni yasemaknaya.*
GNR 983 04 December 2014	19	Ukumbiwa, ukususwa, ukuthuthwa, ukufakwa noma ukubekwa kwesihlabathi, amagobolondo, amatshe noma izimbokodo maduzane komohachazo wamanzi, okuzokweqa izinga lika-5m³. - *Umsebenzi ubandakanya ukususwa komhlabathi ongaphezuluku kuka 5m² kusukela osebeni lomfula nase machibini ngenkathi kwakhiwa futhi noma ukufakwa kwesihlabathi esiyi 5m³ noma ngaphezulu emanzini.*

UMSEBENZI OHLONGOZWAYO: Ukuthuthukiswa okuhlongozwaya kubandakanya ukwakhiwa kwamapayipi amash angama 900-1200mm ububanzi azodonsa amanzi kusuka epulazini lase Brakfontein kuya lapho amanzi elashwa khon kuMasipala waseMnambithi KwaZulu-natal. Lomsebenzi uyigxenye yesigaba sokuqala soMyango wezamanzi nokuthutha kwendle wesifunda zokuthuthukiswa kwengqalasizinda yamanzi yomasipala womkhandlu eMnambithi. Inhloso yalomsebenzi ukubhekana nezinqinba zokutshela amanzi eMnambithi nase-Zakheni . Umzila ohlongozwayo usuhlolw kususelwe ekuphazanyisweni komnumbha onobubanzi obuhlukahlukene obungama 70m-350m ukuvumel okungalindelekile ukwaphambuka kokwakhiwa uma loku kudingeka ngenkathi kwakhiwa. Ubude bomzila nepayi kulinganiselwa kuma 25km.

INDAWO: Brakfontein Farm kuya eMnambithi lapho kwenziwa imisebenzi yokwelashwa kwamanzi. Ukubhalisw njengonentshiseko nom othintekayo (IAP) noma ufisa ukuphawula ngomsebenzi, elcela uxhumane no Mr Joh Richardson of Terratest (Pty) Ltd kulemininingwane engenzansi.

Umcell: WMN Consultancy (Pty) Ltd on behalf of the uThukela District Municipality
Umeluleki wezeMvelo: Terratest (Pty) Ltd
Okuxhunyanwa naye: Mr John Richardson
Tel: (031) 343 6700 **Fax:** (031) 343 6701 **Email:** richardsonj@terratest.co.za
Postal Address: PO Box 794, Hilton, 3245.

Isicelo sesifakiwe eMnyangweni wezokuThuthukiswa koMnotho, ezokuVakasha kanye nezeMvelo esifundazwe sakwaZulu-Natali. Ukuze ube nesiqiniseko sokuthathwa njengothintekayo noma onentshiseko, uyacelwa uthumele igam lakho, imininingwane ongatholakala kuyo, kanye nokuthinteka kwakho noma ukuphawula okanye imibuzo ongab nayo ngalomsebenzi ohlongozwayo, ngokubhalela umeluleki okuhlunyanwa naye obhalwe ngenhla.
Siyabonga ngokuhlanganyela kwakho.

Figure 5: Copy of the poster placed on site, written in English and isiZulu along with the contact details of the EAP.

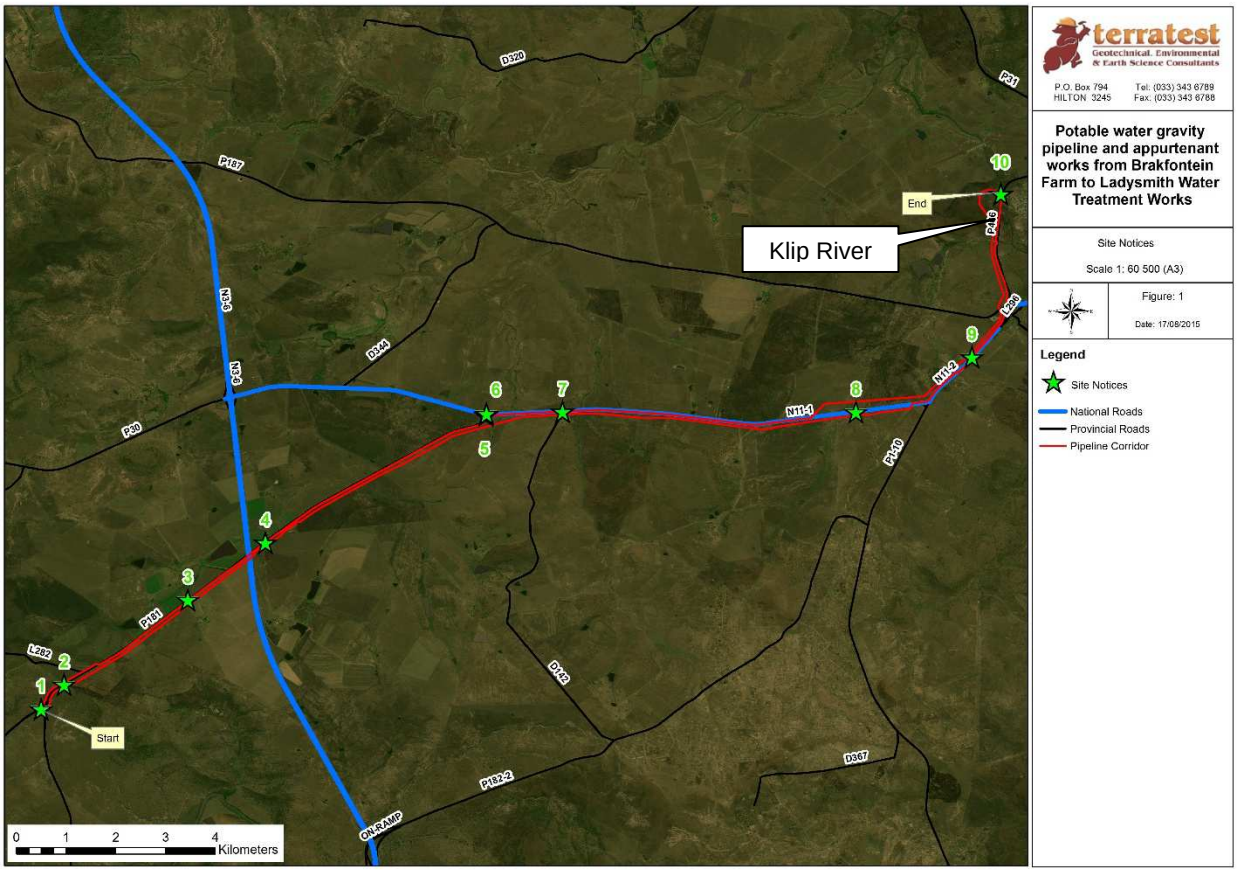


Figure 6: Location of Site Notices placed on site

SITE PHOTOGRAPHS: Plates 25– 35 PUBLIC PARTICIPATION

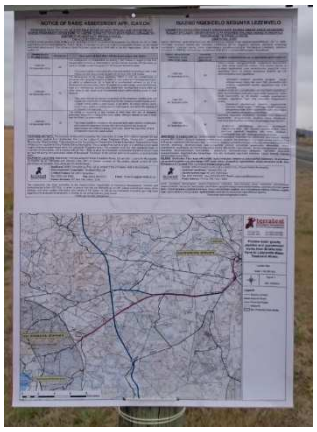


PLATE 25: Example of Site Notice on site.

PLATE 26: Site Notice 1.

PLATE 27: Site Notice 2.

PLATE 28: Site Notice 3.

PLATE 29: Site Notice 4.

PLATE 30: Site Notice 5.

PLATE 31: Site Notice 6.

PLATE 32: Site Notice 7.

PLATE 33: Site Notice 8.

PLATE 34: Site Notice 9.

PLATE 35: Site Notice 10.

9.4 WRITTEN NOTIFICATION TO AUTHORITIES AND NEIGHBOURS

9.4.1 Interested and Affected Parties (IAPs)

A register of IAPs was compiled as per Section 42 of the EIA Regulations, 2014. This included all relevant authorities, Government Departments, the Local Municipality, the District Municipality, relevant conservation bodies and non-governmental organisations (NGO's), as well as neighbouring landowners and the surrounding community. This register will be regularly updated to include those IAPs responding to the newspaper advertisements, site notice boards and Notification Letters. A copy of the IAP Register is included as Appendix 11 of this report.

9.4.2 Notification Letter

A Notification Letter was compiled and circulated to all identified IAPs by email and post (where necessary) on completion & circulation of the draft Basic Assessment Report. The purpose of the Notification Letter was to provide preliminary information regarding the project and its location. Furthermore, the Notification Letter invited comments from IAPs and requested those notified to provide details of other potential IAPs which they may be aware of. A copy of the Notification Letter is included as Appendix 12 of this report.

9.5 PUBLIC MEETING

Several pre-application meetings have been held with the Ladysmith Farmers Association as the majority of private land affected by the pipeline corridor is owned by their members. Copies of the relevant meeting minutes have been included in Appendix 9 of this report. Additional public meetings will be held as part of the formal public consultation process should the level on interest in the project warrant this. IAPs will be notified of the details of any such meetings, and the minutes will be included in the final Basic Assessment report which will be submitted to the EDTEA for a decision on Environmental Authorisation.

9.6 COMMENTS RECEIVED

As this is a new Application forming one part of the overall bulk supply scheme no formal comment on this specific Basic Assessment Report has been received by the EAP to date, nor has any IAP asked to be formally registered for this specific Application. However, the Engineers, WMN Consultancy, have met with various directly affected property owners to inform them of the development proposal, and as such these IAP's have been registered by the EAP where the information has been forthcoming. In this regard a record of these meetings and a summary of the outcomes are provided below for reference:

- **Various Private Landowners along the Route**
    - Several meetings have been held with the Ladysmith Farmers Association and certain directly affected members of their organisation since mid 2013.
    - The engineers have also engaged with various other private and public landowners along the route as part of their preliminary survey and design works.

Comments recorded from the abovementioned parties have, where necessary and relevant, been taken into consideration in the impact assessment process.

- **KZN Department of Transport (DoT)**
    - Meeting held with Mr Roy Ryan at the DoT offices, Pietermaritzburg, on 11 May 2015. Mr Ryan has no concerns in principle with the pipeline alignment, subject to the formal application process being followed.
- **SANRAL**
    - Meeting held with Mr Cas Landman at his offices, Pietermaritzburg, on 21 May 2015. Mr Landman had no concerns in principle with the pipeline alignment, subject to the formal application process being followed
    - Telephonic discussion on 3 June 2015 with Mr Dougal Judd (N3TC). Mr Judd indicted he would comment via the formal application process to be submitted to Mr Landman.
- **Eskom**
    - 11 & 22KV line and servitude crossings - Conditional approval obtained by the engineers is in place and is subject to crossing and work requirements as directed by Eskom (attached for reference).
    - 132KV line and servitude crossings - Conditional approval obtained by the engineers is in place and is subject to crossing and work requirements as directed by Eskom (attached for reference).
- **Transnet Pipelines (ex-Petronet)**
    - Conditional approval obtained by the engineers is in place and is subject to crossing and work requirements as directed by Transnet (attached for reference).
- **Telkom**
    - Engineers have had discussions with the local area manager on the 24th July 2015. Layout drawing is to be submitted by the engineers to the PMB office for clash/encroachment check.
- **Neotel**
    - Engineers have had Telephonic discussions with Neotel on the 24th July 2015. Layout drawing is to be submitted by the engineers to the Neotel office for clash/crossing check.

Where formal comment has been received it has been attached in Appendix 10. Please note that formal comment will be requested from all of the above Stakeholders during the 30 day circulation of the Draft BA Report as part of the public participation process. All comment received will be included in, and attached to, the Final BA Report which will be submitted to the EDTEA for a decision on Environmental Authorisation.

9.7 CIRCULATION OF DRAFT BASIC ASSESSMENT REPORT FOR COMMENT

Copies of the draft Basic Assessment Report have been circulated to the following Key Stakeholders and IAPs for review and comment from the 18th September 2015:

- Ezemvelo KZN Wildlife: Mr A. Blackmore;
- Department of Water and Sanitation: Ms N.Mdlalose;
- Department of Transport: Mr R. Ryan;
- Emnambithi / Ladysmith Municipality: Ms N. Khumalo;
- UThukela District Municipality: Ms P. Lite;
- Amafa Heritage: SAHRIS;
- DAEA: Macro Planning Directorate: Mr Z. Dlamini;
- Department of Agriculture, Forestry and Fisheries: Mr W Rozani;
- Department of Cooperative Governance and Traditional Affairs: Mr M. de Lange;
- SANRAL: Mr C. Landman;
- Transnet Servitude Management: Mr M. Hadebe; and
- Eskom: Ms N. Mtawali.

All registered IAPs were notified of the availability of the Draft BA Report and the deadline for comments, being on, or before, 20 October 2015.

Further, one copy of the report has been placed in the Ladysmith Library for public review on the 16 September 2015.

10 DESCRIPTION OF THE BASELINE ENVIRONMENT

10.1 TOPOGRAPHY

The overall gradient of the corridor alignment is gently undulating from Brakfontein Farm towards the Ladysmith Water Treatment Works. Figure 7 provides an illustration of the gradient along the proposed pipeline corridor.

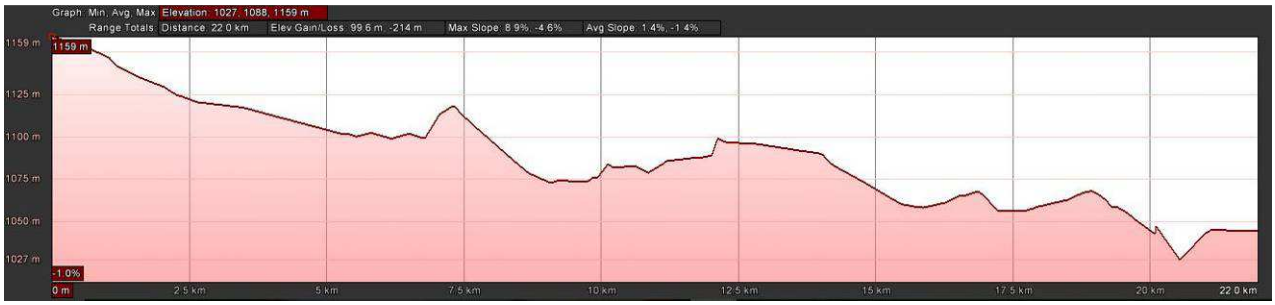


Figure 7: Gradient of the pipeline corridor from Brakfontein Farm to Ladysmith Water Treatment Works.

10.2 VEGETATION

Relevant descriptions of the baseline vegetation along the route have been extracted from the specialist Terrestrial Biodiversity Assessment which was undertaken by Eco-Pulse Environmental Consulting Services in November 2012 for the overall water supply scheme, of which this application comprises the portion of the route located between Brakfontein Farm and the Ladysmith Water Treatment Works. A full copy of the abovementioned specialist assessment is attached in Appendix 13 for reference purposes.

The general study area is located within the Sub-escarpment Grassland and Sub-escarpment Savanna Bioregions (Mucina & Rutherford, 2006) and is classified by Acocks (1953) as Southern Tall Grassland

(Veld Type 65) and Valley Bushveld (Veld Type 23). At a finer scale, the KZN Vegetation Layer (Ezemvelo KZN Wildlife, 2011) classifies the primary vegetation type as being KZN Highland Thornveld (Least threatened type), with the vegetation around Ladysmith and the Klip River crossing being Thukela Thornveld (Least threatened type).

The KZN Highland Thornveld vegetation unit falls within the Grassland Biome and occurs in both dry valleys and moist upland between altitudes of 920 and 1440 m. The vegetation is characterized by hilly, undulating topography and broad valleys supporting tall tussock grassland usually dominated by *Hyparrhenia hirta*, with occasional woodlands with scattered *Acacia* sp. such as *A. sieberiana*, *A. karroo*, and *A. nilotica.* Threats to this vegetation type include alien species such as *Opuntia, Eucalyptus, Populus, Acacia* and *Melia* species, as well as bush encroachment and general transformation for cultivation, urbanisation and dam construction (Mucina & Rutherford, 2006). The status of this vegetation group is *Least Threatened* (EKZNW, 2011).

Thukela Thornveld vegetation unit falls within the Savannah Biome and occurs in the study area around Ladysmith between altitudes of 900 and 1300 m. Topographically, the dominant landscape features are valley slopes to undulating hills. The vegetation comprises *Acacia* dominated bushveld of variable density, ranging from wooded grassland to dense thicket, with dense grassy undergrowth. The status of this vegetation group is *Least Threatened* (EKZNW, 2011).

Specialist reporting has highlighted that the majority of vegetation species occurring within the natural habitat types along the pipeline route are locally common grasses, trees and shrubs that are of *Least Concern* in terms of their conservation status. It has however been noted that it is likely that endangered/protected species of plants may be encountered, particularly within sensitive habitats and largely natural areas away from the existing road network. Although no detailed field survey of vegetation was undertaken as part of the biodiversity assessment, data on potential protected plant species that may occur within the range of natural habitat in the study area was consulted (Emnambithi / Ladysmith Local Municipality: Strategic Environmental Planning Tool – NEMAI Consulting, 2010). Threatened species that may potentially be present in the study area include mainly endemic geophytes or herbaceous plants. These species are highlighted in the table below which has been extracted from the biodiversity assessment for reference purposes.

TABLE 5: Potential threatened plant species on the route

Name	Status	Habitat Description
Aloe dominella	Near Threatened	In grassland or thornveld, in hilly or gently undulating areas, often in rocky outcrops but can also occur in open grasslands and along road reserves.
Aloe inconspicua	Endangered	Succulent that generally occurs in the ecotone between the grassland & valley bushveld, generally on gently sloping ground beside large hills and in hilly thornveld.
Barleria greenii	Critically Endangered	Low shrub endemic to Ladysmith and Colenso, occurring in savannah habitat in open rocky areas on moderately sloping northfacing aspects. It occurs at the interface of grassland and valley bushveld, mostly

		in, or along the borders of seasonal or perennial streams, drainage lines or boggy areas, 1200-1260m altitudinal range.
Barleria argillicola	Critically Endangered	SA endemic occurring between Escourt and Weenen in savannah habitat on eroded doleritic soils or among dolerite boulders, 900- 1200m altitudinal range. This species appears to grow on severely eroded soils; however, whether or not it prefers eroded soils is not certain.
Calpurnia woodii	Vulnerable	Grassland and grassland-woodland transitions on steep, dry, southeast-facing slopes with loose shale soils, 1500 m altitude.
Orbea woodii	Vulnerable	Tugela River Valley. Thicket and savanna, open and closed dry woodland, on gently sloping areas of shale with dolerite rocks, between stones and small tufts of grass in open places, 800-1200 m altitudinal range.

Overall the vegetation quality and overall biodiversity within the proposed pipeline corridor between Brakfontein Farm and the Ladysmith Water Treatment Works is however largely disturbed or transformed, and is in general considered to have a low ecological importance and sensitivity according to the findings of the specialist assessments. Disturbed or transformed areas on the corridor alignment are generally characterised by current agricultural lands, old agricultural lands that are now slowly recovering, road surfaces, bare soils and heavily eroded areas associated with land degradation.

10.3 GEOLOGY

The Desktop Geotechnical Investigation (Appendix 14) notes that according to the 1:250 000 Geological Map Series, 2828, Harrismith, the study area generally comprises sedimentary rocks of the upper Ecca and lower Beaufort groups of the Karoo Supergroup, post-Karoo hyperbyssal dolerite sills and dykes, quaternary Masotcheni Formation Sediments, as well as surficial colluvial and alluvial deposits.

Strategraphically the lowermost sedimentary rock unit is the Volksrust Formation of the Ecca Group of the Karoo Supergroup which is designated Pvo in Figure 2 of the geotechnical investigation (Appendix 14). This rock unit mainly comprises laminated, carbonaceous shale, with subordinate, thin interbeds of siltstone and fine poorly sorted sandstone.

The abovementioned Volksrust Formation is conformably overlain by the Adelaide Subgroup of the Karoo Supergroup which is designated Pa in Figure 2 of the geotechnical investigation (Appendix 14). It comprises mainly mudrock, with interlaced siltsone and sandstone beds and possibly occasional coal seams which are characteristically fossil rich.

Dolerite prevails mainly as extensive sills intruded concordantly to the sedimentary bedding as well as linear discordantly intruded dykes or relatively limited lateral extent. The dolerite generally forms positive relief features relative to the surrounding sedimentary rocks. Dolerite is a medium grained, crystalline rock composed entirely of primary mafic materials. As the project area is located in a region of moisture surplus

the predominant mode of weathering of the primary minerals has been by chemical decomposition, which according to the topographic position generally produces a highly weathered profile comprising of clayey soils, gravel and corestones.

The Masotcheni Formation designated by the yellow dotted black shading in Figure 2 of the geotechnical investigation (Appendix 14) comprises unconsolidated interfluvial deposits comprising clayey soil, pedocretes and gravel. This Formation is characteristically highly dispersive and is generally identified by gulley erosion.

Alluvium is designated by the yellow shading adjacent to the Klip River in Figure 2 of the geotechnical investigation (Appendix 14) and comprises a sequence of clay, silt and sand with boulders. Whilst not indicated on the geological map the geotechnical assessment highlights that localised alluvium is likely to occur immediately adjacent to the lower order rivers and drainage lines located within the project corridor.

10.4 HYDROLOGY

The study area is situated in the Thukela Water Management Area (WMA), Area 7. The major rivers in the municipal area include the Klip River and Sundays River and associated tributaries. Both the aforementioned watercourses drain into the Tugela River (Nemai Consulting, 2010).

The Klip River drains the western and southern portion of the municipality. It rises in the Drakensberg below Van Reenen and is joined by the Sandspruit River located northwest and upstream of Ladysmith. The confluence of the Klip and Tugela Rivers is approximately 20km southeast of Ladysmith. The Qedusizi Dam, located on the Klip River, attenuates flow as it passes through Ladysmith, aimed at preventing flood damage. The Ladysmith Flood Control Scheme is also a flood defence mechanism implemented by the municipality which involves the maintenance of levees and the channelling of the Klip River (Nemai Consulting, 2010).

Since its establishment and due to its location on the banks of the Klip River, Ladysmith has experienced and does experience severe flooding. During the 110 year period between 1887 and 1997, 29 major floods have occurred. The flood of 1996 was a major flood and several hundred families had to be evacuated. Minor flooding occurs almost every year (Nemai Consulting, 2010).

The proposed pipeline corridor crosses the Klip River below the flood control scheme, the Middlespruit, Roodepoorstspruit, and Flagstone Spruit, as well as seven other minor drainage channels / lines and four wetland systems. Coordinates of these crossings are provided in the Wetland and Riparian Assessment Report attached in Appendix 7. Additionally the Wetland and Riparian Assessment Report highlights the presence of seven scrape dams and two farm dams within the pipeline corridor.

10.5 CLIMATE

The area is characterised by a rainy summer season and experiences intermittent rain in winter. Much of the summer rain falls in thunderstorm events. The average annual precipitation is 746mm. The annual average high in terms of temperature is 26.1˚C, while the annual average low is 11.2˚C. Table 6 provides a breakdown of the annual average temperature and perception experienced throughout the months of the year (Climate Data, 2015). Frost does occur in the region with an average of 15 frost days per year (Mucina & Rutherford, 2006).

TABLE 6: Average climatic breakdown.

Month	Temperature (˚C)		Precipitation – mm
	Average high temperature	Average low temperature	Average
January	29	17	147
February	29	17	101
March	28	15	87

Month	Temperature (˚C)		Precipitation – mm
	Average high temperature	Average low temperature	Average
April	26	12	48
May	23	7	16
June	21	3	10
July	21	3	6
August	24	7	27
September	27	11	35
October	27	13	74
November	29	14	93
December	29	16	102

10.6 SURFACE WIND

The prevailing winds blow from the north and north-west. These can be strong at times and can contribute to wind-blown dust and increase the fire hazard probability.

10.7 CULTURAL, HISTORICAL AND ARCHAEOLOGICAL RESOURCES

Given the scale of the proposed development and rich history of Ladysmith and surrounds, a Heritage Impact Assessment (HIA) was undertaken. Although several sites were identified along and adjacent to the route no fatal flaws found. The HIA Report is discussed in detail in Section 11.1 and is attached as Appendix 8.

Amafa KwaZulu-Natal (Amafa), the authority responsible for KwaZulu-Natal's heritage, has been contacted regarding the proposed development and the associated HIA Report submitted to them for comment.

10.8 FAUNA

Any development has the potential to negatively impact upon the local fauna, given the intrusion of an unnatural object in a natural environment, or artificial environment. The Ezemvelo KZN Wildlife Minset database has been consulted and the following species of conservation significance have been highlighted as potentially being present in the general area:

Table 7: Fauna of conservation Significance potentially on the route

Name	Type	Status
Whitea alticeps	*Grasshopper species*	Not Listed
Balearica regulorum	*Grey crowned crane*	Endangered
Bugeranus carunculatus	*Wattled crane*	Critically endangered
Anthropoides paradiseus	*Blue crane*	Endangered
Doratogonus falcatus	*Millipede*	Least Concern
Cochlitoma simplex	*Mollusc/Snail*	Not Listed
Gulella orientalis	*Mollusc/Snail*	Not Listed

The portion of the pipeline corridor where the majority of these species potentially occur is at the start of the pipeline, in the vicinity of Brakfontein Farm, for approximately 4-5km along the pipeline corridor. The Terrestrial Biodiversity Assessment (Appendix 13) which was undertaken by Eco-Pulse Environmental Consulting for the overall water supply scheme focused primarily on a desktop evaluation of fauna against their known ecological requirements which was compared against the habitat types identified along the corridor. In this regard the crane species identified in the above table were highlighted as probably being a historical recording and are unlikely to reside permanently in this area given the specific habitat and

sensitive breeding requirements. The area has none the less been flagged in the sensitivity analysis for the overall scheme.

Given the nature of the proposed pipeline project no significant impacts on the other terrestrial fauna identified in the above table is anticipated according to the biodiversity specialist.

10.9 CURRENT LAND USES

The pipeline corridor consists of a variety of land types and uses. Initially from Brakfontein farm the corridor crosses an Eskom Power Line Servitude and is then located in agricultural lands and natural grazing areas, it crosses the N3 Highway and the Transnet Multi Purpose Pipeline approximately 5km from the start.

The corridor then continues for approximately 14km through agricultural lands and natural grazing areas located adjacent to the R600 and N11 Road Reserves where it enters the peri-urban outskirts of Ladysmith Town. Landuses in this area include the Road Traffic Inspectorate (RTI) testing grounds, which the pipeline corridor bisects, and the Ladysmith Airport and Tourism Accommodation / Lodge which is located on the opposite side of road of the proposed corridor.

The corridor alignment then follows the N11 Ladysmith / Newcastle / Bluebank off ramp between the road reserve and the Total Ladysmith Truck Stop and continues in natural agricultural grazing lands / grasslands adjacent to the R103 road reserve for approximately 2.5 km until it reaches the Klip River and Ladysmith Water Treatment Works.

11 SPECIALIST STUDIES

11.1 HERITAGE IMPACT ASSESSMENT

Umlando: Archaeological Surveys and Heritage Survey (Umlando) was appointed to undertake a Heritage Impact Assessment (HIA) for the overall bulk water supply scheme. The field survey and report were concluded in May 2015 and the section below provides a summary of the findings specific to this particular section of the proposed bulk water pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works. In this regard please note that in reviewing the findings of the HIA Report that the site referred to as the “Boer Commando Location at Brakfontein”, where a regional water treatment works was originally proposed, is currently under review by the project team and will form part of the second Basic Assessment Application for the overall bulk supply scheme. Furthermore since the heritage survey was conducted a corridor alignment for the proposed pipeline has been adopted, this has been adopted by the project team to *inter alia* cater for heritage and ecological sensitivities which have been identified along the pipeline route.

The resultant HIA Report is attached as Appendix 8. The relevant details of the Specialist are noted in Table 8.

TABLE 8: Details of Heritage Specialist

Name of specialist	Education qualifications	Field of expertise	Title of specialist report/ s as attached in Appendix D
Mr Gavin Anderson	M. Phil in Archaeology/Social Psychology	Heritage Impact Assessment	Ladysmith Bulkwater Pipeline: Spionkop To Ladysmith

As noted in the HIA Report (Appendix 8), Ladysmith and its surrounds are renowned for its 2ND Anglo-Boer War (2ABW) battlefields and the Siege of Ladysmith. Additionally dolerite outcrops in the area are also favoured areas for Late Iron Age, Historical Period settlements. The desktop assessment of the pipeline route from Brakfontein Farm to the Ladysmith Water Treatment works revealed several sites of heritage

significance in close proximity to the alignment. However the proposed pipeline will only have a possibility of impacting on two sites according to the findings of the heritage impact assessment, these are as follows:

1. **Site 1NOD04** - This site is located adjacent to the R103 and N11 intersection, south of the Flagstaff River, and is a general scatter of Middle Stone Age (MSA) stone tools that occur over the entire hill. They are more concentrated in this area as it is a "catchment" area for the tools. The tools are thus in a secondary context and have no value. Site 1NOD04 is not an archaeological site *per se* and thus a permit will not be required.
2. **Site 1NOD06 (28°34'14.11"S; 29°44'55.30"E)** – This site comprises a single line of stone walling within the corridor and is approximately 15m – 20m from the pipeline. It will thus not be affected; however it should be demarcated before construction begins.

In terms of the Palaeontology of the pipeline corridor, it is underlain by Permian aged shale of the Volksrust Formation, Ecca Group, Permian aged sandstone and mudstone of the Normandien Formation (Adelaide Subgroup) of the Beaufort Group, Jurassic aged Dolerite of the Karoo Supergroup and Quaternary aged sand and silt of the Masotcheni Formation and most of the route occurs in area of medium to high palaeontologically sensitivity. Only areas where dolerite occurs is of low sensitivity and significant areas will be exposed in areas where the trench depth will exceed 1.5m. The following recommendations have been made by the Heritage Impact Assessment Practitioners:

1. The EAP and ECO of the project must be informed of the fact that all the geological formations, accept for dolerite, will contain fossils if exposed at a depth of more than 1,5m.
2. All sections of the development where bedrock is exposed due to erosion or where geotechnical surveys indicate that trenching will exceed 1,5m in areas underlain by Very High, High and Moderate Palaeontologically Sensitive rocks must be inspected by a qualified palaeontologist as part of a Phase 1 Palaeontological Impact Assessment. The professional Palaeontologist must be appointed to record and collect the fossils according to SAHRA and AMAFA specifications as part of a Phase 1 Palaeontological Impact Assessment, preferably before construction in areas where the rocks area exposed due to erosion and also during construction when trenching exceeds 1,5m in depth.
3. These actions must form part of the EMPr of the project.

11.2 WETLAND & RIPARIAN ASSSESSMENT

Terratest (Pty) Ltd was appointed to undertake a detailed survey of the wetlands, rivers and drainage lines located along the proposed pipeline corridor alignment. The resultant Wetland and Riparian Assessment Report is attached as Appendix 7. The relevant details of the Specialist who undertook the work is noted in Table 9.

TABLE 9: Details of Wetland Specialist

Name of specialist	Education qualifications	Field of expertise	Title of specialist report/ s as attached in Appendix D
Mr. Jake Alletson	BSc Hons (Zoology)	Aquatic and terrestrial ecology, environmental impact assessment, landscape scale conservation science and planning	Findings of a Wetlands Search and Delineation Along The Route of a Proposed New Bulk Raw Water Supply Pipeline from Brakfontein Farm to Ladysmith Water Treatment Works.

A wetland identification, delineation and impact assessment study of the proposed pipeline was undertaken and a summary of the findings and mitigation recommendations of the specialist assessment are provided below.

The proposed pipeline corridor has the potential to impact on several, wetlands, dams, rivers and channels which fall within its extent these are as follows (extract from the specialist Assessment (Appendix 9):

Wetlands - The wetlands in the region around the study area are shown Figure 8. From the figure it is clear that there are no large systems contained within the 500 m buffer which surrounds the designated pipeline area. Three wetland crossings are encountered along the route and are described below.

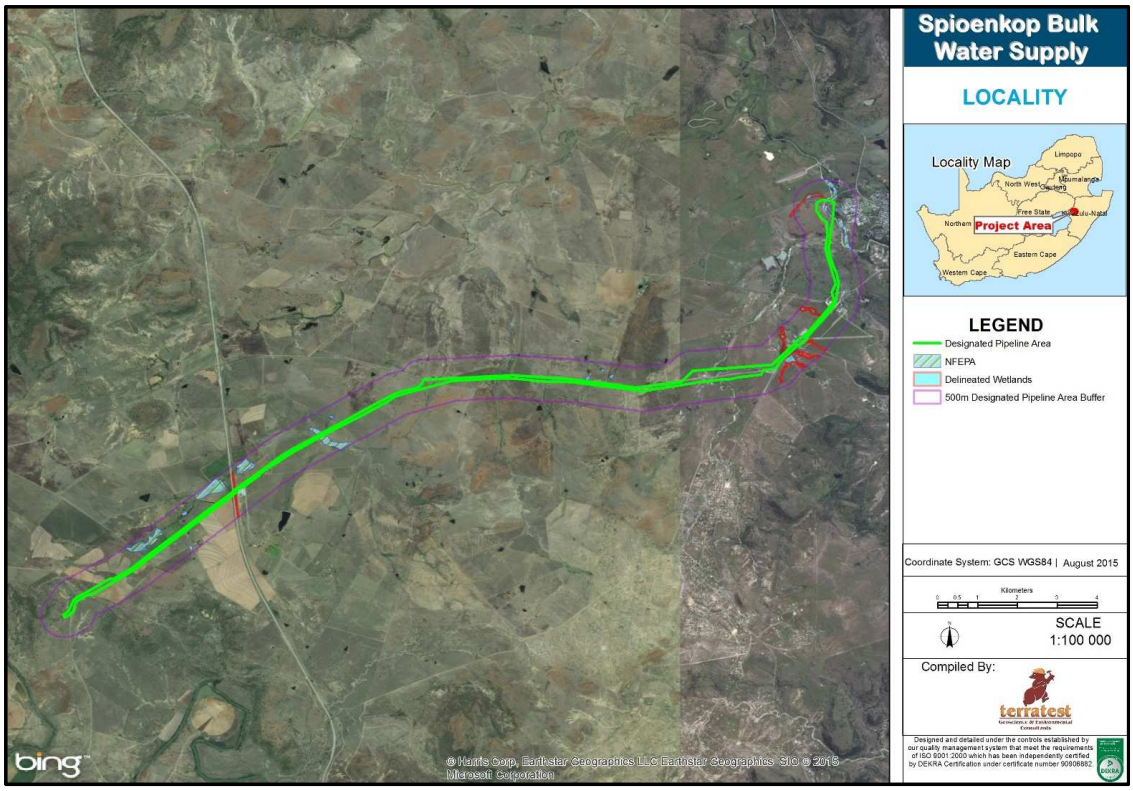


Figure 8: Wetlands within 500 m of the designated pipeline corridor (Source: Wetland and Riparian Assessment Report Appendix 9)

No wetland crossings, or wetlands within 32 metres, occur between the start of the pipeline route and the N11 crossing. To the east of the N11 in the vicinity of the Transnet Multipurpose Pipeline Pump station, two wetland systems occur, these are deemed to be a transformed seep wetland as a result of the construction of the N3 and Multipurpose Pipeline, and an artificial wetland which has been created through channelizing of water from the Transnet pump station (Figure 9).

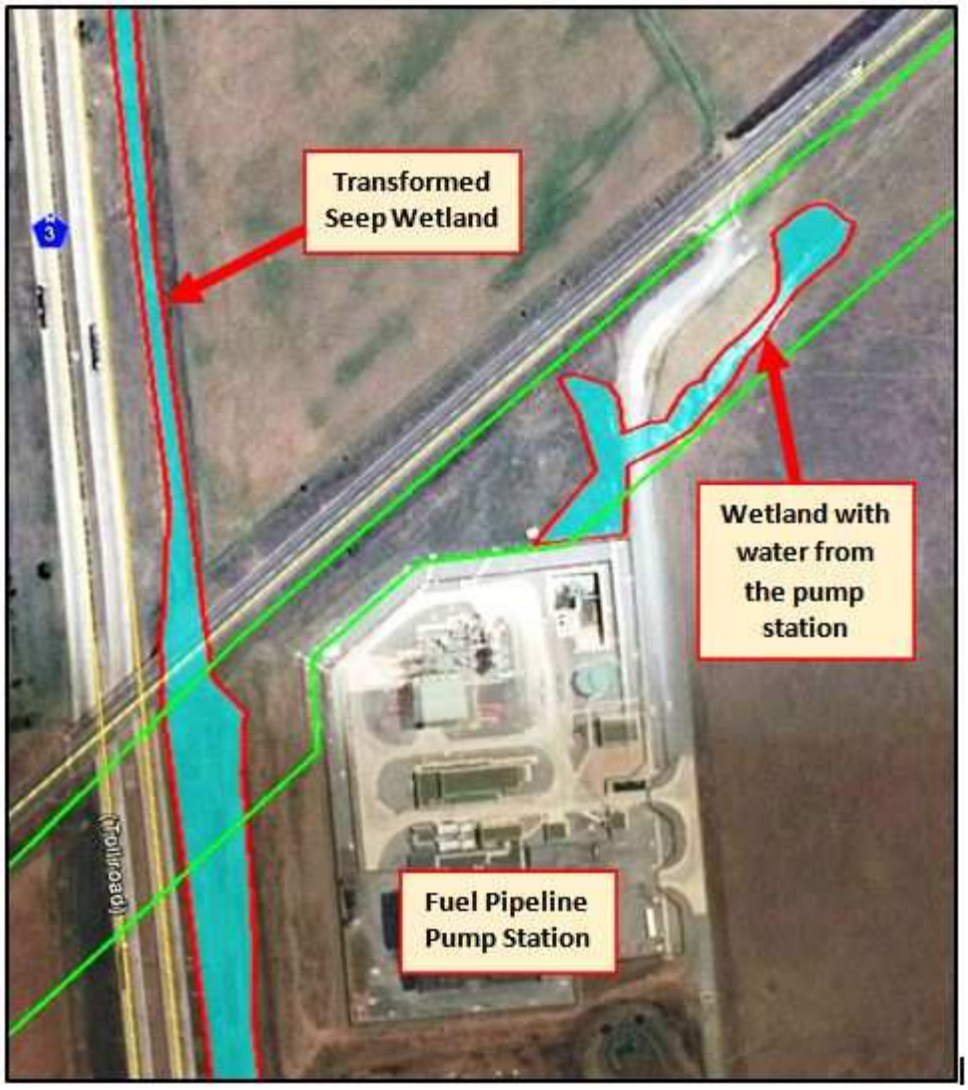


Figure 9: Wetlands close to the N3 highway and the Transnet Pump Station.

Impacts on both wetlands are considered to be acceptable given the state of transformation and condition of the systems provided that certain mitigation measures are implemented.

The next wetland system occurs at the N11 – R103 road junction in the peri-urban area of Ladysmith (28° 35' 7.9" S; 29° 44' 14.9" E) and is a tributary of the Flagstone Spruit (Figure 10). According to the specialist upstream (east) of the road it consists of an old dam which has now been broken and a number of radiating arms most of which are severely degraded as a result of erosion, and drying out. This portion of the system is in a Present Ecological State (PES) Class E (Poor quality & highly modified). Downstream of the road, where the crossing is proposed, this wetland has been almost entirely destroyed. It is severely invaded by *Eucalyptus* trees Syringa (*Melia azerdarach*), and Silver Poplar (*Populus x Canescens*). The system is eroded and consists primarily of a system of gullies which is up to 15 m wide in places and which appears to be a stream rather than a wetland. This system is in PES Class E at this point, however further downstream there is some recovery and the PES is raised to Class C or Class D. The lower ranking is the result of a small, and largely defunct, dam.

Figure 10: Wetland at the N11-R103 intersection.

The next wetland crossing is similar to the above system in that it consists of two very distinct parts. Upstream of the road it consists of a drainage channel leading water out of the airport area. However, downstream of the road, although degraded it retains considerable functionality. The specialist has highlighted that it is evident that the system has been severely impacted upon as a result of the drains in the airport area, probably as a result of the loss of upstream flow attenuation, and the concentration of the flows into a single culvert under the N11 which has resulted in a channel developing at the crossing point. The specialist has highlighted that the latter is an important point as it raises the possibility of scour being enhanced as a consequence of the pipeline construction process. In this regard special erosion control and protection will be required at this crossing.

Impacts on wetlands are considered to be acceptable given the state of transformation and condition of the systems provided that certain mitigation measures are implemented.

Dams

As noted by the wetland specialist dams are a fairly common feature type along the length of the roads in the study area. For assessment purposes the dams were divided into “scrape dams” unlikely to be of any significant hydrological importance, and more formalised agricultural dams linked to wetland systems which are of more conservation concern. Seven Scrape dams and two more formalised dams were noted in the vicinity of the pipeline corridor. The Table below lists the dams found either within the pipeline area or which are downstream of the area and so could be affected by the construction processes.

In addition to the scrape dams there are two dams which are within wetland systems and so are of high conservation concern.

TABLE 10: Localities and characteristics of the dams located within the pipeline area.

SITE	LATITUDE	LONGITUDE	TYPE	PES	EIS	FLAG
SD1	28°37'50.20"S	29°35'36.70"E	Scrape Dam	D	Low	Green
SD2	28°35'50.20"S	29°38'34.90"E	Scrape Dam	B	Moderate	Green
SD3	28°35'26.30"S	29°43'5.60"E	Scrape Dam	D	Low	Green
SD4	28°35'25.70"S	29°40'8.70"E	Scrape Dam	E	Low	Green
SD5	28°35'25.84"S	29°40'59.78"E	Scrape Dam	D	Low	Green
SD6	28°35'24.10"S	29°43'28.50"E	Scrape Dam	D	Low	Green
SD7	28°35'20.50"S	29°43'49.70"E	Scrape Dam	E	Low	Green
D1	28°38'1.96"S	29°35'21.98"E	Dam	C	High	Red
D2	28°34'31.75"S	29°44'35.92"E	Dam	C	High	Red

Impacts on the abovementioned dams are considered to be acceptable provided that certain mitigation measures are implemented.

Channels

The wetland specialist in undertaking his assessment made distinction between “Channels” and “Rivers” on the basis of their flow regimes with channels having non-perennial flow and, as a consequence, probable lower biodiversity value. Table 11 lists the channels which pass through the designated pipeline corridor, most are small but some consist of major erosion systems with braiding and multiple tributaries.

TABLE 11: Localities and characteristics of the channels located within the pipeline area.

SITE	LATITUDE	LONGITUDE	PIPELINE SECTION	PES	EIS	FLAG
CH1	28°38'39.20"S	29°34'25.80"E	1	C	Moderate	Green
CH2	28°38'1.37"S	29°35'20.73"E	1	D	Moderate	Orange
CH3	28°37'27.20"S	29°36'5.40"E	1	D	Low	Green
CH4	28°36'9.40"S	29°37'59.40"E	2	D	Low	Orange
CH5	28°35'24.99"S	29°40'10.05"E	3	E	Low	Green
CH6	28°35'29.02"S	29°41'33.51"E	3	D	Moderate	Orange
CH7	28°35'34.80"S	29°42'12.80"E	3	E	Low	Green

Of the above detailed channels it is the specialists opinion that the standard crossing types of the first six channels will present little difficultly, however channel seven (CH7) comprises a large donga system which runs parallel to the road and will require more care to be taken when working in these areas. The wetland specialist has recommended consideration of a pipe bridge at this location should rehabilitation of the gully system not be feasible.

In general impacts on the abovementioned channels are considered to be acceptable provided that certain mitigation measures are implemented.

Rivers

As indicated above the wetland specialist in undertaking his assessment made distinction between "Channels" and "Rivers" based on their flow regimes with rivers generally having a perennial flow. Along the pipeline corridor a total of six river crossings were noted, however two of the rivers, the Middelspruit and the Flagstone Spruit, were crossed twice and so only four systems were investigated by the specialist. A summary of each crossing is provided below for reference.

1. Middelspruit

The pipeline crossing areas are as follows:

- Upstream: 28°36'13.12"S; 29°37'52.77"E
- Downstream: 28°35'26.70"S; 29°39'33.20"E

At the upstream site some water was present but, at the time of the study, very little visible flow could however be detected. The channel is approximately 8m to 15m wide and is incised to a depth of approximately 1,5 m below the surrounding area. The banks were well vegetated and active erosion was restricted to a few sites at the bridge crossing. Above the water level the specialist notes that there is virtually no true riparian vegetation. Some stands of Cottonwool Grass (*Imperata cylindrica*) are present in places but the greater part of the banks are covered by veld grasses such as Thatch Grass (*Hyparrhenia hirta*) and no woody vegetation was observed.

At the downstream site it was noted that the Middelspruit is substantially larger than at the upstream site. The channel width is up to 20m wide near the bridge and is eroded to a depth of approximately 2 m. Sections of ongoing active erosion were common and so the channel size is probably increasing. The vegetation within the channel is dominated by grasses such as Broomgrass (*Miscanthus capensis*) and Cottonwool Grass (*Imperata cylindrica*) and a variety of sedges were also present. The banks, where slopes permitted, were covered by typical veld grasses and woody vegetation is absent upstream of the existing bridge. To the east of the crossing site an area of active erosion was noted. While it is not close to the river, it does serve as an indication that the soils in the area are dispersive and hence that care will be needed during the pipeline construction process at this area.

2. Roodepoortspruit

The pipeline crossing is at:

- 28°35'24.20"S, 29°40'19.20"E

The Roodepoortspruit is a small river that does not appear to have perennial flow. Its primary headwaters lie in the Klippoort – Roosboom residential area and the catchment was noted to be severely eroded. The specialist also noted that there will also probably be water quality issues associated with nutrient enrichment of this river. A point-source origin of the nutrients was not apparent so it was suggested that they are probably derived from the wastes of livestock which come to the stream to drink.

At the pipeline corridor crossing point the channel is approximately 30 m wide, including a secondary flood channel on the east side, and was noted to be heavily trampled by cattle which come to drink and graze there. It is incised some 1,2 m and the banks are eroding in many places. A fence crosses the river and debris trapped on it indicated that severe flooding can occur. Other than for a few clumps of Broomgrass (*Miscanthus capensis*) and some small sedges, the channel is largely bare of vegetation. Large trees such as Paperbark Thorn (*Acacia sieberiana*) and Pale-bark Sweet Thorn (*Acacia natalita*) were noted to be common in the area but are not regarded as being riparian species since they occur widely across the landscape.

Downstream of the bridge the river was dominated by long pools separated by short rocky sections. The specialist noted that the banks appeared to be in good condition with a vegetation cover dominated by grasses but with clumps of rushes (*Typha capensis)* and Knotweed (Persicaria sp.) being present.

3. Flagstone Spruit

The pipeline crossing areas are as follows:

- Upstream: 28°35'24.70"S, 29°43'17.60"E
- Downstream: 28°33'35.28"S, 29°44'48.68"E

This is a perennial river which flows out of the Klippoort – Roosboom residential area and is crossed twice by the proposed pipeline corridor.

The upstream crossing point is located on the N11 highway in an area where the gradient of the river is very low. According to the specialist the channel is sinuous and, while having now eroded to a width of 50m to 80 m in places, is not eroding vertically very rapidly as the underlying shale bedrock is close to the channel bed under a layer of loose sand and gravel, or is exposed. Although this shale is not particularly hard, it is far less erodible than the overlying dispersive soils and so flood waters remove material laterally rather than vertically. Despite this the channel banks are near vertical in places and as much as five to six metres high in places. The channel contains very little vegetation other than for some low grasses and sedges. The general absence of plants is attributed to the general unsuitability of the substrate in terms of both its composition and its mobility. Since the stream has flash flooding after short storm events or sustained high flows during prolonged rains, there is insufficient time for long-lived plants to be able to set their roots to any depth before the substrate is either scoured or moved. The vegetation on the top of the banks is simply of the local type (KwaZulu-Natal Highland Thornveld) and has no association with the river below it. The specialist notes that there is no obvious features which make crossing the river upstream or downstream of the road bridge a more preferable option and placement should be based on geotechnical and engineering criteria. The specialist does note that whichever crossing point is utilised at this location that the banks must be left in a stable condition at the end of the construction process given the nature of the surrounding soils and limited vegetation cover.

The second downstream crossing of the Flagstone Spruit is on Road R103. According to the specialist the river channel morphology is very different to that at the upstream crossing site in that it has certain characteristics of a floodplain, although lateral wetland development is very weak. Typically it comprises a bare bedrock channel of 20m to 30m in width with low earth banks which are well vegetated and are up to a metre in height. On the northern side this bank forms a platform; the crest of this bank probably represents the channel width for all but the largest floods. In places along the edges of both banks are strips of seepage which are of environmental sensitivity in relation to possible impacts. Typically these are marked by stands of Cottonwool Grass (*Imperata cylindrica*) but in a few places are sparse stands of Knotweed (*Persicaria* sp.) Bullrushes (*Typha capensis*), and Broomgrass (*Miscanthus capensis*). However, on the north bank is a wider area which is linked to water flowing down from the nearby hillside. This seep area could be considered to be a wetland but, since it is so closely associated with the river crossing the specialist included it as part of the river assessment (Figure 11).

Figure 11: Seep area north of the Flagstone River Downstream crossing delineated in yellow.

At the time of the specialist assessment the full extent of the seep area could not be determined as the grass had been burned in places but the feature is probably a weakly developed hillslope or toeslope seep.

On the southern bank of the crossing, there is no clear feature to demarcate a channel. However, it would appear that high floods do flow across the area as debris was found piled up against the base of a tree some 50 m from the rocky channel. The vegetation in the area showed very few indications of wetness so it was assumed that the area is only inundated by the floods.

4. Klip River

Of all proposed crossings the Klip River is the largest and as such presents greater challenges. As such two crossing points and methods have been proposed by the engineers although an approximately 520m section of the river was surveyed at this point. The preferred crossing method being a pipe bridge adjacent to the R103, and the second being an open cut excavation in hard rock approximately 200 meters upstream of the R103 bridge. The engineers preferred crossing point is the Pipe Bridge.

The pipeline crossing areas are as follows:

- Upstream: 28°33'8.86"S, 29°44'45.03"E (Open Cut E xcavation)
- Downstream: 28°33'14.83"S, 29°44'52.24"E (Pipe Br idge - Preferred)

Within the designated survey area, the river channel includes bedrock pools which are separated by stony riffles and runs. Water depth in the pools was not measured but is probably greater than 2m in places. The channel width is approximately 25m to 40m with the banks being stable and vegetated in most places. The specialist has identified the high bank on the south side of the river to be of importance. In places it forms a low cliff while elsewhere it is simply a steep slope. In the rocky area the vegetation there is dominated by woody species while grasses dominate the slopes. The reason for the difference is probably that the rocky areas are not subject to fires and so trees and woody bushes can survive there.

The riparian zone is reasonably well developed, especially along the south bank close to the bridge where there is a lateral bench which is vegetated with hygrophilous grasses, Reeds (*Phragmites mauritianus*) and some scattered small clumps of sedges. This area has been identified by the specialist as having moderate to high conservation value and should not be impacted upon if possible (Figure 12).

Figure 12: Klip River pipeline crossing in relation to sensitive environmental features.

Although modelled data indicated that the riparian zone at this point is “moderately Modified” the specialist noted that all aspects of the biosphere around the river had been changed by human-related activities. Factors which have been affected include water flows, water quality, veld burning regimes, grazing by livestock, and invasion by alien plant species.

The specialist found that terrestrial vegetation in the designated area on the north bank of the river is severely degraded. The dominant species were Thatch Grass (*Hyparrhenia hirta*) with scattered indigenous trees such as Paperbark Thorn (*Acacia sieberiana*), Spike-thorn (*Gymnosporia* cf. *buxifolia*), Buffalo-thorn (*Zizyphus mucronata*), Bluebushes (*Diospyros lycioides*), and alien species dominated by Gum Trees (*Eucalyptus* sp.). He also noted that there has been considerable dumping of waste materials, including concrete rubble, at several places and this exacerbated the low status of the vegetation.

In contrast, he found that the terrestrial vegetation on the south bank was in generally fair to good condition. The grass cover was robust and, along a steep slope or low cliff which fronts the river was a vibrant growth of woody species. Indigenous species noted included those found on the north bank, *inter alia*, Cabbage Tree (*Cussonia spicata*), Climbing Figs (*Ficus* sp.), Aloes (*Aloe* sp.), Sickle-bush (*Dichrostacys cinerea*), Sweet Thorn (*Acacia karroo*), and Smooth-bark Sweet Thorn (*Acacia natalita*). A conspicuous alien species noted was Prickly Pear (*Opuntia* sp.).

Findings of the specialist concluded that from an aquatic biodiversity perspective the pipe bridge crossing would be the preferred crossing point however either would be suitable provided careful rehabilitation of the terrestrial vegetation is undertaken.

11.2.1 Impact on Wetlands

The Wetland and Riparian Assessment Report (Appendix 7) notes the key issues associated with construction, design and operation of the pipeline through a wetland. These include:

- Trampling and compaction of the soil and loss of vegetation in the area around the pipeline trench as a result of vehicles and machines operating there.
- Spillage of oils and fuel in the area around the pipeline trench as a result of vehicles and machines operating there.
- Establishment of preferential routes for water drainage through the soil along the pipeline trench.
- Disturbance of the soil, including disruption of soil profiles in the trench.
- If a scour valve is located close to the wetland then flows from it could lead to soil erosion in its vicinity.
- Maintenance work could set off impacts similar to those of the construction phase.
- Cattle might selectively graze in the area and so set off a process of surface erosion.

In order to mitigate these impacts, the following recommendations are made:

- Prior to the start of construction, the project Environmental Control Officer (ECO) must set out markers indicating the area within which the wetland-related precautionary measures must be adhered to.
- The total width of the working servitude in wetland areas may not exceed 10 m – 12 m.
- The construction of the pipeline crossing should be done during the dry season when ground water will be at a minimum.
- Soil excavated from the trench must be set aside from the wetland. Great care must be taken to keep the topsoil separated from the subsoil.
- No materials or soils, including pipe bedding material, may be stockpiled in the wetland.
- Once the pipe is set in place impervious plugs of compacted clay-rich material must be set in place on each side of the wetland. The purpose of these plugs is to prevent water flowing out of the wetland and along the pipeline trench.
- The soil from the trench must be returned in the correct sequence with the subsoil being located underneath the topsoil.
- Once the soil has been returned, the whole area of the trench is to be uniformly and lightly ripped to a depth of approximately 30 cm and is to be levelled to match the original ground profile.
- Once the soil has been prepared, the area is to be revegetated. This is to be done by hand planting plugs of wetland species taken from elsewhere in the system. The plugs are not to be greater than 30 cm x 30 cm and must be collected individually. NOTE: No fertiliser is to be applied in the wetland area.
- If cattle are likely to graze in the area then the pipeline trench should be fenced off.
- The site must be watered until such time as natural water flows will sustain the plants.

11.2.2 Impact on Dams

The Wetland and Riparian Assessment Report (Appendix 7) notes the key issues associated with construction, design and operation of the pipeline through and on adjacent dams. These include:

- Loss of water storage capacity. Storage capacity may be lost though either reshaping of dams so as to make provision for the pipeline route, or through diversion of water away from the catchment of a dam. The latter is of particular reference in regard to the scrape dams which rely on unchannelled surface flows for their water.

- Loss of water from dams. If the pipeline passes through a dam basin it is possible that it may create a seepage line from the basin and so allow water to leak away.

In order to mitigate these impacts, the following recommendations are made:

- The pipeline route should not pass within 10 m of a dam if at all possible.
- As a matter of preference, the pipeline should pass a dam on the downslope side. If it must pass on the upslope side then especial care must be taken to ensure that the construction trench is rehabilitated and revegetated as soon as is possible and care must be taken that any erosion control structures such as drains or berms do not lead water away from the dam.
- The pipeline should not ever pass through a dam. If this is unavoidable, then especial care must be taken to seal the pipeline trench along its length within the dam basin so as to avoid establishing a situation in which water leaks away along the trench. The owner of the dam must give written consent and must be adequately compensated if leakage occurs.

11.2.3 Impact on Channels

The Wetland and Riparian Assessment Report (Appendix 7) notes the key issues associated with channel crossings. These include:

- Release of sediment into the channel. Most channels have soft substrates consisting of sediment or of soil derived from the banks. Thus the release of further sediment would seem to have relatively potential for new impacts. However, it must be considered that the material will probably be transported to a system where it will have a direct impact on water quality and the like.
- Release of uncured cement into the channel. This impact is unlikely to occur unless an unanticipated high flow event occurs at a time while cement is curing. The likelihood of such events is considered to be small. Erosion of the banks which, if not contained can spread from the site in both upstream and downstream directions.
- Degradation of the water quality will also have further impacts on any water users whether the water is used for domestic purposes or for livestock drinking. All of the above can lead to loss of biodiversity and hence a decrease in the ecological condition of the overall aquatic system.

In order to mitigate these impacts, the following recommendations are made:

- The construction of the pipeline crossings should be done during the dry season when flows are likely to be at a minimum.
- The working servitude within the channels and for a distance of 20m on either side of them must be no more than 7 m on either side of the centreline of the pipe.
- All soil and sediment excavated from the channels and their immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel edge.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. It is suggested that extensive use be made of creeping grasses such as Kweek (*Cynodon dactylon*). If necessary, the seeds and then the young plants must be watered until such time as they are self-sufficient.
- At sites where there is a risk of the pipeline trench being trampled by cattle, it must be protected by a fence until such time as it is considered to be fully rehabilitated.

11.2.4 Impact on Rivers

The Wetland and Riparian Assessment Report (Appendix 7) notes the general issues associated with river crossings. These include:

- Release of sediment into the riverine environment where it may result in infilling of pools, choking of stony substrates, increase of turbidity, reduction of water quality, and blooms of alien weed species such as the Water Hyacinth (*Eichornia crassipes*) which is known to be present in the system.
- Release of uncured cement into the water column where it is toxic to aquatic life.
- Erosion of the river banks which, if not contained can spread from the site in both upstream and downstream directions.
- All of the above lead to loss of biodiversity and hence a decrease in the ecological condition of the system.
- Degradation of the water quality will have further impacts on any water users whether the water is used for domestic purposes or for livestock drinking.

In order to mitigate these impacts, the following general recommendations are made:

- Rivers should be crossed at points where the channel is as narrow as possible. This recommendation is based on reduction of both the extent of time spent working in the channel, and the extent of the working footprint in the channel.
- Rivers should be crossed at points where the banks are stable and where rehabilitation of the banks after construction will be most likely to be simple and successful.
- To the greatest possible extent the pipeline should approach rivers at right angles since this obviates the banks being cut at sharp angles which will leave spurs which are susceptible to erosion.

Site specific issues and mitigation associated with the various river crossings are presented below:

1. Middelspruit Upstream Crossing

The channel in the area is relatively open and lateral wetlands are either totally absent or are seasonal in character. During the construction phase the primary potential impacts will be as follows:

- Release of soil/sediment into the channel downstream of the site. The sediment will lead to a short term loss of water quality, and possible infilling of the channel.
- Release of uncured cement into the channel downstream of the crossing site. Uncured cement is toxic to aquatic life and so biodiversity will be affected for up to a year after the operation is complete.
- Damage to the channel banks at the entrance and exit points. The soils in the area are highly dispersive and so are prone to erosion. Damage at one point could set off a process of erosion along a greater length of bank.

During the operational phase the primary potential impacts will be as follows:

- If a scour valve is located close to the river channel then flows from it could lead to soil erosion in its vicinity.
- Maintenance work could set off impacts similar to those of the construction phase.

In order to minimise or obviate the impacts of the pipeline on the Middelspruit, the following actions are recommended:

- The construction of the pipeline crossing should be done during the dry season when flows are likely to be at a minimum.
- The working servitude within the stream channel and for a distance of 20m on either side of it must be no more than 7 m on either side of the centreline of the pipe.
- All soil and sediment excavated from the channel and its immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. Where wetland species are called for they may be sourced from nearby in the channel but only small plugs (± 40 cm x 40 cm) should be moved since extraction of larger plugs may led to damage at the donor site.

2. Middelspruit Downstream Crossing

At the downstream crossing site the pipeline will pass through the Middelspruit a short distance upstream of the N11 bridge. It is assumed that the pipe will pass under the channel and will be encased in concrete. However, the designated pipeline area includes approximately 300 m of channel and conditions vary considerably within it in terms of the channel width and the bank vegetation cover.

It is recommended that, from an ecological perspective, the preferred crossing site will be at a point where the channel is narrow and where the banks are sloping rather than vertical. These criteria are suggested since they will entail the least amount of construction work in the channel, and the easiest options for rehabilitation after construction is complete.

Given the above conditions, the impact assessments and management guidelines are identical to those of the upstream crossing site.

3. Roodepoortspruit Crossing

The Roodepoortspruit will be crossed upstream of the N11 bridge and, while conditions in the designated pipeline area are such that the crossing will be straightforward, care will have to be taken to ensure that there are no downstream impacts since nearby residents may be dependent on water from the stream for some of their needs.

The channel at the crossing site is wide but has low banks and a firm substrate. It is suggested that the crossing point be close to the bridge since only a single channel is present there while there is a secondary flood channel further upstream. During the construction phase the primary potential impacts will be as follows:

- Release of soil/sediment into the channel downstream of the site. Since much of the channel is dominated by bedrock, it is probable that release of fine sediment will not be a significant issue.
- Reduction of water quality. Any reduction of water quality could have impacts on the residents and farming operations situated some 3.5 km downstream from the crossing site. However, because of the distance, it is probable that the river itself will ameliorate the impact and that it will be low at the affected area.
- Release of uncured cement into the channel downstream of the crossing site. Uncured cement is toxic to aquatic life and so biodiversity will be affected for up to a year after the operation is complete.

- Damage to the channel banks at the entrance and exit points. The soils in the area are highly dispersive and so are prone to erosion. The banks are already extensively eroded at the crossing site and there is considerable probability that the construction operation could lead to new erosion if especial care is not taken.

During the operational phase the primary potential impacts will be as follows:

- If a scour valve is located close to the river channel then flows from it could lead to soil erosion in its vicinity.
- Maintenance work could set off impacts similar to those of the construction phase.
- Cattle entering the area to drink could trample the pipeline trench and cause soil erosion there.

In order to minimise or obviate the impacts of the pipeline on the Roodepoortspruit, the following actions are recommended:

- The construction of the pipeline crossing should be done during the dry season when flows are likely to be at a minimum.
- The working servitude within the stream channel and for a distance of 20m on either side of it must be no more than 7 m on either side of the centreline of the pipe.
- All soil and sediment excavated from the channel and its immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. Where wetland species are called for they may be sourced upstream of the crossing site but only small plugs (± 40 cm x 40 cm) should be moved since extraction of larger plugs may led to damage at the donor site. The actual crossing site should be fenced off for at least a year so as to prevent cattle from walking over it and possible causing erosion of the trench area.

4. Flagstone Spruit Upstream Crossing (N11)

The extent of the designated pipeline area at the upstream crossing site of the Flagstone Spruit indicates that the crossing could be on either side of the road. The assessment of the site (Section 5.2.3) suggested that there is no ecological reason to select one side over the other and so the decision could be made purely on the basis of engineering considerations. Since the channel is narrower upstream of the road and sections of the banks there are sloping rather that vertical it is suggested here that a site upstream of the road be used. Use of this side will also obviate the need to go around the large borrow pit scrape dam situated north of the road.

While the consideration of the site was done with the upstream crossing site under consideration, the general homogeneity of the channel in the designated pipeline area implies that the recommendations will apply elsewhere. During the construction phase the primary potential impacts will be as follows:

- Release of soil/sediment into the channel downstream of the site. The sediment will lead to a short term loss of water quality, and possible infilling of the channel.
- Release of uncured cement into the channel downstream of the crossing site. Uncured cement is toxic to aquatic life and so biodiversity will be affected for up to a year after the operation is complete.
- Damage to the channel banks at the entrance and exit points. The soils in the area are highly dispersive and so are prone to erosion. Damage at one point could set off a process of erosion along a greater length of bank.

During the operational phase the primary potential impacts will be as follows:

- If a scour valve is located close to the river channel then flows from it could lead to soil erosion in its vicinity.
- Maintenance work could set off impacts similar to those of the construction phase.

In order to minimise or obviate the impacts of the pipeline on the Flagstone Spruit, the following actions are recommended:

- The construction of the pipeline crossing should be done during the dry season when flows are likely to be at a minimum.
- The working servitude within the stream channel and for a distance of 20m on either side of it must be no more than 7 m on either side of the centreline of the pipe.
- All soil and sediment excavated from the channel and its immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. It is suggested that extensive use be made of creeping grasses such as Kweek (*Cynodon dactylon*). Where wetland species are called for they may be sourced upstream of the crossing site but only small plugs (± 40 cm x 40 cm) should be moved since extraction of larger plugs may led to damage at the donor site.

5. Falgstone Spruit Downstream Crossing (R103)

The designated pipeline area at the downstream crossing point on the Flagstone Spruit differs considerably from that at the upper crossing point. While the channel is totally dominated by exposed bedrock, the banks are very much lower, are covered by vegetation, and are generally stable as shown in Photograph 11. In addition to the primary river channel, the crossing site also includes secondary flood channels on the south bank and a seep area on the north bank. There are no water users between the crossing site and the confluence of the Flagstone Spruit with the Klip River. During the construction phase the primary potential impacts will be as follows:

- Release of soil/sediment into the channel downstream of the site. The sediment will lead to a short term loss of water quality which may affect the Klip River. Infilling of the channels is not likely and the impact risk is considered to be low.
- Release of uncured cement into the channels downstream of the crossing site. Uncured cement is toxic to aquatic life and so biodiversity will be affected for up to a year after the operation is complete. This potential for this impact will be greater in the Klip River.
- Damage to the channel banks at the entrance and exit points. The soils in the area are highly dispersive and so are prone to erosion. However, the low banks and their stable condition reduce the risk of this impact.
- The placement of the pipe through the secondary flood channel on the south side of the river implies that a relatively large area of indigenous vegetation will be affected. While this vegetation is not considered to be aquatic vegetation, and includes some alien plants, its loss will lead to risk of erosion in that area.
- The seep zone on the north bank implies that the area has some environmental sensitivity and so there is a higher risk of impacts there.

During the operational phase the potential impacts will be as follows:

- If a scour valve is located close to the river channel then flows from it could lead to soil erosion in its vicinity.
- Maintenance work could set off impacts similar to those of the construction phase.
- Flood events could scour the pipeline trench if the rehabilitation is insufficient to hold the soil in place.

In order to minimise or obviate the impacts of the pipeline on the Flagstone Spruit at the downstream crossing site, the following actions are recommended:

- The construction of the pipeline crossing should be done during the dry season when flows are likely to be at a minimum.
- The working servitude within the stream channel and for a distance of 20m on either side of it must be no more than 7 m on either side of the centreline of the pipe.
- All soil and sediment excavated from the channel and its immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. On the south bank, including the area in the secondary flood channel, the primary grasses to be used will be tall species such as Thatch Grass (*Hyparrhenia* hirta). These plugs may be sourced from the surrounding area but must be small (± 40 cm x 40 cm) should be moved since extraction of larger plugs may led to damage at the donor site. Creeping grasses such as Kweek (*Cynodon dactylon*) may be seeded between the plugs so as to produce some cover in a short space of time. Kikuyu Grass may not be used as the species is an alien invader.
- On the north bank if the seep zone is affected, then the balance of grasses used should be dominated by the creeping grasses. Near the river some plugs of sedges and other hygrophilous species may be placed. These may be taken from the surrounding area and should be placed in bands which run along the horizontal contour line. It will not be necessary to cover the entire area with them since they will tend to spread naturally when water is present.
- Where the pipeline trench passes through the seep zone care must be taken to ensure that it does not become a preferential channel for ground water since there could then be both damage to the pipe bedding material, and to the seep zone. Therefore impervious barriers of clay or a similar material should be built into the trench at 8 m to 10 m intervals in that section.

6. Klip River Crossing

The designated pipeline area includes a length of approximately 500 m of the Klip River channel. There is, however it has been suggested that the crossing might be done by means of a pipe bridge instead or a buried pipe.

The assessment of the site found that the riparian zone is in generally fair to good condition throughout the reach and so, irrespective of the crossing site chosen, care will be necessary when working close to the river. A flood bench on the south bank has very well developed reedbeds and a rocky riffle in that area will be important to aquatic invertebrates and small fish. However, it was also noted that the steep slope along the south side of the river included an area of terrestrial vegetation of relatively high biodiversity conservation value. If possible this vegetation should not be impacted upon. It is therefore suggested that either the actual crossing site should be directly alongside the R103 bridge or that it be at least 180 m

further upstream so as to avoid the sensitive vegetation area. See Figure 12. On the north bank of the river there is no particular reason to suggest any one particular pipeline route.

Assuming that the ecologically sensitive areas are avoided during the construction phase the primary potential impacts will be as follows:

- Release of soil/sediment into the channel downstream of the site. The sediment will lead to a short term loss of water quality. Although the abstraction point for the Ladysmith water treatment works is upstream of this point it is probable that some downstream users could be affected. However, infilling of the channel is not likely and the impact risk is considered to be low.
- Release of uncured cement into the channels downstream of the crossing site. Uncured cement is toxic to aquatic life and so biodiversity will be affected for up to a year after the operation is complete. This potential for this impact will be substantial if the pipeline is buried under the river channel.
- Damage to the channel banks at the entrance and exit points. The soils in the area are highly dispersive and so are prone to erosion. The low banks are generally low and sloping and their condition is stable. Therefore the risk of this impact is considered to be low providing that the standard of rehabilitation is high and that provision is made for the floods which pass through the area.

During the operational phase the primary potential impacts will be as follows:

- If a scour valve is located close to the river channel then flows from it could lead to soil erosion in its vicinity.
- Maintenance work could set off impacts similar to those of the construction phase.

In order to minimise or obviate the impacts of the pipeline on the Klip River, the following actions are recommended:

- The construction of the pipeline crossing must be done during the dry season when flows are likely to be at a minimum.
- The working servitude within the stream channel and for a distance of 20m on either side of it must be no more than 7 m on either side of the centreline of the pipe.
- All soil and sediment excavated from the channel and its immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. The primary grasses to be used will be tall species such as Thatch Grass (*Hyparrhenia* hirta). Creeping grasses such as Kweek (*Cynodon dactylon*) may be seeded between the plugs so as to produce some cover in a short space of time. Kikuyu Grass may not be used as the species is an alien invader.

11.2.5 Water Use Licence Application

A Water Use Licence Application (WULA) is also being applied for as the proposed construction will intercept various watercourses, dams and wetlands. In this regard, the National Water Act (1998 (Act No. 36 of 1998) notes that any water use, as defined in the Act, requires a Water Use Licence. Section 21 of the Act identifies the following two water uses which will require a WULA to be made to the Department of Water and Sanitation (DWS), specific to the proposed development:

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

Furthermore, any such activity that triggers the above-mentioned, which occurs within 32m of a watercourse, or within the 1:100 year floodline, or within 500m of a wetland, also necessitates the need for a WULA.

The WULA is being made under a separate submission to the DWS and does not form part of the Competent Authority's mandate in terms of Environmental Authorisation. The WULA is being undertaken by Terratest (Pty) Ltd.

11.3 GEOTECHNICAL INVESTIGATION

Terratest (Pty) Ltd was appointed to undertake a preliminary desktop Geotechnical Investigation for the overall bulk water supply scheme. The report was concluded in January 2015 and the detail below provides a summary of the findings specific to this particular section of the proposed bulk water pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works.

The objectives of the Geotechnical Investigation were to:

- Provide a desktop assessment of the geology and expected ground conditions along the pipeline route;
- Comment on the potential suitability of in situ materials for use during the construction phase of the pipeline (vis backfill material– Note: Bedding materials to be obtained from commercial sources);
- Comment on the likely excavation conditions; and
- Identify potential geological problems and additional pre-construction phase geotechnical assessment requirements.

The resultant Geotechnical Investigation Report is attached as Appendix 14. The relevant details of the Specialist who undertook the work is noted in Table 12.

TABLE 12: Details of Geotechnical Specialist

Name of specialist	Education qualifications	Field of expertise	Title of specialist report/ s as attached in Appendix D
Mr. Tom Speirs	PrSciNat, BSc Hons (Geol); BSc Hons (Eng Geol)	Geotechnical	Spieonkop to Ladysmith Bulk Water Supply Pipeline – Geotechnical Desktop Study Report.

Please note that the general geology of the study area, based on an evaluation of the 1:250000 Geological Map Series, has been detailed in Section 10.3 of this report and as such have not been repeated in this section of the report.

11.3.1 Potential suitability of in situ materials for use during the construction phase

Based on the findings of the desktop geotechnical assessment the specialist has indicated that a significant proportion, if not all, of the backfill requirements can potentially be obtained from the trench excavations. The engineers have indicated that all bedding material requirements, in the form of rock aggregate and sands, will be obtained from commercial sources where necessary and hence this aspect was not assessed by the specialist.

11.3.2 Likely excavation conditions along the corridor route

The portions of the corridor traversing and founded in the sedimentary units of the Volksrust Formation and Adelaide Subgroup are not expected to encounter unduly difficult excavation conditions except where localised sandstone ledges may be present and more harder excavation may be required. The specialist has highlighted that the bedded and jointed nature of sedimentary rocks generally allows excavation by means of 30 ton class excavator and is in some cases more easily facilities by the use of a rock bucket.

In terms of the areas comprising the Masotcheni Formation excavation is not anticipated to present a problem. Variable boulder excavation is expected in the alluvial deposits and trench instability and seepage problems can be expected in these areas.

11.3.3 Problem Soils along the corridor route

Transported soils derived from the weathering by-products of argillaceous sedimentary rocks (Shales and Mudrocks) are known to be potentially expansive and could be susceptible to heave and shrinkage movements. Such soils generally are likely to be of limited thickness in the project area however this will require verification during more detailed geotechnical investigations which will be required prior to construction commencing.

Colluvial soils derived from dolerite generally comprise red and black sandy clay or clayey sand of variable thickness, which may also potentially be expansive. The presence of potentially expansive soils along the pipeline corridor will need to be verified during more detailed geotechnical investigations which will be required prior to construction commencing.

Soils from the Masotcheni Formation are known for their dispersive characteristics which makes them highly erodible. Areas underlain by this Formation are usually marked by gulley erosion and sections of the pipeline which traverse these areas will need to take into account these characteristics and give serious consideration to erosion prevention measures to minimise impacts and prevent exposure of the pipeline.

Alluvium at the river and watercourse crossings will present variable conditions with numerous boulders and significant seepage. Excavations in these areas could possibly require stabilisation of trench walls, dewatering and the implementation of scour prevention measures.

11.3.4 Additional pre-construction phase geotechnical investigations

More detailed in situ material testing and trial pit excavations are recommended at intervals of approximately 300m along the pipeline route, with closer spacing where prevailing conditions dictate. The trial pits should be excavated to at least 300mm below the pipeline invert levels or to a suitable depth to define problematic conditions. Based on the pipe diameter it is recommended that the excavations be undertaken by means of a tractor-loader-backhoe (TLB) due to its enhanced mobility compared to an excavator.

Trail pits must be described and assessed by a professional engineering geologist or geotechnical engineer in respect of:

1. Geotechnical conditions;
2. Ease of excavation; and
3. Potential use of the excavated materials during construction.

It has been highlighted that consideration could also be given to augmenting the trial pit information along the route by undertaking seismic refraction surveys along selected sections of the route for a representative evaluation of the excavation conditions and bedrock profile.

Where larger structures are required to augment the pipeline trial pits will be required at selected positions for the assessment of founding conditions. These are to be augmented by the undertaking of DCP / DLP probes in the evaluation of load bearing capacity.

In terms of material sampling representative disturbed, and where necessary undisturbed, samples of the materials intersected in the trial pits must be retrieved for laboratory testing to determine their material properties and geotechnical characteristics. Prerequisite tests are to include the following:

1. Particle size analysis;
2. Compaction and strength determinations;
3. Tests to calculate the indices of corrosiveness towards buried concrete and steel structures; and
4. During construction tests to confirm the suitability of designated construction materials such as rock aggregate sand and fill materials.

The specialist has also highlighted that additional tests may be required depending on prevailing geotechnical conditions which may include the determination of shear strength, dispersion and durability.

11.3.5 Conclusion

The proposed pipeline alignment at a desktop level is considered suitable for development, subject to the recommendations of the Geotechnical Engineer and more detailed geotechnical investigations prior to construction commencing. Points highlighted by the desktop assessment include:

- Overly onerous geotechnical conditions are not anticipated;
- Geotechnical constraints to the construction phase are anticipated to be associated with the occurrence of potentially expansive soils, dispersive soils, sections of hard excavations associated with near surface rock and boulder excavation over sections of the pipeline transversing dolerite;
- A significant proportion, or all of the selected backfill and fill requirements can, by selection, be obtained from trench excavation.

11.4 TERRESTRIAL BIODIVERSITY ASSSESSMENT

Eco-Pulse Environmental Consulting Services was appointed to undertake a Terrestrial Biodiversity Assessment for the overall water supply scheme, of which this application comprises the portion of the route located between Brakfontein Farm and the Ladysmith Water Treatment Works. The report was concluded in November 2012 and the detail below provides a summary of the findings specific to this particular section of the proposed bulk water pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works.

A full copy of the abovementioned specialist assessment is attached in Appendix 13 for reference purposes. The relevant details of the Specialists who undertook the work are noted in Table 13.

TABLE 13: Details of Biodiversity Specialist

Name of specialist	Education qualifications	Field of expertise	Title of specialist report/ s as attached in Appendix D
Mr. Douglas Macfarlane	BSc (Agric) MSc	Wetland & Biodiversity Specialist	Proposed Bulk Water Pipeline from Spioenkop Dam to Ladysmith, KZN - Specialist Terrestrial Biodiversity Assessment
Adam Teixeira-Leite	BSc Hons (Envs)	Wetland & Biodiversity Specialist	Proposed Bulk Water Pipeline from Spioenkop Dam to Ladysmith, KZN - Specialist Terrestrial Biodiversity Assessment

11.4.1 Impacts on Terrestrial Biodiversity

The Biodiversity Assessment highlighted a number of potential impacts which could occur on local biodiversity as a result of the proposed pipeline construction project. These included *inter alia* the following impacts which have been extracted from the specialist report:

- **Pollution of Soils and Habitat** - Waste products such as fuels and hazardous chemicals can contaminate soils in the construction zone. Solid waste in the form of building material and litter degrade natural vegetation and may prove detrimental to fauna and flora habitat on site. Sensitive/intolerant vegetation types would be impacted the most by spills of hazardous substances such as fuels. Solid waste pollution (including litter) can also have a negative effect on vegetation, displacing certain species of plants in some instances and encouraging the invasion of early successional and alien invasive species. The significance of this impact is negated in cases where vegetation has been largely transformed or invaded.
- **Disturbance and destruction of Indigenous Terrestrial Vegetation & Habitat** - This relates to the direct removal/loss or partial destruction/disturbance of existing indigenous vegetation communities associated with the clearing of vegetation and use of machinery and workers accessing the site in order to install pipelines, as well as for the construction of temporary site camps. As the pipeline will be subterranean, a large proportion of the construction servitude will be cleared, excavated and trampled during the construction activities, and therefore any significant species or habitats within the servitude may be affected. This is likely to result in potential adverse effects on terrestrial biodiversity in terms of reduced habitat availability and loss of red data/protected species, depending on the specific habitat/vegetation type affected. Many rare or endangered species rely on micro-habitats such as rocky out crops and termitaria, and the loss of even a few of these resources could impact on biodiversity. Other secondary effects of disturbance in these areas include woodland encroachment into natural grasslands an increase in the abundance of decreaser grass species and the potential fragmentation of habitat if rehabilitation is inadequate.
- **Compaction of Soils** - Soils that are compacted and their morphology/structure altered during construction are not ideal for supporting vegetation growth, diminishing the potential for effective rehabilitation of disturbed areas.
- **Soil Erosion** - Soil erosion on steep slopes can have a great impact on habitat and vegetation, with the loss of valuable topsoil and formation of erosion gullies. The clearing and excavation of the construction servitude will temporarily denude the vegetation on the site and expose the soils to the erosive elements. Where the pipe will be placed along ridges and spurs, or down the sides of valleys, the potential for erosion during construction is likely to be greater, especially for soils that are naturally prone to erosion. Rapid and effective rehabilitation of these areas is critical to reduce erosion risk. While erosion may be largely restricted the construction phase, soil erosion can operate long after construction is complete if uncontrolled / managed.
- **Increased poaching/ harvesting of fauna and flora** - Construction activities occurring within a close proximity to habitat containing sensitive fauna and fauna can lead to an increase in the hunting/poaching/trapping of plants, animals, reptiles or insects from these locations for various uses (medicinal, financial, other). This is specifically relevant in areas where protected/Red data species may occur.
- **Noise Disturbance** - Construction activities occurring within a close proximity to habitat containing fauna can lead to both the physical disturbance of areas of habitat by construction machinery/labourers as well as the disturbance of fauna due to noise pollution in the short term.
- **Increased Risk of Fire** - With increased human and vehicular activity comes the added risk of increased accidental fires, which can have a devastating effect on intact natural areas that are not typically exposed to veld fires. The impact on habitat and fauna utilizing these areas can be particularly significant. Runaway fires can have either a positive or negative depending on a number of factors including:

- Timing, frequency and extent of the fire, and the type of fire (determined by environmental conditions at the time of the fire).

Veld fires in late winter are likely to have the least impact, while early winter or summer fires are likely to have a larger impact. Closed woody communities are at the greatest risk where a recently cut servitude can result in high fuel loads from dead trees, shrubs and branches; and a hot fire under these circumstances may cause substantial damage to the remaining vegetation.

- **Colonisation by Weeds and Alien Invasive Plant Species** - The disturbance to the pipeline servitude during construction has the potential to promote the invasion by AIPs (Alien Invasive Plant Species) and weeds which have the ability to out-compete indigenous flora. The exponential spreading of alien plant species will impact on natural biodiversity. Clearing and disturbance is also likely to result in an increase in edge habitat immediately adjacent to disturbed areas. Edge habitat is characterized by a predominance of generalist and alien species that are usually highly competitive species which can invade areas of established vegetation, resulting in a loss of sedentary species of mature habitats which are normally considered sensitive. In addition, certain alien plants exacerbate soil erosion whilst others contribute to a reduction in stream flows. Edge effects will be lower for grasslands and generally higher for open woody communities. Although the impact is initiated during the construction phase, it is really an operational issue as recovery of vegetation community types is a long term process. Potential localized impacts on the composition and function of the natural vegetation and flora would probably occur at a medium intensity and over a long-term period. It is important that such impacts are addressed in terms of rehabilitation strategies, servitude maintenance regimes and management programmes.

In order to mitigate these potential impacts, a number of generic mitigation measures were proposed by the specialists (Table 18, Pg 40 of the Terrestrial Biodiversity Assessment contained in Appendix 13 of this report). The mitigation measures were broad and extensive and as such these mitigation measures were, where relevant to this section of the pipeline, incorporated into the environmental assessment and EMPr for the construction phase of the project.

12 IMPACT ASSSESSMENT AND MITIGAITON MEASURES

12.1 IMPACT ASSESSMENT METHODOLOGY

The EIA Regulations, 2014, prescribes requirements to be adhered to and objectives to be reached when undertaking Impact Assessments. These are noted in the following sections contained within the EIA Regulations (2014):

- Regulation 982, Appendix 1, Section 2 and Section 3 – Basic Assessment Impact Requirements; and
- Regulation 982, Appendix 2 and Appendix 3 – Environmental Impact Assessment Requirements.

In terms of these Regulations, the following should be considered when undertaking an Impact Assessment:

– A description and assessment of the significance of any environmental impact including:
- Cumulative impacts that may occur as a result of the undertaking of the activity during the project life cycle;
- Nature of the impact;
- Extent and duration of the impact;
- The probability of the impact occurring;
- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources; and

- The degree to which the impact can be mitigated.

The overall significance of an impact / effect has been ascertained by attributing numerical ratings to each identified impact. The numerical scores obtained for each identified impact have been multiplied by the probability of the impact occurring before and after mitigation. High values suggest that a predicted impact / effect is more significant, whilst low values suggest that a predicted impact / effect is less significant.

The interpretation of the overall significance of impacts is presented in Table 14.

TABLE 14: Interpretation of the significance scoring of a negative impact / effect.

Scoring value	Significance
>35	**High - The impact is total / consuming / eliminating** - In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. Mitigation may not be possible / practical. Consider a potential fatal flaw in the project.
25 - 35	**High - The impact is profound** - In the case of adverse impacts, there are few opportunities for mitigation that could offset the impact, or mitigation has a limited effect on the impact. Social, cultural and economic activities of communities are disrupted to such an extent that their operation is severely impeded. Mitigation may not be possible / practical. Consider a potential fatal flaw in the project.
20 – 25	**Medium - The impact is considerable / substantial** - The impact is of great importance. Failure to mitigate with the objective of reducing the impact to acceptable levels could render the entire project option or entire project proposal unacceptable. Mitigation is therefore essential.
7 – 20	**Medium - The impact is material / important to investigate** - The impact is of importance and is therefore considered to have a substantial impact. Mitigation is required to reduce the negative impacts and such impacts need to be evaluated carefully.
4 – 7	**Low - The impact is marginal / slight / minor** - The impact is of little importance, but may require limited mitigation; or it may be rendered acceptable in light of proposed mitigation.
0 – 4	**Low - The impact is unimportant / inconsequential / indiscernible** – no mitigation required, or it may be rendered acceptable in light of proposed mitigation.

The significance rating of each identified impact / effect was further reviewed by the Environmental Assessment Practitioner (EAP) by applying professional judgement.

For the purpose of this assessment, the impact significance for each identified impact was evaluated according to the following key criteria outlined in the sub-sections below.

NATURE OF IMPACT

The environmental impacts of a project are those resultant changes in environmental parameters, in space and time, compared with what would have happened had the project not been undertaken. It is an appraisal of the type of effect the activity would have on the affected environmental parameter. Its description includes what is being affected, and how.

SPATIAL EXTENT

This addresses the physical and spatial scale of the impact. A series of standard terms and ratings used in this assessment relating to the spatial extent of an impact / effect are outlined in Table 15.

TABLE 15: Rating scale for the assessment of the spatial extent of a predicted effect / impact

RATING	SPATIAL DESCRIPTOR
7	**International** - The impacted area extends beyond national boundaries.
6	**National** - The impacted area extends beyond provincial boundaries.
5	**Ecosystem** - The impact could affect areas essentially linked to the site in terms of significantly impacting ecosystem functioning.
4	**Regional** - The impact could affect the site including the neighbouring areas, transport routes and surrounding towns etc.
3	**Landscape** - The impact could affect all areas generally visible to the naked eye, as well as those areas essentially linked to the site in terms of ecosystem functioning.
2	**Local** - The impacted area extends slightly further than the actual physical disturbance footprint and could affect the whole, or a measurable portion of adjacent areas.
1	**Site Related** - The impacted area extends only as far as the activity e.g. the footprint; the loss is considered inconsequential in terms of the spatial context of the relevant environmental or social aspect.

SEVERITY / INTENSITY / MAGNITUDE

This provides a qualitative assessment of the severity of a predicted impact / effect. A series of standard terms and ratings used in this assessment which relate to the magnitude of an impact / effect are outlined in Table 16.

TABLE 16: Rating scale for the assessment of the severity / magnitude of a predicted effect / impact[2]

RATING	MAGNITUDE DESCRIPTOR
7	**Total / consuming / eliminating** - Function or process of the affected environment is altered to the extent that it is permanently changed.
6	**Profound / considerable / substantial** - Function or process of the affected environment is altered to the extent where it is permanently modified to a sub-optimal state.
5	**Material / important** - The affected environment is altered, but function and process continue, albeit in a modified way.
4	**Discernible / noticeable** - Function or process of the affected environment is altered to the extent where it is temporarily altered, be it in a positive or negative manner.
3	**Marginal / slight / minor** - The affected environment is altered, but natural function and process continue.
2	**Unimportant / inconsequential / indiscernible** - The impact temporarily alters the affected environment in such a way that the natural processes or functions are negligibly affected.
1	**No effect / not applicable**

DURATION

This describes the predicted lifetime / temporal scale of the predicted impact. A series of standard terms and ratings used in this assessment are included in Table 17.

[2] **Source:** adapted from Glasson J, Therivel R & Chadwick A. Introduction to Environmental Impact Assessment, 2nd Edition. 1999. pp 258. Spoon Press, United Kingdom.

TABLE 17: Rating scale for the assessment of the temporal scale of a predicted effect / impact.

RATING	TEMPORAL DESCRIPTOR
7	**Long term** – Permanent or more than 15 years post decommissioning. The impact remains beyond decommissioning and cannot be negated.
3	**Medium term** – Lifespan of the project. Reversible between 5 to 15 years post decommissioning.
1	**Short term** – Quickly reversible. Less than the project lifespan. The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than any of the project phases or within 0 -5 years.

IRREPLACEABLE LOSS OF RESOURCES

Environmental resources cannot always be replaced; once destroyed, some may be lost forever. It may be possible to replace, compensate for or reconstruct a lost resource in some cases, but substitutions are rarely ideal. The loss of a resource may become more serious later, and the assessment must take this into account. A series of standard terms and ratings used in this assessment are included in Table 18.

TABLE 18: Rating scale for the assessment of loss of resources due to a predicted effect / impact.

RATING	RESOURCE LOSS DESCRIPTOR
7	**Permanent** – The loss of a non-renewable / threatened resource which cannot be renewed / recovered with, or through, natural process in a time span of over 15 years, or by artificial means.
5	**Long term** – The loss of a non-renewable / threatened resource which cannot be renewed / recovered with, or through, natural process in a time span of over 15 years, but can be mitigated by other means.
4	**Loss of an 'at risk' resource** - one that is not deemed critical for biodiversity targets, planning goals, community welfare, agricultural production, or other criteria, but cumulative effects may render such loss as significant.
3	**Medium term** – The resource can be recovered within the lifespan of the project. The resource can be renewed / recovered with mitigation or will be mitigated through natural process in a span between 5 and 15 years.
2	**Loss of an 'expendable' resource** - one that is not deemed critical for biodiversity targets, planning goals, community welfare, agricultural production, or other criteria.
1	**Short-term** – Quickly recoverable. Less than the project lifespan. The resource can be renewed / recovered with mitigation or will be mitigated through natural process in a span shorter than any of the project phases, or in a time span of 0 to 5 years.

REVERSIBILITY / POTENTIAL FOR REHABILITATION

The distinction between reversible and irreversible impacts is a very important one and the irreversible impacts not susceptible to mitigation can constitute significant impacts in an EIA (Glasson et al, 1999). The potential for rehabilitation is the major determinant factor when considering the temporal scale of most predicted impacts. A series of standard terms and ratings used in this assessment are included in Table 19.

TABLE 19: Rating scale for the assessment of reversibility of a predicted effect / impact.

RATING	REVERSIBILITY DESCRIPTOR
7	**Long term** – The impact / effect will never be returned to its benchmark state.
3	**Medium term** – The impact / effect will be returned to its benchmark state through mitigation or natural processes in a span shorter than the lifetime of the project, or in a time span between 5 and

	15 years.
1	**Short term** – The impact / effect will be returned to its benchmark state through mitigation or natural processes in a span shorter than any of the phases of the project, or in a time span of 0 to 5 years.

PROBABILITY

The assessment of the probability / likelihood of an impact / effect has been undertaken in accordance with ratings and descriptors provided in Table 20.

TABLE 20: Rating scale for the assessment of the probability of a predicted effect / impact[3]

RATING	PROBABILITY DESCRIPTOR
1.0	Absolute certainty / will occur
0.9	Near certainty / very high probability
0.7 – 0.8	High probability / to be expected
0.4 - 0.6	Medium probability / strongly anticipated
0.3	Low probability / anticipated
0.2	Possibility
0.0 - 0.1	Remote possibility / unlikely

12.2 MITIGATION

In terms of the assessment process the potential to mitigate the negative impacts is determined and rated for each identified impact and mitigation objectives that would result in a measurable reduction or enhancement of the impact are taken into account. The significance of environmental impacts has therefore been assessed taking into account any proposed mitigation measures. The significance of the impact "without mitigation" is therefore the prime determinant of the nature and degree of mitigation required.

13 IMPACTS IDENTIFIED

The preferred site alternative is the construction of a 900mm – 1200mm ø bulk gravity pipeline from Brakfontein Farm to the Ladysmith Water Treatment Works. The pipeline corridor which has been assessed is 70 - 350m wide, which will allow for unforeseen construction deviations if necessary. The construction zone will be approximately 25m wide and fall within the abovementioned corridor. The chosen alignment corridor has been determined based on affected landowner requirements, and environmental and heritage aspects identified and the avoidance thereof where possible. No other site alternative exists which can satisfy the need and desirability of the Application.

The preferred technology alternative is to construct the entire pipeline of continuously welded grade API X 42 steel with a D/t ratio of <=120. The pipeline will be fabricated in accordance with the DWS 1310 specification. Pipeline construction will generally be in accordance with SABS 1200L except where more onerous requirements are deemed necessary. The pipeline will be epoxy lined (epoxy suitable for use on potable water applications) and the corrosion resistant coating will be either polyurethane or medium density polyethylene. All coatings and linings will comply with the DWS 9900 specification.

[3] **Source:** adapted from Glasson J, Therivel R & Chadwick A. Introduction to Environmental Impact Assessment, 2nd Edition. 1999. pp 258. Spoon Press, United Kingdom.

Provision will be made for the fitment of a temporary cathodic protection system during construction and a permanent cathodic protection system, probably of the impressed current type, will be provided.

All chambers will be fabricated either from precast concrete rings (airvalve chambers on the 900mm diameter pipe) or insitu reinforced concrete (airvalve chambers, scour and isolating valve chambers on the 1200mm diameter pipe).

Scour chambers will be located at all low points to allow drainage of the pipeline for occasional maintenance. A considerable portion of the route is located in dispersive soils and energy dissipation measures are provided at scour valve installations to mitigate erosion when scouring takes place.

Air valves are provided at high points but not exceeding a spacing of 600m to ensure hydraulic efficiency.

In-line isolating valves are provided at a spacing not exceeding 5m to ensure minimise wastage of water in the event that the pipeline is drained.

No other reasonable and / or practical technology alternative exists that would meet the need and desirability of this Application.

The proposed project has the following objectives:

1. To provide a new and more reliable bulk pipeline from Brakfontein Farm to Ladysmith Water Treatment Works which will act as a temporary raw water provision pipeline until such time regional bulk supply scheme has been completed.
2. Once the regional bulk supply scheme[4] has been completed the pipeline will act as a bulk supply line transporting potable water from the regional water treatment works and associated command reservoir to Ladysmith, where it will be distributed to various supply nodes.

The above will assist in providing temporary and permanent, reliable supply of potable water to the surrounding regions and will assist in fulfilling the requirements of the uThukela District Municipality's Ezakheni / Emnambithi Infrastructure Masterplan / Upgrade Project.

The No-go Alternative is to not to construct the pipeline. As a result, the existing bulkwater supply scheme will continue to operate, which is inefficient, unreliable and cannot meet future demands for the region. Further, the uThukela District Municipality's Ezakheni / Emnambithi Infrastructure Masterplan / Upgrade Project will not be realised and the unacceptable loss of potable water will continue through the current water supply scheme.

The impacts identified for the proposed construction of the pipeline within the corridor and the associated mitigation measures are provided in Table 21.

[4] *Please note that the overall regional bulk supply scheme will include raw water transfer scheme from Spioenkop dam to a 150 Ml/d Water Treatment Works which is currently in the process of being investigated under a separate EIA process due to the complexities surrounding features of heritage significance at proposed reservoir and treatment works sites which have been identified.*

TABLE 21: Construction Phase Impacts identified and associated mitigation measures

Impact	Description	Mitigation
Soil	• Potential disturbances include compaction, physical removal and potential pollution; • The exposed soil surfaces have the potential to erode easily if left uncovered which could lead to the loss of vegetation. • Potential loss of stockpiled topsoil and other materials if not protected properly; • Insufficient stormwater control measures may result in localised high levels of soil erosion, possibly creating dongas or gullies, which may lead to decreased water quality in surrounding watercourses; • River bank instability alongside watercourses and the Kip River could cause erosion; • Increased erosion could result in increased sedimentation which could impact on ecological processes; • The additional hardened surfaces created during construction could increase the amount of stormwater runoff, which has the potential to cause erosion; • Physical disturbance of the soil and plant removal may result in soil erosion/loss; and • Erosion and potential soil loss from cut and fill activities and areas where naturally dispersive soils occur.	• Soil erosion prevention measures should be implemented such as gabions, sand bags etc. whilst energy dissipaters should be constructed at any surface water outflow points. The sites should be monitored weekly for any signs of off-site siltation. All areas impacted by earth-moving activities should be re-shaped post-construction to ensure natural flow of runoff and to prevent ponding. All exposed earth should be rehabilitated promptly with suitable vegetation to stabilize the soil; • The areas surrounding watercourse crossings must be regularly checked for signs of erosion. If erosion is evident, corrective action must be taken; and • Any exposed earth should be rehabilitated promptly with suitable vegetation to protect the soil. Vigorous grasses planted with fertiliser are very effective at covering exposed soil. It is important to note, that the use of fertilisers, must be undertaken with caution and must not be allowed, in any circumstances, to run into drainage lines, rivers, wetlands or the Klip River, to avoid any possible Eutrophication impacts. • Special care and erosion prevention measures must be taken when working in areas where naturally dispersive soils occur. Final designs must take into account specialised recommendations made by the geotechnical engineers for sensitive areas which may be naturally prone to soil erosion.
Vegetation and fauna	• Disturbance of the site may lead to encroachment of alien plant species on-site and to the surrounding areas; • Increase in alien invasive species, therefore a possible loss in biodiversity; • Potential off-site pollution as a result of accidental spillages of petrochemicals or bituminous substances; • Potential loss of important / protected floral species; • Increase in road strikes of birds and wildlife, especially slow-moving organisms such as frogs; • Injury to agricultural livestock as a result of construction activities; • Loss of endangered or protected flora and fauna • Loss of grazing lands for local farmers; • Unnecessary loss of vegetation and trees as a result of	• Identify sensitive fauna and flora prior to construction works commencing and once the final pipeline alignment has been established and preferably pegged. This is to be undertaken by a suitably qualified environmental / biodiversity specialist/s who must be required to identify any features which require permit applications prior to their removal / destruction. Any required permits must be obtained prior to the feature being removed or destroyed; • Site personnel must undergo Environmental Training and be educated on keeping any vegetation disturbance to a minimum; • Poaching or harvesting of indigenous flora / fauna must be strictly forbidden; • Alien plant encroachment must be monitored and prevented as outlined in the EMPr;

Impact	Description	Mitigation
	unregulated vegetation clearance.	• All exposed earth should be rehabilitated promptly with suitable vegetation to protect the soil. Vigorous grasses planted with fertiliser are very effective at covering exposed soil. Necessary rehabilitation measures (e.g. burning, seeding, removing alien plants etc.) should be introduced to ensure species composition reverts to a more natural state (with regards to affected areas). Indigenous vegetation with deep set root systems is advisable to limit soil loss on site. Alternatively, water dissipating mechanisms such as gabions or reno-mattresses may be implemented on-site to help stabilize the surrounding soil and provide a platform for the growth of vegetation. • No hunting is permitted on-site or the surrounding areas; • No animals required for hunting e.g. dogs, under the supervision of construction workers, should be allowed into the area. All construction personnel on the property should be informed of this ruling; and • Any construction personnel found to be poaching in the area should be subjected to a disciplinary hearing. • The working corridor must be no wider than 25 metres under normal circumstances. Where sensitive features occur this must be reduced to an appropriate with as per the recommendations of the appropriate specialist. In terms of watercourse and wetland crossings the working corridor must be no wider than 14m either side of the centre of the pipeline. • Where the construction corridor transverses agricultural land the working zone must be appropriately fenced off in the same manner which is practiced by the affected landowner. No clearance of vegetation must occur outside of this zone. Post construction agricultural lands must be rehabilitated as close as possible back to their previous state and in accordance with the grassing requirements of the landowner.
Air quality and noise pollution	• Potential dust generation from soil stripping, vehicle traffic on access roads and motor vehicle fumes will have an impact on air quality; • Potential increase in noise from the operation of machinery and equipment, as well as the construction vehicle traffic; and • Dust and noise will be created during the Construction Phase, which may impact on the local community.	• All construction machinery and equipment must be regularly serviced and maintained to keep noise, dust and possible leaks to a minimum, as per the requirements of the EMPr; and • Road dampening or alternative dust suppression measures must be undertaken to prevent excess dust during construction. • Operational Hours: No works must be executed between sunset and sunrise and on the non-working and special non-working days as stated in the Contract Data unless otherwise agreed between the Engineer and Contractor; and

Impact	Description	Mitigation
		• Construction personnel must be made aware of the need to prevent unnecessary noise such as hooting and shouting.
Traffic	• Increase in construction vehicles in the area; • Possible lane closures, traffic delays and congestion during the construction phase; • Slow-moving construction vehicles on the surrounding roads may cause accidents; and • If not properly maintained, increased road use to existing surrounding road infrastructure, for access purposes by construction personnel, may cause damage to the existing infrastructure and private access roads.	• Appropriate temporary traffic control and warning signage must be erected and implemented on all affected roads in the vicinity of the construction zones; • Construction workers / construction vehicles must take heed of normal road safety regulations, thus all personnel must obey and respect the law of the road. A courteous and respectful driving manner must be enforced and maintained so as not to cause harm to any individual; and • Any damage cause to surrounding roads as a result of construction activities must be repaired as soon as possible to prevent further deterioration to the private or public road network. • Construction vehicles and plant must not be permitted outside of the demarcated construction working zone unless it is on a public road. The use of private access roads must be strictly forbidden unless a prior agreement has been entered into with the affected landowner.
Waste	• There is potential for the site and surrounding areas to become polluted if construction activities are not properly managed (e.g. oil / cement, bitumen spills, litter from personnel on-site, sewage from portable ablutions etc.); and • Waste generation could be created by the following: - Solid waste - plastics, metal, wood, concrete, stone, asphalt; - Chemical waste- petrochemicals, resins and paints; and - Sewage as may be generated by employees.	• All waste generated on-site during construction must be adequately managed. Separation and recycling of different waste materials should be supported; • All solid wastes must be disposed of at a registered landfill site and records maintained to confirm safe disposal; • Adequate scavenger-proof refuse disposal containers must be supplied at site camps and the work front to control solid waste on-site; • It should be ensured that existing waste disposal facilities in the Ladysmith area are able to accommodate the increased waste generated from the proposed construction; • Chemical waste must be stored in appropriate containers and disposed of at a licensed disposal facility by a licensed service provider; • Portable sanitation facilities must be erected for construction personnel. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation). These facilities must also be monitored and serviced regularly so as to prevent contamination of the water resources. A minimum of one toilet for every 20 site staff must be maintained. These facilities must be located no further than 100m from the work front. • The construction site should be inspected for litter on a daily basis. Extra care should be taken on windy days. Precautions must be taken to avoid

Impact	Description	Mitigation
		litter from entering watercourses and the Klip River; • Soil that is contaminated with, e.g. cement, petrochemicals or paint, must be disposed of at a registered waste disposal site by a licence service provider and is NOT to be disposed of in watercourses; and • It must be ensured that all hazardous contaminants are stored in designated areas that are sign-posted, lined with an appropriate barrier and bunded to 110% of the volumes of liquid being stored to prevent the bio-physical contamination of the environment (ground and surface water and soil contamination). Hazardous substance storage must not take place within 100m of a wetland or within the 1:100 year floodline of a watercourse; and • Any significant spills on-site must be reported to the relevant Authority (e.g. Department of Water and Sanitation / EDTEA / Municipality etc.) and must be remediated as per the requirements of the EMPr.
Social and Socio-Economic	• Creation of job opportunities for skilled personnel (e.g. engineers, specialists etc.) and non-skilled personnel (e.g. labourers); • Skills development of the local community through employment opportunities; • Social anxiety may arise should the surrounding community not be adequately notified of the proposed activity; • Possible economic benefits to suppliers of building materials in Ladysmith as goods and services may be purchased from these entities during the construction phase; • Possible negative impacts on commercial agricultural activities and production in the area; and • Social impacts arising from foreign workers entering the area.	• Inform the surrounding communities and general public of the proposed activity as soon as possible. This will serve to ease potential social anxiety. Such notification can be conducted through the Public Participation Process and must be ongoing during the construction phase; • No private lands outside of the construction zone may be accessed without the permission of the landowner; • Local people must be employed where ever possible; • Materials for construction must be sourced from local suppliers wherever possible and feasible; • Reasonable financial compensation must be provided to local landowners where their agricultural activities or infrastructure is directly affected by construction activities. This also applies to businesses and other landowners who may also be directly affected by construction activities; • Where boundary fences are removed in agricultural areas the project managers and contractor are to ensure that adequate temporary fencing to secure the affected farm land / livestock is in place prior to it being removed; • A Community Liaison Officer would assist in raising any concerns / complaints noted by the affected community to the Construction Team. It is recommended that a clear line of communication and contact person be established to inform local farmers of any upcoming construction

Impact	Description	Mitigation
		activities during the construction phase. This representative must be invited to monthly progress meetings so that project information can be relayed back to the Ladysmith Farmers Association; and • No staff accommodation must be provided on site or in the more rural areas immediately surrounding the project. Foreign site staff should preferably be housed in Ladysmith and transported to the work front on a daily basis.
Existing infrastructure / heritage resource disturbance	• If not properly designed services such as telecommunication lines, roads, pipelines, electrical and sewage services etc could be damaged during construction activities; • Potential for grave disturbance during construction activities; • Potential for heritage resource disturbance / destruction during construction activities; and • Potential for damage to private property as a result of construction activities.	• Prior to construction activities commencing the contractor and project manager must ensure that the adequate measures have been taken to identify underground / hidden services and potential features of heritage significance which could potentially be on / at the specific site. The construction and design requirements of the owners of any underground services must be adhered to at all times. Should any features of heritage of significance or graves be identified / uncovered during construction events then work in that area must cease immediately until an archaeologist has inspected the feature and is satisfied, or the necessary authorisations to continue with work have been obtained from AMAFA. • Notify IAPs as soon as possible of the commencement of construction in areas close to their services, such as SANRAL; DoT, Transnet, Eskom and Telkom; • Reasonable financial compensation must be provided to local landowners where their agricultural activities or infrastructure is directly affected by construction activities. This also applies to businesses and other landowners who may also be directly affected by construction activities; • No-go areas must be clearly demarcated, such as graves and other sensitive features, and must be afforded an appropriate no-go buffer to prevent disturbance; and • The recommendations of the Heritage Impact Assessment report and any comment received from AMAFA must be adhered to at all times (Appendix 8).
Site safety and security	• There is potential for construction labour to trespass onto neighbouring properties; and • Construction personnel / construction vehicles – movement of construction personnel and vehicles may pose a potential health and safety risk to road users, landowners and local residents.	• No construction staff must be permitted to trespass on private land. Any construction personnel found to be trespassing on private land must be immediately subjected to a disciplinary hearing; • Construction workers / construction vehicles must take heed of normal road safety regulations, thus all personnel must obey and respect the law of the road. A courteous and respectful driving manner must be enforced

Impact	Description	Mitigation
		and maintained so as not to cause harm to any individual; and • A safe designated speed limit must be set by the project managers to limit possible road strikes and accidents.
Water Resources	• Contamination of ground and surface water, and soil; • The watercourses within and surrounding the construction zone may be polluted due to accidental spillages of petrochemicals from vehicles and equipment, or concrete from the construction activities; • The additional hardened surfaces created during construction will increase the amount of stormwater runoff, which has the potential to cause erosion and create turbidity in nearby watercourses; • Possible damage to the riparian surrounds; and • Risk of initiating erosion gullies which could spread into the floodplain. • Risk of Eutrophication of watercourses through inappropriate / excess applications of fertiliser during rehabilitation.	• Appropriate stormwater / surface water management measures must be put in place before construction commences and maintained throughout the lifetime of the development; • An appropriate number of toilets (1 toilet for every 20 workers) must be provided for labourers during the Construction Phase. These must be maintained in a satisfactory condition and a minimum of 100m away from any water resources and outside of the 1:100 year floodline of a watercourse; • Any contaminated water associated with construction activities must be contained in separate areas or receptacles such as Jo-Jo tanks or water-proof drums, and must not be allowed to enter into the natural drainage systems / watercourse / wetlands; • The Construction Camp should be positioned on previously disturbed areas (if possible) and must be located outside of the 1:100 yr floodline of a watercourse and more than 100m away from any other water resource; • Soil erosion prevention measures must be implemented such as gabions, sand bags etc. whilst energy dissipaters must be constructed at any surface water outflow points. The site must be monitored by the Contractor weekly for any signs of off-site siltation. All areas impacted by earth-moving activities must be re-shaped post-construction to ensure natural flow of runoff and to prevent ponding; • Appropriate silt control mechanisms must be installed around all soil excavations to prevent silt from entering the Klip River and surrounding watercourses; • Should any excavations require dewatering, this is to occur through an adequately designed silt trap prior to discharge. All silt traps are to be regularly monitored and maintained to ensure efficient and effective use; • Special care must be taken in regard to the stability of the river banks once the pipeline has been installed. It is strongly recommended that the rehabilitation measures be undertaken with emphasis on the use of plants to protect the river bank. Hard structures such as gabions and mattresses should be avoided if possible since they may well lead to bank erosion in the long term; • All recommendations noted in the Wetland and Riparian Assessment

Impact	Description	Mitigation
		Report (Appendix 9) must be adhered to; and • At the end of the construction phase, the site must be fully revegetated to match as closely as possible the pre-construction condition.

14 IMPACT ASSESSMENT

Table 22 presents the impact assessment findings in relation to the proposed construction activities.

TABLE 22: Assessment of Impacts

	Nature of project impact	Spatial extent		Severity / intensity / magnitude		Duration		Resource loss	Reversibility		Probability		Significance without mitigation	Significance with mitigation
		Without	With	Without	With	Without	With		Without	With	Without	With		
CONSTRUCTION IMPACTS	Soil impacts	5	2	6	2	3	1	7	3	1	0.9	0.3	21.6	3.9
	Flora and fauna impacts	5	1	5	2	7	1	3	3	1	0.8	0.3	18.4	2.4
	Air quality and noise pollution impacts	2	1	3	2	1	1	1	1	1	0.9	0.2	7.2	1.2
	Traffic impacts	3	1	3	2	1	1	1	1	1	0.6	0.2	5.4	1.2
	Waste impacts	3	1	4	2	3	1	3	1	1	0.9	0.2	12.6	1.6
	Social and Socio-economic impacts	4	2	4	2	3	1	1	1	1	0.6	0.3	7.8	2.1
	Existing infrastructure and heritage resource disturbance	4	1	5	1	7	1	7	7	1	0.7	0.1	21	1.1
	Safety and security impacts	2	1	3	1	1	1	1	1	1	0.5	0.1	4	0.5
	Water impacts	5	1	4	2	3	1	7	3	1	0.9	0.3	19.8	3.6
												Average	13.1	2.0
	Overall impact significance												**MEDIUM**	**LOW**

14.1 SIGNIFICANCE

Based on the outcome of the significance scoring noted in Table 22, the overall significance impact without mitigation, is considered to be MEDIUM, with a score of 13.1. With mitigation, the overall significance impact is considered to be LOW, with a score of 2.0.

The greatest impact of significance is considered to be the potential for soil impacts, while impacts on existing infrastructure and heritage resources, and water resource impacts are rated as the second and third highest possible impact. However, with the correct mitigation measures employed as noted in Table 21 and as per the EMPr (Appendix 6), these impacts can be significantly reduced. As such, there is no significant reason why the Preferred Site Alternative and the Preferred Technology Alternative put forward in this application should not be adopted.

15 ENVIRONMENTAL IMPACT STATEMENT

Assuming all phases of the project adhere to the conditions stated in the EMPr (Appendix 6) it is believed that the impacts associated with the proposed construction will have no significant, adverse, long term environmental impact on the surrounding environment.

Positive impacts associated with construction include:

- Provision of a reliable potable water supply;
- Reduced water losses over the supply scheme;
- Economic growth and development;
- Employment opportunities and skills development.

It is perceived that these impacts will be long term and have sustainable benefits.

It must be ensured that the construction phase, in no way, hampers the health of any of the ecological systems or items of heritage significance identified on and surrounding the site, and that post-construction rehabilitation leaves the surrounding environments in an as good, if not better, state.

On completion of construction activities for the project, the contractors must ensure that all construction related waste and hazardous materials are removed from the site and that rehabilitation of land is undertaken according to the requirements of the EMPr.

Any alien plant management programmes that are implemented during the construction phase must be maintained during the construction defects liability period. It is also critically important that the watercourses, wetlands and drainage lines are kept free of alien plant infestation.

16 RECOMMENDATIONS OF THE EAP

The proposed development should not result in impacts on the natural or social environment that are highly detrimental, nor result in undue risks to the natural environment if proper mitigation measures are implemented. The nature and types of negative impacts do not outweigh the potential benefits of this project, provided that the short term localised impacts of the construction phase are adequately mitigated. In this regard, an EMPr has been compiled and is attached to this report (see Appendix 6), this must be implemented by the Applicant, as well as his appointed Project managers and Contractors. It is recommended that external monthly EMPr monitoring takes place by an independent Environmental Control Officer (ECO) to ensure that the requirements of the EMPr are being correctly implemented, thus ensuring the protection of the surrounding environments during construction.

It is the recommendation of the EAP that the following management and mitigation measures be incorporated into any project approvals which may be issued:

- All recommendations noted in the **Geotechnical Investigation Report** (Appendix 14) be adopted and followed by the contractor, these include *inter alia* the undertaking of more detailed pre-construction investigations to determine:
    - Site Specific Geotechnical conditions;
    - Ease of excavation along the route; and
    - Potential use of the excavated materials during construction.

- All recommendations noted in the **Heritage Impact Assessment** (Appendix 8) be adopted and followed by the contractor, these include *inter alia*:
    - The ECO of the project must be informed of the fact that all the geological formations, accept for dolerite, will contain fossils if exposed at a depth of more than 1,5m.
    - All sections of the development where bedrock is exposed due to erosion or where geotechnical surveys indicate that trenching will exceed 1,5m in areas underlain by Very High, High and Moderate Palaeontologically Sensitive rocks must be inspected by a qualified palaeontologist as part of a Phase 1 Palaeontological Impact Assessment. The professional Palaeontologist must be appointed to record and collect the fossils according to SAHRA and AMAFA specifications as part of a Phase 1 Palaeontological Impact Assessment, preferably before construction in areas where the rocks area exposed due to erosion and also during construction when trenching exceeds 1,5m in depth.
    - Site 1NOD06 (28°34'14.11"S; 29°44'55.30"E) should be demarcated before construction begins.

  Additionally the following must be undertaken:
  – Should any features of heritage significance / graves be identified during construction, the following procedure is to be followed:
    - Amafa should be contacted if any heritage objects are identified during earthmoving activities and all development should cease until further notice;
    - No structures older than sixty years or parts thereof are allowed to be demolished altered of extended without a permit from Amafa;
    - No activities are allowed within 50m of a site which contains rock art;
    - No stone walling may be damaged without permission from the archaeologist and/or Amafa KZN.
    - Amafa should be contacted if any graves are identified during construction and the following procedure is to be followed:
        - Stop construction;
        - Report finding to local police station; and
        - Report to Amafa to investigate.

- All recommendations noted in the **Wetland and Riparian Assessment Report** (Appendix 7) be adopted and followed by the contractor, these include *inter alia*:

  <u>Impact Mitigation for Wetland Areas</u>:
    - Prior to the start of construction, the project Environmental Control Officer (ECO) must set out markers indicating the area within which the wetland-related precautionary measures must be adhered to.
    - The total width of the working servitude in wetland areas may not exceed 10 m – 12 m.
    - The construction of the pipeline crossing should be done during the dry season when ground water will be at a minimum.
    - Soil excavated from the trench must be set aside from the wetland. Great care must be taken to keep the topsoil separated from the subsoil.

- No materials or soils, including pipe bedding material, may be stockpiled in the wetland.
- Once the pipe is set in place impervious plugs of compacted clay-rich material must be set in place on each side of the wetland. The purpose of these plugs is to prevent water flowing out of the wetland and along the pipeline trench.
- The soil from the trench must be returned in the correct sequence with the subsoil being located underneath the topsoil.
- Once the soil has been returned, the whole area of the trench is to be uniformly and lightly ripped to a depth of approximately 30 cm and is to be levelled to match the original ground profile.
- Once the soil has been prepared, the area is to be revegetated. This is to be done by hand planting plugs of wetland species taken from elsewhere in the system. The plugs are not to be greater than 30 cm x 30 cm and must be collected individually. NOTE: No fertiliser is to be applied in the wetland area.
- If cattle are likely to graze in the area then the pipeline trench should be fenced off.
- The site must be watered until such time as natural water flows will sustain the plants.

Impact Mitigation for Dams:

- The pipeline route should not pass within 10 m of a dam if at all possible.
- As a matter of preference, the pipeline should pass a dam on the downslope side. If it must pass on the upslope side then especial care must be taken to ensure that the construction trench is rehabilitated and revegetated as soon as is possible and care must be taken that any erosion control structures such as drains or berms do not lead water away from the dam.
- The pipeline should not ever pass through a dam. If this is unavoidable, then especial care must be taken to seal the pipeline trench along its length within the dam basin so as to avoid establishing a situation in which water leaks away along the trench. The owner of the dam must give written consent and must be adequately compensated if leakage occurs.

Impact Mitigation for Channels

- The construction of the pipeline crossings should be done during the dry season when flows are likely to be at a minimum.
- The working servitude within the channels and for a distance of 20m on either side of them must be no more than 7 m on either side of the centreline of the pipe.
- All soil and sediment excavated from the channels and their immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel edge.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. It is suggested that extensive use be made of creeping grasses such as Kweek (*Cynodon dactylon*). If necessary, the seeds and then the young plants must be watered until such time as they are self-sufficient.
- At sites where there is a risk of the pipeline trench being trampled by cattle, it must be protected by a fence until such time as it is considered to be fully rehabilitated.

Impact Mitigation for Rivers

General:

- Rivers should be crossed at points where the channel is as narrow as possible. This recommendation is based on reduction of both the extent of time spent working in the channel, and the extent of the working footprint in the channel.
- Rivers should be crossed at points where the banks are stable and where rehabilitation of the banks after construction will be most likely to be simple and successful.
- To the greatest possible extent the pipeline should approach rivers at right angles since this obviates the banks being cut at sharp angles which will leave spurs which are susceptible to erosion.

Site Specific:

Middelspruit Upstream and Downstream crossings

- The construction of the pipeline crossing should be done during the dry season when flows are likely to be at a minimum.
- The working servitude within the stream channel and for a distance of 20m on either side of it must be no more than 7 m on either side of the centreline of the pipe.
- All soil and sediment excavated from the channel and its immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. Where wetland species are called for they may be sourced from nearby in the channel but only small plugs (± 40 cm x 40 cm) should be moved since extraction of larger plugs may led to damage at the donor site.

Roodepoort crossing

- The construction of the pipeline crossing should be done during the dry season when flows are likely to be at a minimum.
- The working servitude within the stream channel and for a distance of 20m on either side of it must be no more than 7 m on either side of the centreline of the pipe.
- All soil and sediment excavated from the channel and its immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. Where wetland species are called for they may be sourced upstream of the crossing site but only small plugs (± 40 cm x 40 cm) should be moved since extraction of larger plugs may led to damage at the donor site. The actual crossing site should be fenced off for at least a year so as to prevent cattle from walking over it and possible causing erosion of the trench area.

Flagstone Spruit Upstream crossing

- The construction of the pipeline crossing should be done during the dry season when flows are likely to be at a minimum.

- The working servitude within the stream channel and for a distance of 20m on either side of it must be no more than 7 m on either side of the centreline of the pipe.
- All soil and sediment excavated from the channel and its immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. It is suggested that extensive use be made of creeping grasses such as Kweek (*Cynodon dactylon*). Where wetland species are called for they may be sourced upstream of the crossing site but only small plugs (± 40 cm x 40 cm) should be moved since extraction of larger plugs may led to damage at the donor site.

Flagstone Spruit Downstream crossing

- The construction of the pipeline crossing should be done during the dry season when flows are likely to be at a minimum.
- The working servitude within the stream channel and for a distance of 20m on either side of it must be no more than 7 m on either side of the centreline of the pipe.
- All soil and sediment excavated from the channel and its immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. On the south bank, including the area in the secondary flood channel, the primary grasses to be used will be tall species such as Thatch Grass (*Hyparrhenia* hirta). These plugs may be sourced from the surrounding area but must be small (± 40 cm x 40 cm) should be moved since extraction of larger plugs may led to damage at the donor site. Creeping grasses such as Kweek (*Cynodon dactylon*) may be seeded between the plugs so as to produce some cover in a short space of time. Kikuyu Grass may not be used as the species is an alien invader.
- On the north bank if the seep zone is affected, then the balance of grasses used should be dominated by the creeping grasses. Near the river some plugs of sedges and other hygrophilous species may be placed. These may be taken from the surrounding area and should be placed in bands which run along the horizontal contour line. It will not be necessary to cover the entire area with them since they will tend to spread naturally when water is present.
- Where the pipeline trench passes through the seep zone care must be taken to ensure that it does not become a preferential channel for ground water since there could then be both damage to the pipe bedding material, and to the seep zone. Therefore impervious barriers of clay or a similar material should be built into the trench at 8 m to 10 m intervals in that section.

Klip River crossing

- The construction of the pipeline crossing must be done during the dry season when flows are likely to be at a minimum.
- The working servitude within the stream channel and for a distance of 20m on either side of it must be no more than 7 m on either side of the centreline of the pipe.

- All soil and sediment excavated from the channel and its immediate surrounds must be stockpiled or spoiled at a site at least 20 m from the channel.
- Great care must be taken to ensure that the channel banks are left in a stable condition at the completion of the construction process. As necessary, use may be made of degradable soil meshes and/or gabions.
- All exposed soil must be planted over with indigenous vegetation similar to that of the pre-construction state. The primary grasses to be used will be tall species such as Thatch Grass (*Hyparrhenia* hirta). Creeping grasses such as Kweek (*Cynodon dactylon*) may be seeded between the plugs so as to produce some cover in a short space of time. Kikuyu Grass may not be used as the species is an alien invader.

- All generic recommendations noted in the **Terrestrial Biodiversity Assessment Report** (Appendix 13) be adopted, where necessary, with guidance on site specific mitigation from a suitably qualified Environmental Control Officer (ECO).

Further, in terms of Environmental Monitoring, the following is recommended for the project:

- An independent ECO must audit the construction site during the Construction Phase of the pipeline;
- An ECO must audit the site once every two weeks while the construction of the Klip River crossing is taking place;
- The ECO must audit the site once a month while construction is taking place in less sensitive areas until completion of the rehabilitation phase of project; and
- The Project Manager must be responsible to ensure that Environmental Audit Reports are submitted to the EDTEA: Compliance and Monitoring Department for the duration of the construction and rehabilitation phases of the project.

All of the above recommendations have been incorporated into the EMPr where necessary (Appendix 6) which must be approved and implemented for the construction phase of the project.

Based on the above, it is the opinion of the EAP that the Application should be granted a positive decision on Environmental Authorisation for the proposed corridor alignment.

17 CONSTRUCTION TIMEFRAMES

Construction timeframes have not been estimated as yet however it is estimated that the proposed construction will take approximately 12-18 months to complete. Further, it is requested that the Environmental Authorisation, if issued by the Competent Authority, be valid for a period of five (5) years from the date of signature.

18 SUBMISSION AND CONSIDERATION OF DOCUMENTATION BY THE COMPETENT AUTHORITY

It is to be noted that in terms of the EIA Regulations (2014), GNR 982 43(2), all State Departments that administer a law relating to a matter affecting the environment, specific to the Application, must submit comments within 30 days to the EAP. Should no comment be received within the 30 day commenting period, it will be assumed that the relevant State Department has no comment to provide.

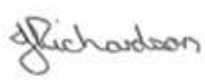
All comments received in response to the Basic Assessment Report will be attached to, summarised and responded to in a comments and responses report which will be included in the final submissions to the Competent Authority, (i.e. EDTEA) for consideration in terms of issuing a decision on Environmental Authorisation.

19 UNDERTAKING

Terratest (Pty) Ltd hereby confirms that the information provided in this report is correct at the time of compilation and was compiled with technical information provided by WMN Consultancy (Pty) Ltd.

Terratest (Pty) Ltd further confirms that all comments received from Stakeholders and IAPs have been included in this report where necessary. Further, a record has to-date and will continue to be kept of all comments, which will be consolidated and incorporated into all subsequent reports, either submitted for comment to IAPs, or to the EDTEA for consideration and decision-making.

For Terratest (Pty) Ltd:



John Richardson
Environmental Scientist

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APPENDIX 1: CV of the EAP

APPENDIX 2: Affected Property Details

APPENDIX 3: A3 Locality MAP & Pipeline Corridor Layout Plans

APPENDIX 4: Environmental Authorisation Application

APPENDIX 5: Engineering Report

APPENDIX 6: Environmental Management Programme (EMPr)

APPENDIX 7: Wetland & Riparian Assessment Report

APPENDIX 8: Heritage Impact Assessment

APPENDIX 9: Meeting Minutes

APPENDIX 10: Key Stakeholder and Public Comments

APPENDIX 11: IAP Register

APPENDIX 12: Basic Assessment Notification Letter

APPENDIX 13: Terrestrial Biodiversity Assessment

APPENDIX 14: Desktop Geotechnical Assessment