water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

REPORT NO:
P RSA 000/A00/22118/2

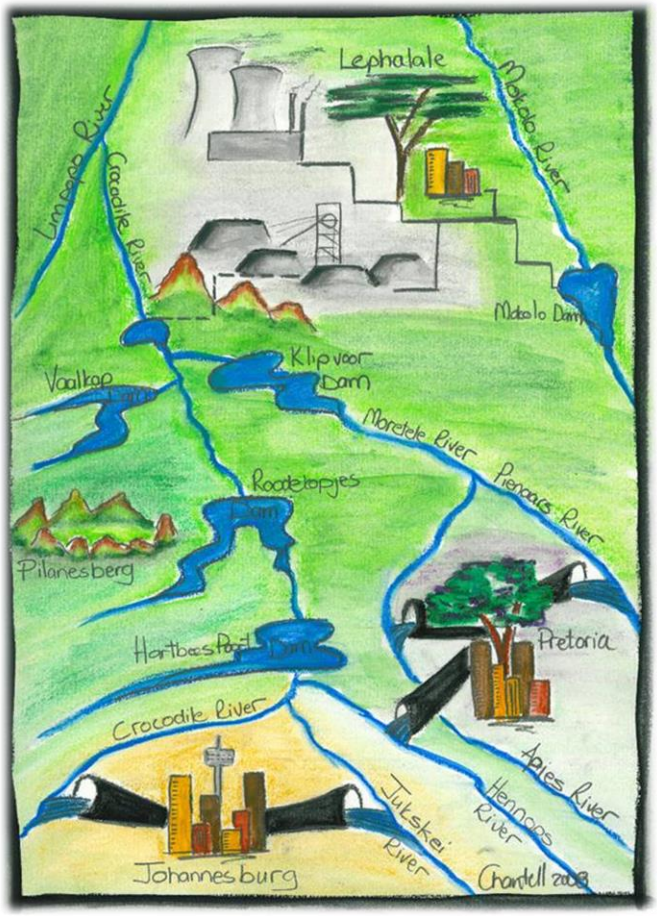
PROPOSED MOKOLO AND CROCODILE RIVER (WEST) WATER AUGMENTATION PROJECT (PHASE 2A) (MCWAP-2A):

WATER TRANSFER INFRASTRUCTURE

SCOPING REPORT

DRAFT

February 2018



TITLE AND APPROVAL PAGE

Project Name:	***Proposed Mokolo and Crocodile River (West) Water Augmentation Project (Phase 2A) (MCWAP-2A): Water Transfer Infrastructure***
Report Title:	***Draft Scoping Report***
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Authority reference no.:	***To be provided by DEA***
DWS report reference no.:	***P RSA 000/A00/22118/2***
Status of report:	***Draft***
Date of issue:	***February 2018***

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EXECUTIVE SUMMARY

PROJECT BACKGROUND AND MOTIVATION

Major developments are planned for the Waterberg coalfields that are located in the Lephalale area. As a direct result of the aforementioned developments, the demand for water in the Lephalale area is expected to significantly increase into the future.

Due to the limited availability of water in the Lephalale area, the Department of Water and Sanitation conducted a feasibility study (completed in 2010) of the Mokolo Crocodile River (West) Water Augmentation Project to establish how the future water demands could be met. The phases of the proposed project include the following:

- Mokolo Crocodile River (West) Water Augmentation Project Phase 1: Augment the supply from Mokolo Dam to supply in the growing water use requirement for the interim period until a transfer pipeline from the Crocodile River West can be implemented. The solution must over the long term optimally utilise the full yield from Mokolo Dam and will be operated as a system together with Mokolo Crocodile River (West) Water Augmentation Project Phase 2A. Phase 1 is operational since June 2015.
- **Mokolo Crocodile River (West) Water Augmentation Project Phase 2A**: Transfer water from the Crocodile River (West) to the Steenbokpan and Lephalale areas, including the implementation of the River Management System in the Crocodile River (West) and its tributaries. Phase 2A is the focus of this Environmental Impact Assessment.

The overall Mokolo Crocodile River (West) Water Augmentation Project Phase 2A consists of the following components:

- **Water Transfer Infrastructure** - transfer of water from Crocodile River (West) to Lephalale;
- Borrow Pits - sourcing of construction material; and
- River Management System - manage abstractions from, and the river flow in, the Crocodile River (West) between Hartbeespoort Dam and Vlieëpoort Weir, the Moretele River from Klipvoor Dam to the confluence with the Crocodile River (West), the stretch of Elands River from Vaalkop Dam to Crocodile confluence, and also the required flow past Vlieëpoort.

This Scoping Report specifically deals with the Water Transfer Infrastructure component.

PROJECT LOCATION

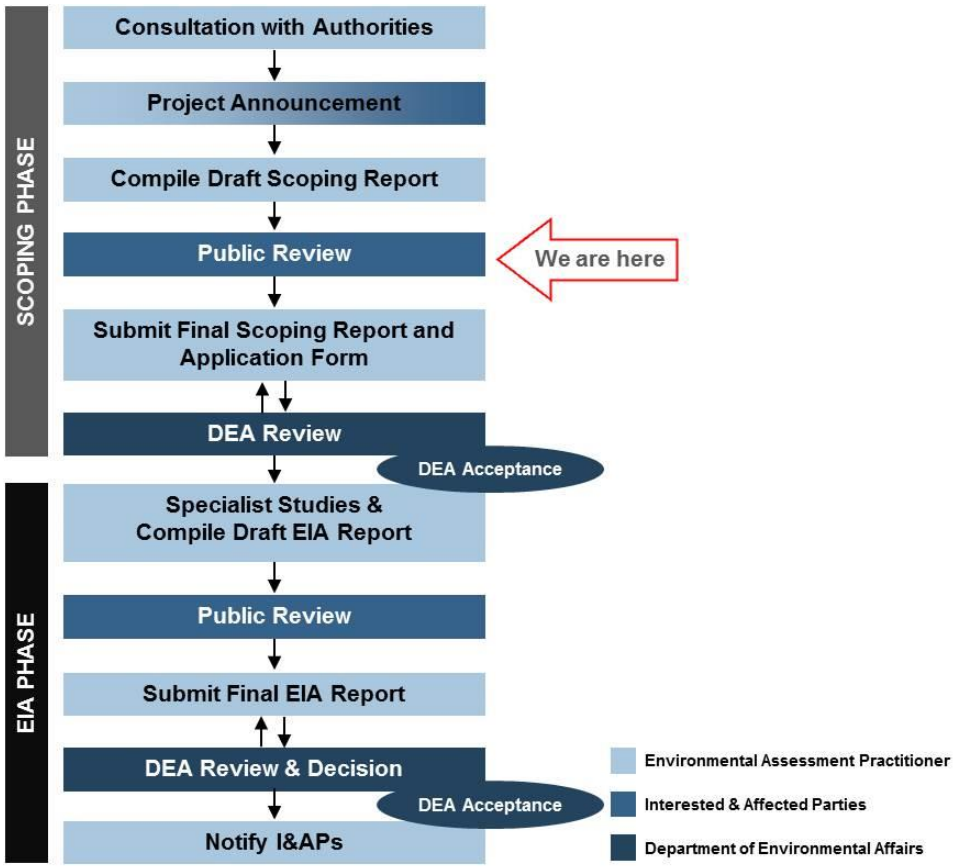
The project is located within the western part of the Limpopo Province. The footprint of the proposed Water Transfer Infrastructure traverses the Thabazimbi Local Municipality and Lephalale Local Municipality, which fall within the Waterberg District Municipality.

The proposed pipeline route commences from the Vlieëpoort Mountains at the weir site in the Crocodile River, in the south-western point of the project area. From there it runs in a

predominantly northern direction along existing roads, farm boundaries and a railway line, until it reached its destination near Steenbokpan. Thabazimbi is situated approximately 10 km to the north-east of the Vlieëpoort weir site and Lephalale is situated approximately 30 km to the east of the Alternative D1 pipeline route's terminal point. The project infrastructure is mostly located on privately-owned properties that are primarily used for agricultural practices and game-farming.

SCOPING AND EIA PROCESS

The process for seeking authorisation under the National Environmental Management Act (No. 107 of 1998) is undertaken in accordance with Government Notice No. R. 982 of 4 December 2014 (as amended), promulgated in terms of Chapter 5 of this Act. Based on the types of activities involved the requisite environmental assessment for the project is a Scoping and Environmental Impact Assessment process. An outline of the process is provided in the diagram to follow.



Outline of Scoping and Environmental Impact Assessment process

In terms of the National Environmental Management Act (No. 107 of 1998) the lead decision-making authority for the environmental assessment is the Department of Environmental Affairs, as the project proponent (Department of Water and Sanitation) is a national department. Nemai Consulting was appointed by the Department of Water and Sanitation and TCTA (implementing agent) as the independent Environmental Assessment Practitioner to undertake the environmental assessment for the proposed Mokolo Crocodile River (West) Water Augmentation Project Phase 2A: Water Transfer Infrastructure.

PROJECT DESCRIPTION

The major scheme components for the proposed Water Transfer Infrastructure include the following:

- Vlieëpoort Abstraction Weir on the Crocodile River (West);
- Low-lift Pumping Station;
- Low-lift Rising Main (2 pipes);
- Sedimentation Works;
- Balancing Reservoir;
- High-lift Pumping Station;
- High-lift Rising Main to Break Pressure Reservoir;
- Break Pressure Reservoir;
- Gravity Pipeline from Break Pressure Reservoir to Operational Reservoir;
- Operational Reservoir;
- Gravity pipeline from Operational Reservoir to Medupi Tee-off via Steenbokpan; and
- Ancillary infrastructure (gauging weirs, River Management System, access roads, accommodation, offices, workshops and security measures).

ALTERNATIVES

Alternatives are the different ways in which the project can be executed to ultimately achieve its objectives. Alternatives considered during the Technical Pre-Feasibility and Feasibility Studies and initial Environmental Screening include the following:

- Alternative water resources -
  - Ground water;
  - Re-use of effluent in the project area;
  - Mokolo Dam;
  - Crocodile water;
  - Return flows in Crocodile River (West) and Vaal River Catchments;
  - Creating more storage by raising of existing dams and/or building new dams;
  - Abstraction point at Faure Weir; and
  - Water transfer from rivers beyond the borders of South Africa.

The alternatives to the project components that are further discussed in the Scoping Report include route options for the transfer and delivery systems.

As a standard practice and to satisfy regulatory requirements, the option of not proceeding with the project is included in the evaluation of the alternatives.

PROFILE OF THE RECEIVING ENVIRONMENT

The Scoping Report provides a general description of the status quo of the receiving environment in the project area. This serves to provide the context within which the Scoping exercise was

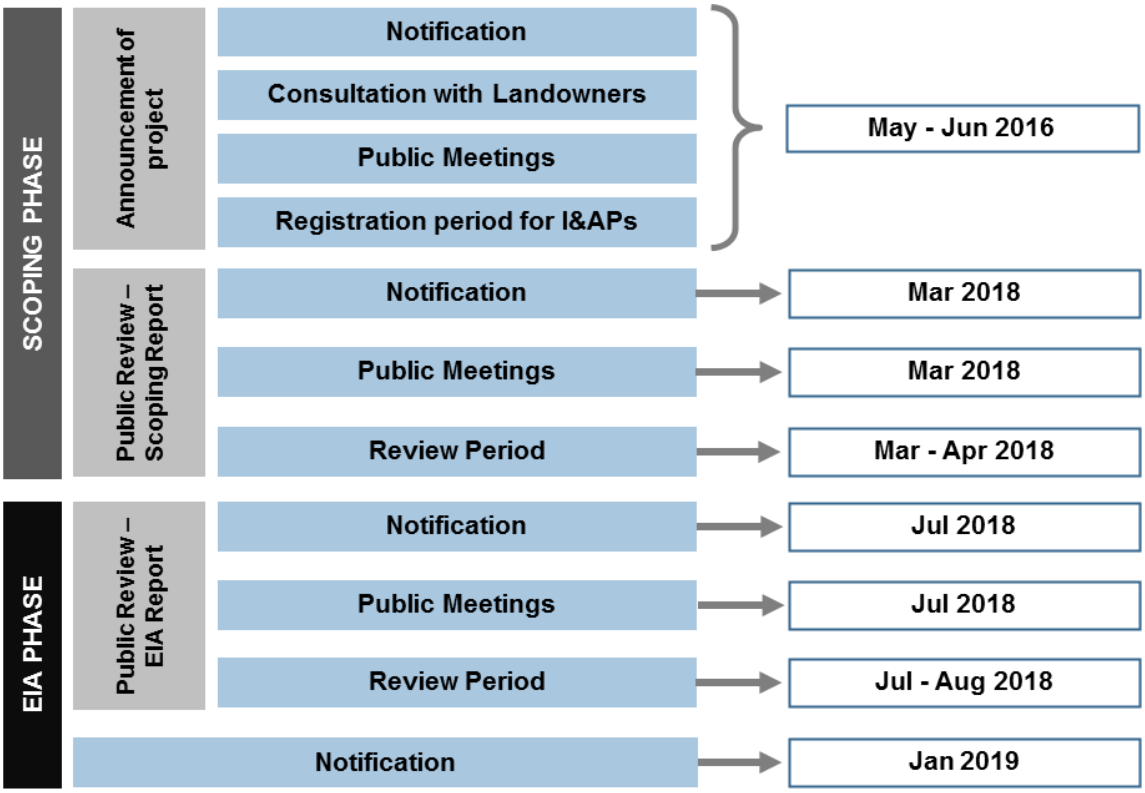
conducted. It also allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project. A brief overview is also provided of the manner in which the environmental features may be affected (positively or negatively) by the proposed project.

The receiving environment is assessed and discussed in terms of the following:

- Land Use and Land Cover;
- Climate;
- Geology;
- Geohydrology;
- Soils;
- Topography;
- Surface Water;
- Terrestrial Ecology;
- Socio-Economic Environment;
- Agriculture;
- Air quality;
- Noise;
- Historical and Cultural Features;
- Planning;
- Existing Structures and Infrastructure;
- Transportation;
- Aesthetic Qualities; and
- Tourism.

PUBLIC PARTICIPATION

The diagram to follow outlines the public participation process for the Scoping (current) and Environmental Impact Assessment (pending) phases.



Outline of Public Participation Process

POTENTIALLY SIGNIFICANT ENVIRONMENTAL ISSUES

In accordance with the purpose of the Scoping exercise as part of the overall environmental assessment, the Scoping Report identifies potentially significant environmental issues for further consideration and prioritisation during the Environmental Impact Assessment phase. This allows for a more efficient and focused impact assessment going forward, where the analysis is largely limited to significant issues and reasonable alternatives.

Pertinent environmental issues, which will receive specific attention during the Environmental Impact Assessment phase through a detailed quantitative assessment and relevant specialist and technical studies (where deemed necessary), are discussed in the Scoping Report.

Cumulative impacts will also be identified and assessed in the Environmental Impact Assessment phase by combining the potential environmental implications of Mokolo Crocodile River (West) Water Augmentation Project Phase 2A: Water Transfer Infrastructure with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the project area.

A methodology to quantitatively assess the potential impacts is also provided, which will be employed during the Environmental Impact Assessment phase.

PLAN OF STUDY FOR EIA

The Scoping Report is concluded with a Plan of Study, which explains the approach to be adopted to conduct the Environmental Impact Assessment for the proposed project in accordance with the following pertinent tasks and considerations:

- Potentially significant environmental issues identified during the Scoping Phase to be investigated further;
- Feasible alternatives to be assessed during Environmental Impact Assessment Phase;
- Specialist studies to be undertaken, which include –
  - Aquatic Impact Assessment;
  - Terrestrial Ecological Impact Assessment;
  - Heritage Impact Assessment;
  - Agricultural Impact Assessment;
  - Social Impact Assessment;
  - Socio-Economic Impact Assessment;
  - Wildlife Impact Assessment; and
  - Consideration of specialist studies conducted for previous Environmental Impact Assessment;
- Public Participation process to be followed;
- Contents of the Environmental Impact Assessment Report;

- Consultation with authorities; and
- Timeframes of the Environmental Impact Assessment.

CONCLUSION

Key outcomes of the Scoping phase are as follows:

- Stakeholders were effectively identified and were afforded adequate opportunity to participate in the scoping process;
- Alternatives for achieving the objectives of the proposed activity were duly considered;
- Potentially significant issues pertaining specifically to the pre-construction, construction and operational phases of the project were identified;
- Sensitive elements of the environment that may be affected by the project were identified;
- A Plan of Study was developed to explain the approach to executing the Environmental Impact Assessment phase, which also includes the Terms of Reference for the identified specialist studies; and
- The scoping exercise set the priorities for the ensuing Environmental Impact Assessment phase.

It is the opinion of the Environmental Impact Assessment team that Scoping was executed in an objective manner and that the process and report conform to the requirements of GN No. R 982 of 4 December 2014 (as amended). It is also believed that the Plan of Study for Environmental Impact Assessment is comprehensive and will be adequate to address the significant issues identified during Scoping, to select the Best Practicable Environmental Option, and to ultimately allow for informed decision-making.

BESTUURSOPSOMMING

PROJEK AGTERGROND EN MOTIVERING

Groot ontwikkelings word beplan vir die Waterberg Steenkool velde in die Lephalale area. As 'n direkte gevolg van die voorgenoemde ontwikkelings sal die water aanvraag in die Lephalale area noemenswaardig toeneem in die toekoms.

Weens die beperkte beskikbaarheid van water in die Lephalale area het die Departement van Water en Sanitasie die Mokolo en Krokodilrivier (Wes) Wateraanvullingsprojek Uitvoerbaarheid Studie van stapel gestuur om opsies vir die voorsiening in die water behoeftes te ondersoek. Die fases vir die voorgestelde infrastruktuur behels die volgende:

- Mokolo en Krokodilrivier (Wes) Wateraanvullingsprojek Fase 1: Aanvulling vanaf Mokolodam om aan die groeiende water behoeftes te voldoen vir die interim periode totdat die oordragpyplyne vanaf die Krokodilrivier (Wes) geïmplementeer kan word. Die oplossing moet die volle lewering vanaf Mokolodam oor die langtermyn optimaal benut en sal as 'n stelsel bedryf word tesame met die Mokolo en Krokodilrivier (Wes) Wateraanvullingsprojek Fase 2A. Fase 1 word al bedryf vanaf Junie 2015.
- **Mokolo en Krokodilrivier (Wes) Wateraanvullingsprojek Fase 2A**: Oordrag van water vanaf Krokodilrivier (Wes) tot by die Steenbokpan en Lephalale areas, insluitend die implementering van die rivierbedryfstelsel in die Krokodilrivier (Wes) en sy sytakke. Fase 2A is die fokus van die Omgewingsimpakbepaling.

Die algehele Mokolo en Krokodilrivier (Wes) Wateraanvullingsprojek Fase 2A bestaan uit die volgende komponente:

- **Wateroordraginfrastruktuur** (hoofonderwerp van hierdie Omgewingsimpakbepaling) - oordrag van water van die Krokodilrivier (Wes) na Lephalale;
- Leengroewe – verkryging van konstruksiemateriaal; en
- Rivierbedryfstelsel – bestuur ontrekkings vanaf, asook die riviervloei in, die Krokodilrivier (Wes) tussen Hartbeespoortdam en die stuwal by Vlieëpoort, die Moretelerivier vanaf Klipvoordam tot by die samevloei met die Krokodilrivier (Wes), die Elandsrivier vanaf Vaalkopdam tot by die samevloei met die Krokodilrivier (Wes), asook die vereiste vloei verby Vlieëpoort.

Die Omvangsbepalingsverslag handel spesifiek oor die voorgestelde Wateroordraginfrastruktuur.

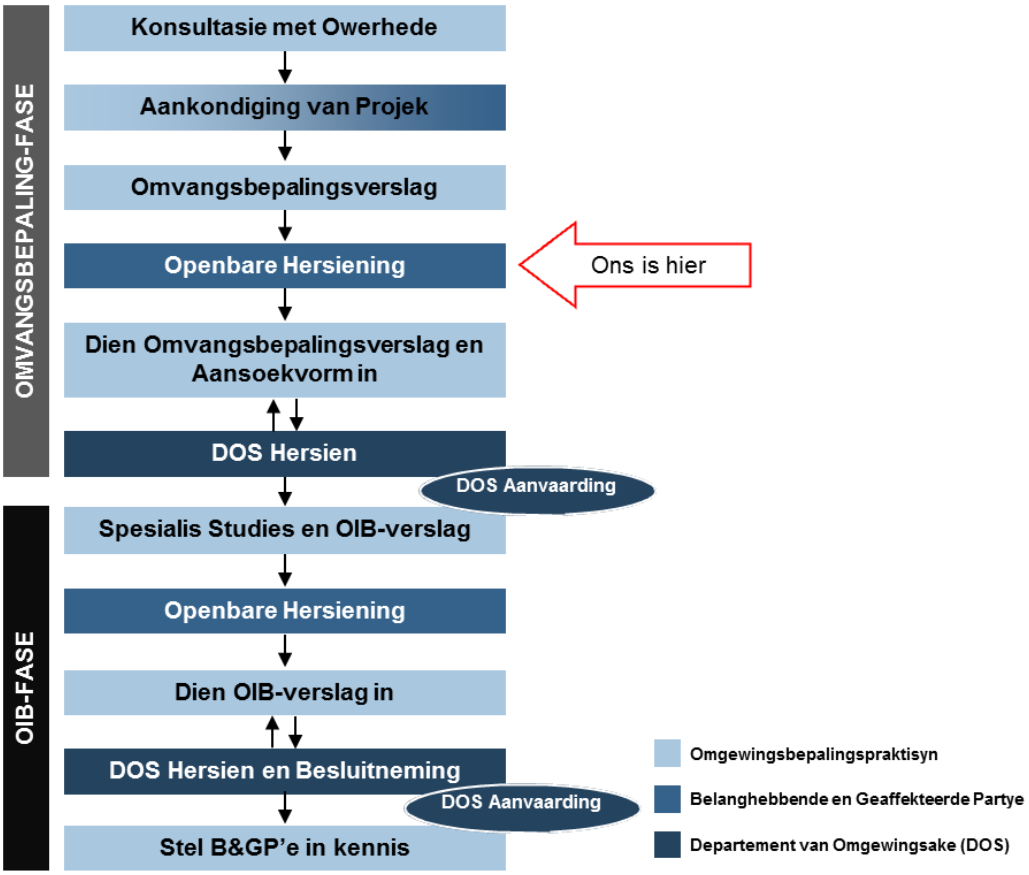
PROJEK LIGGING

Die projekgebied is geleë in die westelike gedeelte van die Limpopo-provinsie. Die voorgestelde Wateroordraginfrastruktuur oorkruis die Thabazimbi en Lephalale Plaaslike Munisipaliteite, wat beide in die Waterbergdistriksmunisipaliteit geleë is.

Die voorgestelde pyplynroete begin in die Vlieëpoortberge by die stuwal in die Krokodilrivier (Wes), in die suid-westelike gedeelte van die projek area. Van daar af volg die pyplynroete meestal 'n noordelike rigting langsaan bestaande paaie, plaasgrense en 'n spoorlyn tot by Steenbokpan. Thabazimbi is ongeveer 10 km noord-oos van die Vlieëpoort stuwal en Lephalale is ongeveer 30 km oos van die eindpunt van die Alternatief D1 pyplynroete. Die projekinfrastruktuur is meestal geleë op private eiendom wat hoofsaaklik benut word vir landbou en wildsboerdery.

OMVANGSBEPALING EN OMGEWINGSIMPAKBEPALING-PROSES

Die aansoekproses vir magtiging van die Wet op Nasionale Omgewingsbestuur (Wet Nr. 107 van 1998) word onderneem ingevolge die Omgewingsimpakbepalingsregulasies (Staatskennisgewing Nr. R. 982 van 4 Desember 2014, soos gewysig). Op grond van die gelyste aktiwiteite wat deur die Wateroordraginfrastruktuur genoodsaak word, sal 'n Omvangsbepaling en Omgewingsimpakbepaling-proses uitgevoer word. Verwys na die diagram vir 'n oorsig van die proses.



Oorsig van Omvangsbepaling en Omgewingsimpakbepaling-proses

Ingevolge die Wet op Nasionale Omgewingsbestuur (Wet Nr. 107 van 1998) is die besluitnemende owerheid die Departement van Omgewingsake, aangesien die projekvoorsteller (Departement van Water en Sanitasie) 'n Nasionale Departement is. Nemai Consulting is aangestel deur DWS en TCTA (Implementeringsagent) as die onafhanklike Omgewingsimpakbepalingspraktisyn om die

Omgewingsimpakbepaling-proses uit te voer vir die Mokolo en Krokodilrivier (Wes) Wateraanvullingsprojek Fase 2A: Wateroordraginfrastruktuur.

PROJEKBESKRYWING

Die hoofkomponente van die voorgestelde Wateroordraginfrastruktuur behels die volgende:

- Vlieëpoort onttrekkingstuwal in die Krokodilrivier (Wes);
- Laedruk- pompstasie;
- Laedruk-styghoofleiding;
- Ontslikkingswerke;
- Balanseerdamme;
- Hoëdruk-pompstasie;
- Hoëdruk-styghoofleiding tot by Drukbreekreservoir;
- Drukbreekreservoir;
- Gravitasiepyplyn vanaf Drukbreekreservoir tot by Operasionele bergingsdam;
- Operasionele bergingsdam;
- Gravitasiepyplyn vanaf Operasionele bergingsdam tot by Steenbokpan-gebied; en
- Aanvullende infrastruktuur (riviermeetstasies, rivierbedryfstelsel, toegangspaaie, akkommodasie, kantore, werkswinkels en sekuriteitsmaatreëls).

ALTERNATIEWE

Alternatiewe opsies ten opsigte van 'n Omgewingsimpakbepaling behels die verskillende maniere waarop 'n projek uitgevoer van word om uiteindelik dieselfde doelwitte te bereik. Opsies wat oorweeg was tydens die voor-uitvoerbaarheid- en uitvoerbaarheid studies sluit in die volgende:

- Alternatiewe waterbronne –
  - Grondwater;
  - Hergebruik van afvalwater;
  - Mokolodam;
  - Water vanaf die Krokodilrivier;
  - Terugvloeie in Krokodilrivier (Wes) en Vaalrivier Opvangsgebiede;
  - Skep addisionele berging deur bestaande damme te verhoog en/of om nuwe damme te bou;
  - Onttrekkingspunt by Faure Stuwal; en
  - Water oordrag vanaf riviere buite Suid Afrika se grense.

Die projek-alternatiewe wat verder in die Omvangsbepalingsverslag bespreek word sluit in verskillende pyplynroetes vir die oordrag en lewerings-stelsels. Volgens gewone praktyk en ter bevrediging van wetlike vereistes word die opsie van geen-ontwikkeling ook in ag geneem.

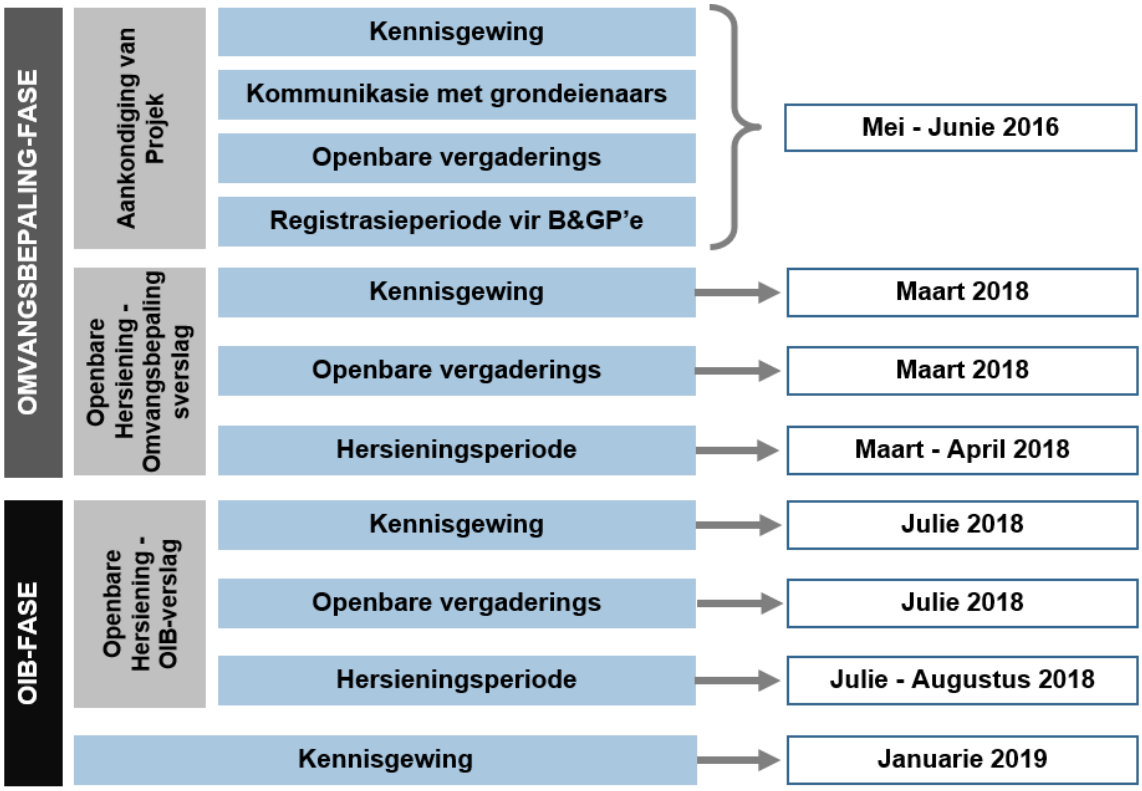
OORSIG VAN GEAFFEKTEERDE OMGEWING

Die Omvangsbepalingsverslag gee 'n algemene beskrywing van die stand van die omgewing in die projek area, wat vir die inagneming van sensitiewe omgewingskenmerke en moontlike geaffekteerde partye van die voorgestelde projek voorsiening maak. Die moontlike gevolge van die projek op die volgende kenmerke word bespreek op 'n kwalitatiewe vlak:

- Grondgebruik;
- Klimaat;
- Geologie;
- Geohidrologie;
- Grond;
- Topografie;
- Oppervlak water;
- Terrestriële Ekologie;
- Sosio-Ekonomiese Omgewing;
- Landbou;
- Lug Kwaliteit;
- Geraas;
- Historiese en Kulturele Kenmerke;
- Beplanning;
- Bestaande strukture en infrastruktuur;
- Vervoer;
- Visuele Kwaliteit; en
- Toerisme.

OPENBARE DEELNAME

Die gepaargaande diagram voorsien 'n oorsig van die openbare deelname proses vir die Omvangsbepaling en Omgewingsimpakbepaling fases.



Openbare Deelname Proses

MOONTLIKE BEDUIDENDE OMGEWINGSIMPAKTE

Volgens die doel van die Omvangsbepaling word die moontlike betekenisvolle omgewingsimpakte geïdentifiseer vir verdere ondersoek tydens die Omgewingsimpakbepaling-fase. Dit bevorder 'n meer effektiewe impak-assessering wat fokus op beduidende kwessies en uitvoerbare alternatiewe.

Daar sal aandag geskenk sal word aan die pertinente omgewingskwessies tydens die Omgewingsimpakbepaling-fase deur middel van 'n gedetailleerde kwantitatiewe assessering en relevante spesialis en tegniese studies (waar nodig geag).

Kumulatiewe impakte sal ook tydens die Omgewingsimpakbepaling-fase geïdentifiseer en geassesseer word deur die moontlike omgewingskwessies wat verband hou met die Mokolo en Krokodilrivier (Wes) Wateraanvullingsprojek Fase 2A: Wateroordraginfrastruktuur te kombineer met die impakte van projekte en aktiwiteite wat in die verlede plaasgevind het, of huidiglik plaasvind, of voorgestel word vir die toekoms binne die projek area.

Die Omvangsbepalingsverslag voorsien ook 'n metode om die moontlike impakte te assesseer wat tydens die Omgewingsimpakbepaling-fase toegepas sal word.

PLAN VAN STUDIE VIR OMGEWINGSIMPAKBEPALING

Die Omvangsbepalingsverslag sluit in 'n Plan van Studie wat die benadering tot die Omgewingsimpakbepaling verduidelik in terme van die volgende:

- Moontlike betekenisvolle omgewingsimpakte geïdentifiseer tydens die Omvangsbepaling wat verder ondersoek gaan word;
- Uitvoerbare alternatiewe wat geassesseer sal word tydens die Omgewingsimpakbepaling-fase;
- Spesialis-studies wat uitgevoer gaan word -
  - Terrestriële Ekologiese Impakassessering;
  - Akwatiese Impakassessering;
  - Erfenis Impakassessering;
  - Landbou Impakassessering;
  - Sosiale Impakassessering;
  - Sosio-ekonomiese Impakassessering;
  - Wild Impakassessering;
  - Inagneming van spesialis-studies wat uitgevoer was as deel van die vorige Omgewingsimpakbepaling;
- Die Openbare Deelname proses wat gevolg gaan word;
- Inhoud van die Omgewingsimpakbepalingsverslag;
- Konsultasie met owerhede; en
- Tydsraamwerk van die Omgewingsimpakbepaling.

GEVOLGTREKKING

Sleuteluitkomste van die Omvangsbepalings-fase sluit in die volgende:

- Belanghebbende en Geaffekteerde Partye was geïdentifiseer en die geleentheid gegun om deel te neem aan die Omvangsbepaling;
- Alternatiewe om die projek se doelwitte te bereik was in ag geneem;
- Moontlike betekenisvolle kwessies rakende die projek-lewensiklus was geïdentifiseer;
- Sensitiewe omgewingskenmerke wat moontlike deur die projek geaffekteer kan word was geïdentifiseer;
- ’n Plan van Studie was saamgestel wat die benadering tot die Omgewingsimpakbepaling-fase voorsien, insluitend die terme van verwysing vir die geïdentifiseerde spesialis-studies; en
- Die Omvangsbepaling stel die prioriteite vir die daaropvolgende Omgewingsimpakbepaling-fase.

Die Omgewingsimpakbepaling-span is van mening dat die Omvangsbepaling objektief uitgevoer was en dat die proses en verslag voldoen aan die vereistes van Staatskennisgewing Nr. R. 982 van 4 Desember 2014 (soos gewysig). Die Plan van Studie vir die Omgewingsimpakbepaling word ook beskou as omvattend en genoegsaam om die beduidende kwessies aan te spreek wat geïdentifiseer was tydens die Omvangsbepaling om sodoende die beste uitvoerbare omgewingsopsie te selekteer en om ingeligte besluitneming te laat plaasvind.

AMENDMENTS PAGE

Date	Nature of Amendment	Amendment No.	Signature
February 2018	Draft for Review by Authorities and the Public	0	

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LIST OF FIGURES

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LIST OF ACRONYMS & ABBREVIATIONS

BID	Background Information Document
BPR	Break Pressure Reservoir
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
LDEDET	Limpopo Department of Economic Development, Environment and Tourism
DME	Department of Mineral and Energy
DMR	Department of Mineral Resources
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EWR	Ecological Water Requirements
FGD	Flue-Gas Desulphurisation
GIS	Geographical Information System
GN	Government Notice
IAPs	Interested and Affected Parties
IDP	Integrated Development Plan
IPP	Independent Power Producer
IRP	Integrated Resource Plan
MAR	Mean Annual Runoff
MCWAP	Mokolo Crocodile (West) Water Augmentation Project
MCWAP-2A	Mokolo Crocodile (West) Water Augmentation Project Phase 2A
NEMA	National Environmental Management Act (No. 107 of 1998)
OHS	Occupational Health and Safety
OR	Operational Reservoir
PGDS	Provincial Growth and Development Strategy
PLC	Programmable Logic Controller
PMF	Probable Maximum Flood
RHP	River Health Programme
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SIPs	Strategic Integrated Projects
SMA	Scheme Management Authority
TAU-SA	Transvaal Agricultural Union South Africa

TCTA	Trans-Caledon Tunnel Authority
TD	Terminal Dam
ToR	Terms of Reference
UNESCO	United Nations Educational, Scientific and Cultural Organization
VSD	Variable Speed Drive
WMA	Water Management Area
WRC	Water Research Commission
WSDP	Water Services Development Plan
WWTW	Wastewater Treatment Works

UNITS OF MEASUREMENT

°C	Degrees Celsius
ha	Hectare
km	Kilometre
km^2	Square kilometre
kV	Kilovolt
l	Litres
l/s	Litres per second
m	Metre
m^3	Cubic metre
m^3/a	Cubic metre per annum
mm	Millimetre
Mm^3	Million m^3
Mm^3/a	Million m^3/a
MVA	Megavolt-ampere
%	Percentage

1 PURPOSE OF THIS DOCUMENT

Water demand will increase in the Lephalale area due to various planned and anticipated developments associated with the Waterberg coalfields. The Department of Water and Sanitation (DWS) commissioned the Proposed Mokolo and Crocodile River (West) Water Augmentation Project (MCWAP) Feasibility Study to investigate the options for meeting the aforementioned water requirements.

Nemai Consulting was appointed by DWS and the Trans Caledon Tunnel Authority (TCTA) (implementing agent) to conduct the Environmental Impact Assessment (EIA) for MCWAP Phase 2A (MCWAP-2A) in terms of Government Notice (GN) No. R. 982 of 4 December 2014 (as amended). This document serves as the **draft Scoping Report** for the proposed **MCWAP-2A Water Transfer Infrastructure** (WTI), which consists of the following:

- Weir and abstraction infrastructure, including a balancing dam, desilting woks, and a high-lift pump station at Vlieëpoort (near Thabazimbi);
- Transfer system (approximately 100 km);
- Break Pressure Reservoir;
- Operational Reservoir;
- Delivery system, consisting of a gravity pipeline (approximately 30km) running from the Operational Reservoir to the terminal point near Steenbokpan; and
- Gauging weirs.

The purpose of Scoping, which constitutes the first phase of the overall Environmental Impact Assessment (EIA) process, includes the following (amongst others):

- Identify the legal framework in terms of the proposed project;
- Identify and engage with Interested and Affected Parties (IAPs) and allow for adequate participation in the process;
- Assess the receiving environment in terms of current state and potential positive or negative impacts;
- Duly consider alternatives for achieving the project's objectives;
- Identify significant issues to be investigated further during the execution of the EIA phase;
- Determine the scope of the ensuing EIA phase, in terms of specialist studies, public participation, assessment of impacts and appraisal of alternatives; and
- Allow for informed decision-making with regard to the EIA process.

2 DOCUMENT ROADMAP

As a minimum, the Scoping Report aims to satisfy the requirements stipulated in Appendix 2 of GN No. R 982 of 4 December 2014 (as amended). **Table 1** presents the document's composition in terms of the aforementioned regulatory requirements.

Table 1: Scoping Report Roadmap

Chapter	Title	Correlation with GN No. R 982, Appendix 2	Overview
1	Purpose of this Document	–	–
2	Document Roadmap	–	–
3	Project Background and Motivation	2(1)(f)	A motivation for the need and desirability for the proposed development.
4	Project Location	2(1)(b) & 2(1)(c)	A description of the location of the activity.
5	Legislation and Guidelines Considered	2(1)(e)	A description of the policy and legislative context within which the development is proposed.
6	Scoping and EIA Process	2(1)(a)	Details of Environmental Assessment Practitioner (EAP) who prepared the report and the expertise of the EAP.
7	Assumptions & Limitations	–	–
8	Need & Desirability	2(1)(f)	A motivation for the need and desirability for the proposed development.
9	Project Description	2(1)(c) & 2(1)(d)	A description of the scope of the proposed activity.
		2(1)(g)(i)	Details of all the alternatives considered.
		2(1)(g)(vii)	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected.
10	Profile of the Receiving Environment	2(1)(g)(iv)	Environmental attributes associated with the alternatives.
		2(1)(g)(vii)	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected.
11	Public Participation	2(1)(g)(ii)	Details of the public participation process.
		2(1)(g)(iii)	A summary of the issues raised by IAPs.
12	Potentially Significant Environmental Issues	2(1)(g)(v)	Impacts and risks identified for each alternative.
		2(1)(g)(vii)	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected.
		2(1)(g)(vi)	The methodology used in identifying and ranking the potential environmental impacts and risks associated with the alternatives.
13	Plan of Study for EIA	2(1)(h)	A plan of study for undertaking the environmental impact assessment process.
Appendix T		2(1)(i) and 2(1)(j)	An undertaking under oath or affirmation by the EAP.
N/A		2(1)(k)	Where applicable, any specific information required by the competent authority.
N/A		2(1)(l)	Any other matter required in terms of section 24(4)(a) and (b) of the Act.

Note that the following sections of Appendix 2 of GN No. R 982 of 4 December 2014 (as amended) will be investigated further and reported on in the Environmental Impact Report (EIR), following the execution of the relevant specialist studies and targeted public participation:

- Section 2(1)(g)(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 these impacts-*
  (a) can be reversed;
  (b) may cause irreplaceable loss of resources; and
  (c) can be avoided, managed or mitigated.

  The impacts and risks which have informed the identification of each alternative, including the nature, significance, consequence, extent, duration and probability of such identified impacts, including the degree to which these impacts -
  (a) can be reversed;
  (b) may cause irreplaceable loss of resources; and
  (c) can be avoided, managed or mitigated.
- Section 2(1)(g)(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 geographical, physical, biological, social, economic, heritage and cultural aspects.*
- Section 2(1)(g)(viii) - *The possible mitigation measures that could be applied and level of residual risk.*
- Section 2(1)(g)(ix) - *The outcome of the site selection matrix.*
- Section 2(1)(g)(xi) - *A concluding statement indicating the preferred alternatives, including preferred location of the activity.*

3 PROJECT BACKGROUND AND MOTIVATION

3.1 National Development Context

The South African Government adopted a National Infrastructure Plan in 2012 that intends to transform our economic landscape while simultaneously creating significant numbers of new jobs, and to strengthen the delivery of basic services. The plan also supports the integration of African economies. The National Infrastructure Plan consists of 18 Strategic Integrated Projects (SIPs) spread across the country.

SIP 1 aims to unlock SA's northern mineral belt in one of the poorest provinces (Limpopo) through key infrastructure provision in the Waterberg and Steelpoort districts, initiating new energy and industrial development, shifting coal from road to rail in Mpumalanga and increasing rail capacity to Richards Bay whilst supporting regional integration. 15% of the country's total power generation is situated in Waterberg. The assurance of water supply to the current power stations is not acceptable and places the country's power supply at risk. The components associated with SIP 1 thus include the proposed MCWAP-2. The former Minister of Water Affairs approved the implementation of MCWAP-1 (MCWAP Phase 1), MCWAP-2A (MCWAP Phase 2A) and MCWAP-3 (MCWAP Phase 3) as government waterworks in terms of Section 109 of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) on 14 May 2010, subject to the environmental authorisation of the project by the Department of Environmental Affairs (DEA). The MCWAP-3 (River Management System) was since merged with MCWAP-2A.

3.2 Increased Need for Water in the Lephalale Area

The Lephalale municipal area falls in the Limpopo catchment. The Mokolo (previously known as the Mogol) and the Lephalala (also referred to as the Phalala) rivers run through the municipal area to the north, with the Matlabas River running along the south eastern boundary and the Mogalakwena River along the eastern boundary. All four rivers feed into the Limpopo River which forms the north western border of South Africa with Botswana.

The Mokolo Dam (formerly known as the Hans Strijdom Dam) was constructed in the late 1970s and completed in July 1980, to supply water to Matimba Power Station, Grootegeluk Mine, Lephalale (Ellisras) Municipality and for irrigation downstream of the dam. Based on the water infrastructure, the current water availability and water use allows only limited spare yield existing for future allocations for the anticipated surge in

Box 1:	Why is water needed in Lephalale?

Water demand will increase in the Lephalale area due to the following planned and anticipated consequential developments due to the Waterberg coalfields:

- Construction of Eskom's Medupi Power Station;
- Possible development of further Eskom power stations;
- Possible development of power stations by Independent Power Producers (IPPs);
- Extension of the Grootegeluk mining operations and further mines;
- Possible exploitation of gas; and
- Accelerated growth in the population in the area.

economic development in the area.

Large parts of the Mokolo River catchment area are located on the Waterberg coalfields (refer to **Figure 1**) where, according to preliminary estimates, almost half of South Africa's in-situ coal reserves are situated. As such, the Waterberg has long been considered the country's major coal resource for the future, especially once the current mining areas in the Witbank-Highveld coalfields of the Mpumalanga province have been depleted (DWAF, 2008a). As a result, major developments are planned for the Lephalale area. As a direct result of the above developments, the demand for water in the Lephalale area is expected to significantly increase into the future.

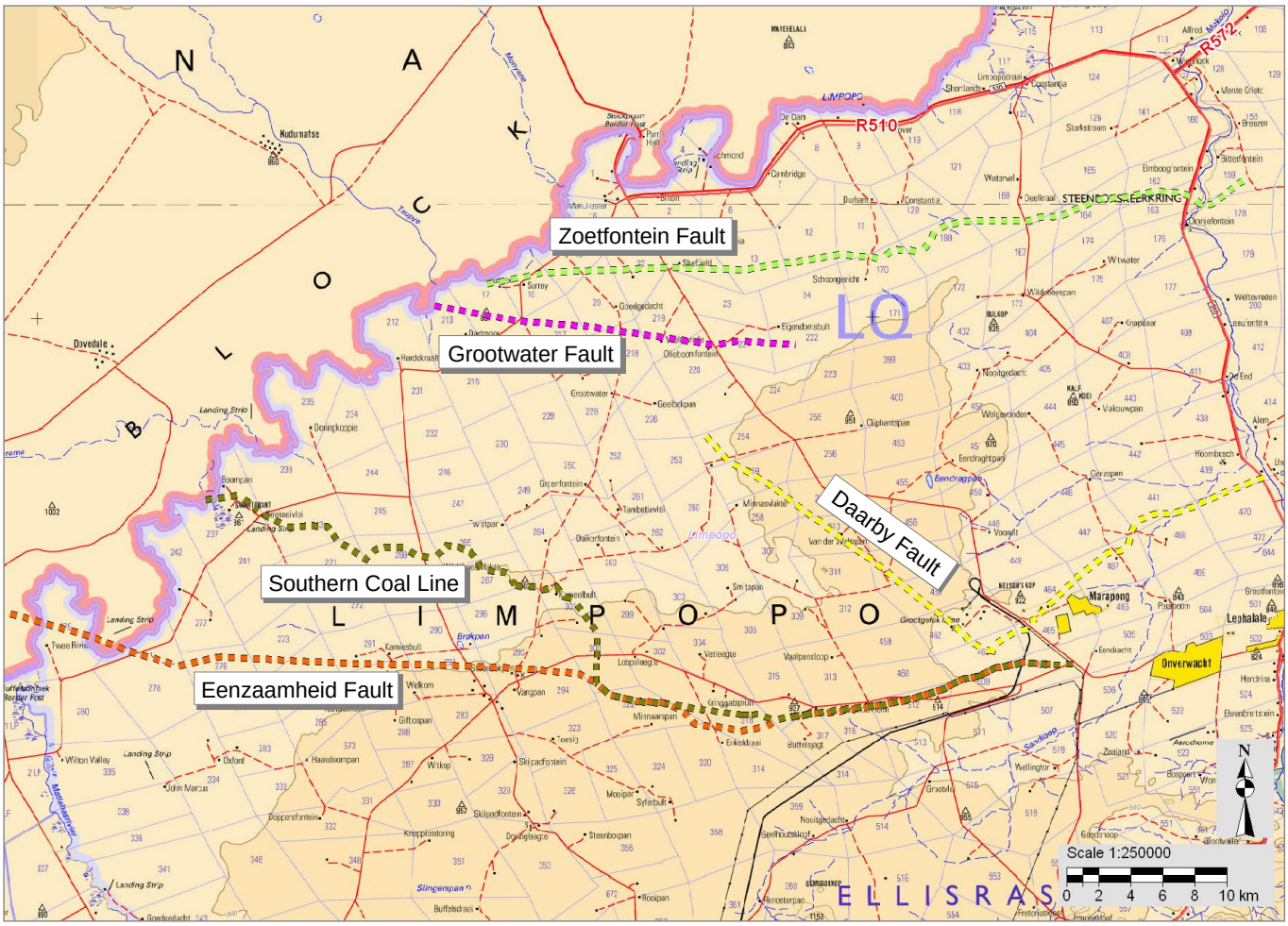


Figure 1: Fault lines of the Waterberg Coalfield

3.3 Inter-Basin Transfers In

According to the Crocodile River (West) Reconciliation Strategy 2015 (DWS, 2015), transfers of water into the catchment from the Vaal by Rand Water supplies a majority of the domestic water requirements in the larger Metros in the Southern Part of the catchment (see **Figure 2**).

The current and projected transfers into the Crocodile River (West) catchment from the Vaal River system by Rand Water for domestic supply are shown in **Table 2**.

Table 2: Projected water future transfer volumes into the Crocodile River (West) catchment from the Vaal by Rand Water for domestic water supply

	Projected transfers into the Crocodile River catchment (million m^3/a)						
	2010	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Rand Water supply	523	524	577	624	686	725	765

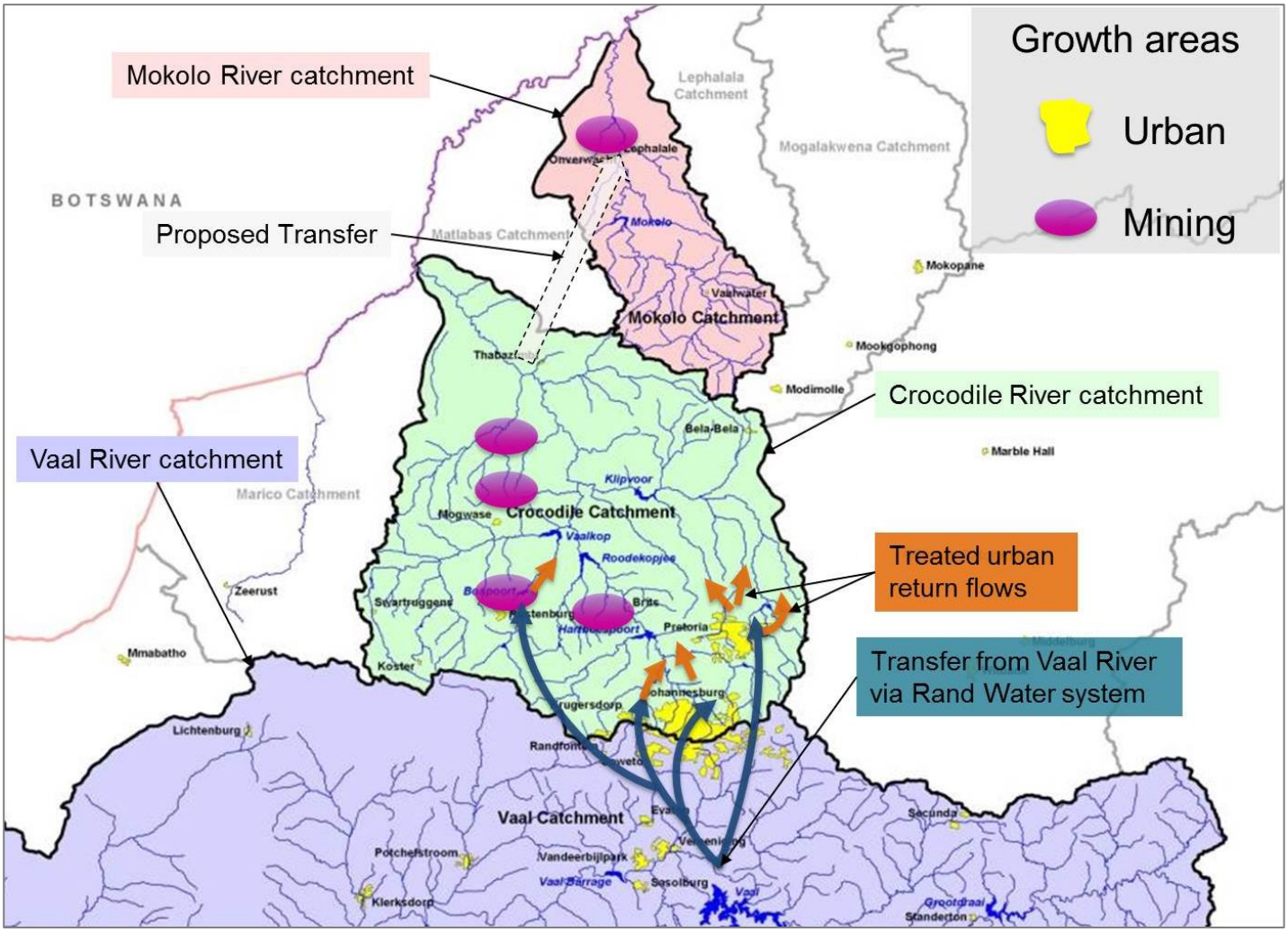


Figure 2: Context of the Crocodile West System

3.4 Meeting the Increased Water Demands

Due to the limited availability of water in the Lephalale area, the DWS conducted a feasibility study (completed in 2010) of the MCWAP to establish how the future water demands could be met. The phases of the proposed project include (shown in **Figure 3**):

- **MCWAP Phase 1 (MCWAP-1):** Augment the supply from Mokolo Dam to supply in the growing water use requirement for the interim period until a transfer pipeline from the Crocodile River West can be implemented. The solution must over the long term optimally utilise the full yield from Mokolo Dam and will be operated as a system together with MCWAP-

2A when the latter is completed. Phase 1 is operational since June 2015. The pipeline section between Lephalale to Steenbokpan was not constructed as part of MCWAP-1 as originally envisaged, and will form part of the construction contract/s for MCWAP-2A. However, the environmental authorisation for this section was received as part of the EIA for MCWAP-1.

- **MCWAP-2A:** Transfer water from the Crocodile River (West) to the Steenbokpan and Lephalale areas, including the implementation of the River Management System in the Crocodile River (West) and its tributaries. Phase 2A is the focus of this EIA.

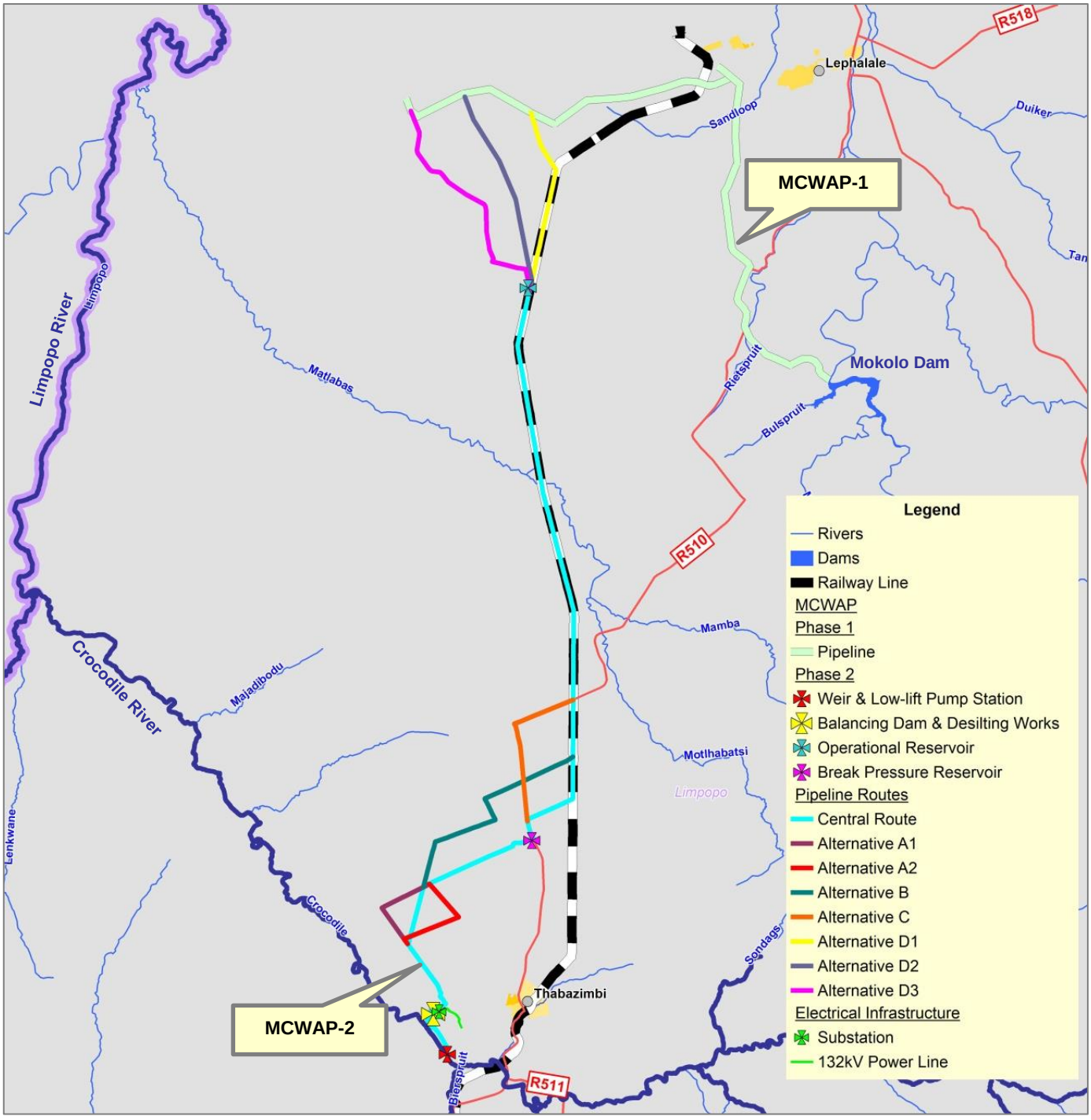


Figure 3: MCWAP Phases 1 and 2
(Note: gauging weirs not shown)

In essence, water from the Mokolo Dam will primarily be provided to existing consumers such as Matimba Power Station, Municipal users in the vicinity of Lephalale (Ellisras), as well as the new Medupi Power Station (partly), while the Crocodile River (West) Transfer Scheme will provide water to the new consumers such as Eskom.

It was originally intended that construction of the two MCWAP phases should start concurrently, but with the smaller Phase 1 Scheme being able to deliver water much sooner than Phase 2. However, due to significant changes occurring in the national energy planning environment and their related water demand figures compared to the demand scenarios considered during the 2010 Feasibility Study, the implementation of MCWAP-2A was placed on hold. This decision was informed by two main aspects:

- Firstly by the Department of Energy's (DoE) Integrated Resource Plan (IRP 2010) published in March 2011 and updated in November 2013, which redefined the country's future electric power supply energy mix. The latest IRP was updated in November 2016 and final approval is still awaited at the time of this report; and
- Secondly by Sasol's decision to cancel their plans for developing a coal to liquid fuel facility in the project area called Project Mafutha.

In order to address the impact of the reduced water demand from the revised energy planning process, DWS initiated a Post Feasibility Bridging Study to review and update the Feasibility Study findings for MCWAP-2A. The important development principles that have been formulated in the Feasibility Study reports remain relevant. These documents still inform the basic configuration, design, construction and operation of the MCWAP. The bridging study aimed to redefine the capacity required for MCWAP-2A.

The MCWAP will also aim to satisfy most of the water requirements of the new anticipated developments from the increasing source of return flows from the Gauteng area. Operating rules for both the Mokolo and the Crocodile River (West) systems need to be developed by DWS in a separate process and must take cognisance of this and ensure that existing lawful use is respected and protected. Similarly, it is a legal requirement that provision is made for meeting the requirements of the Reserve, as catered for in the National Water Act (Act No. 36 of 1998).

3.5 Water Requirements

The water requirements of users in the MCWAP System were obtained from the Post Feasibility Bridging Study Report. They are reflected in **Table 3** and shown in **Figure 4** and are aligned to a transfer capacity of 75 million m^3/a, which is marginally (<10%) less than the maximum requirements beyond 2040.

Table 3: Combined Water Requirement Projection for the MCWAP in million m^3/a

USER GROUP	2019	2020	2025	2030	2035	2040	2045	2050
Committed Commercial Users (Eskom & Exxaro)	**23,92**	**27,02**	**34,62**	**42,75**	**42,75**	**42,75**	**42,75**	**42,75**
Eskom	**11,90**	**14,00**	**19,00**	**26,60**	**26,60**	**26,60**	**26,60**	**26,60**
Matimba Power Station	3,60	3,60	3,60	11,20	11,20	11,20	11,20	11,20
Medupi Power Station	8,30	10,40	15,40	15,40	15,40	15,40	15,40	15,40
Exxaro	**12,02**	**13,02**	**15,62**	**16,15**	**16,15**	**16,15**	**16,15**	**16,15**
IPP Exxaro Initiative	0,77	0,77	1,42	1,95	1,95	1,95	1,95	1,95
Exxaro Mine (Matimba and Medupi)	6,16	6,38	6,81	6,54	6,54	6,54	6,54	6,54
Mpumalanga	1,24	1,40	2,07	2,23	2,23	2,23	2,23	2,23
Export	0,85	0,95	1,21	1,26	1,26	1,26	1,26	1,26
Industrial	3,00	3,52	4,11	4,17	4,17	4,17	4,17	4,17
DoE Future Users	**5,86**	**10,60**	**24,51**	**40,18**	**43,79**	**42,99**	**53,79**	**53,79**
CF3 Power Generation	0,20	0,20	0,37	15,50	15,50	15,50	15,50	15,50
IPP other	0,17	0,33	0,50	0,50	0,50	0,50	0,50	0,50
CF3 Mines	2,06	2,06	5,54	6,00	6,00	6,00	6,00	6,00
Mpumalanga	3,43	5,48	8,05	8,35	11,00	10,60	16,00	16,00
Industrial	0,00	0,94	2,59	2,66	2,66	2,66	2,66	2,66
Export	0,00	1,58	7,46	7,17	8,13	7,73	13,13	13,13
Social Users	**11,96**	**12,47**	**13,02**	**14,08**	**13,97**	**14,02**	**14,20**	**14,39**
Lephalale Municipality	11,96	12,47	13,02	14,08	13,97	14,02	14,20	14,39
Total requirements excluding Incidental Users	**41,74**	**50,09**	**72,15**	**97,01**	**100,51**	**99,76**	**110,74**	**110,93**
Incidental Users	**0,40**	**0,40**	**0,40**	**0,40**	**0,40**	**0,40**	**0,40**	**0,40**
MCWAP-1	0,10	0,10	0,10	0,10	0,10	0,10	0,10	0,10
MCWAP-2A	0,30	0,30	0,30	0,30	0,30	0,30	0,30	0,30
Total requirements including Incidental Users	**42,14**	**50,49**	**72,55**	**97,61**	**100,91**	**100,16**	**114,14**	**111,33**
Capacity MCWAP-1	**29,4**	**29,4**	**29,4**	**29,4**	**29,4**	**29,4**	**29,4**	**29,4**
Volume required in MCWAP-2A	**12,74**	**21,09**	**43,15**	**68,21**	**71,51**	**80,76**	**84,74**	**81,93**

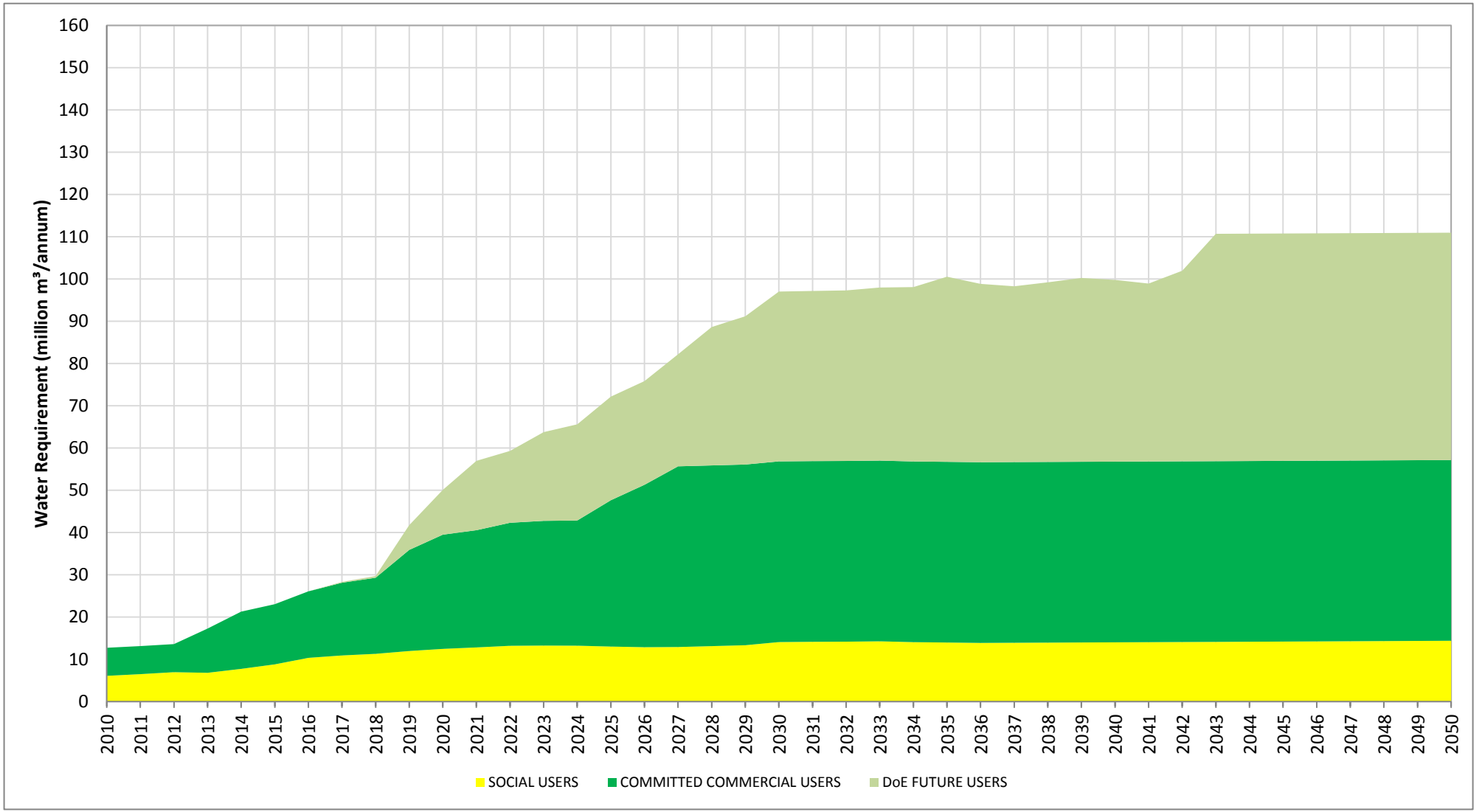


Figure 4: **Aggregated Water Requirement Projection**

3.6 MCWAP-2A Scope

The overall MCWAP-2A consists of the following components:

- WTI - transfer of water from the Crocodile River to Lephalale (refer to **Sections 9.2 – 9.7**);
- Borrow Pits - sourcing of construction material; and
- River Management System - manage abstractions from, and the river flow in, the Crocodile River (West) between Hartbeespoort Dam and Vlieëpoort Weir, the Moretele River from Klipvoor Dam to the confluence with the Crocodile River (West), the stretch of Elands River from Vaalkop Dam to Crocodile confluence, and also the required flow past Vlieëpoort (refer to **Section 9.11**).

As mentioned, this Scoping Report specifically deals with the WTI component.

3.7 DWS Project Life-cycle

The generic DWS project life cycle consists of nine stages, as shown in **Figure 5**.

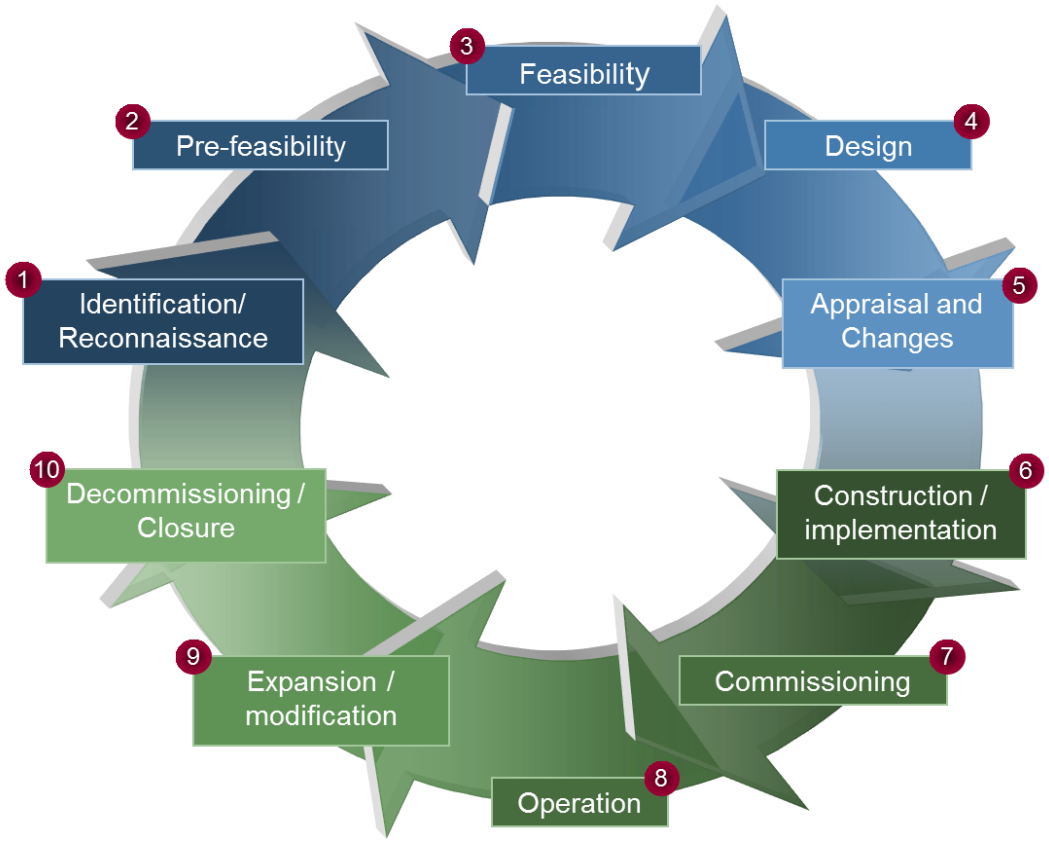


Figure 5: Generic DWS Project Life Cycle for Water Resource Management

As mentioned, DWS initiated a feasibility study in 2008 entitled “Mokolo and Crocodile River (West) Water Augmentation Project (MCWAP) Feasibility Study”. The feasibility study was commissioned to augment the water supply to the Lephalale area. The reports were completed in

September 2010. Thereafter, DWS initiated a Post Feasibility Bridging Study to review and update the Feasibility Study findings for MCWAP-2A. The following technical reports are of particular relevance to the information contained within the Scoping Report:

- P RSA A000/00/8809 - Pre-feasibility Stage: Supporting Report 1: Water Requirements;
- P RSA A000/00/8909 - Pre-feasibility Stage: Supporting Report 2: Water Resources;
- P RSA A000/00/9109 - Pre-feasibility Stage: Supporting Report 4: Dam, Weir and River Engineering;
- P RSA A000/00/9309 - Pre-feasibility Stage: Supporting Report 6: Crocodile River Transfer Scheme Options;
- P RSA A000/00/8109 - Feasibility Stage: Main Report: MCWAP Feasibility Study Technical Module Summary;
- P RSA A000/00/8609 - Feasibility Stage: Supporting Report 10: Requirements for the Sustainable Delivery of Water;
- P RSA A000/00/8309 - Feasibility Stage: Supporting Report 12: Phase 2 Feasibility Stage; and
- P RSA 000/A00/18413 - Feasibility Bridging Stage: MCWAP-2: Post Feasibility Bridging Study; Review Report.

The EIA, which takes place during the feasibility stage of the project life-cycle, makes a final recommendation on the preferred option which is submitted with motivation to management for approval and funding.

4 PROJECT LOCATION

4.1 Geographical Context

The project is located within the western part of the Limpopo Province. The footprint of MCWAP-2A WTI traverses the Thabazimbi Local Municipality (LM) and Lephalale LM, which fall within the Waterberg District Municipality (DM). Refer to **Figure 6**. The locality map is provided in **Figure 7** and an aerial view is shown in **Figure 8**. Maps are also contained in **Appendix A**.

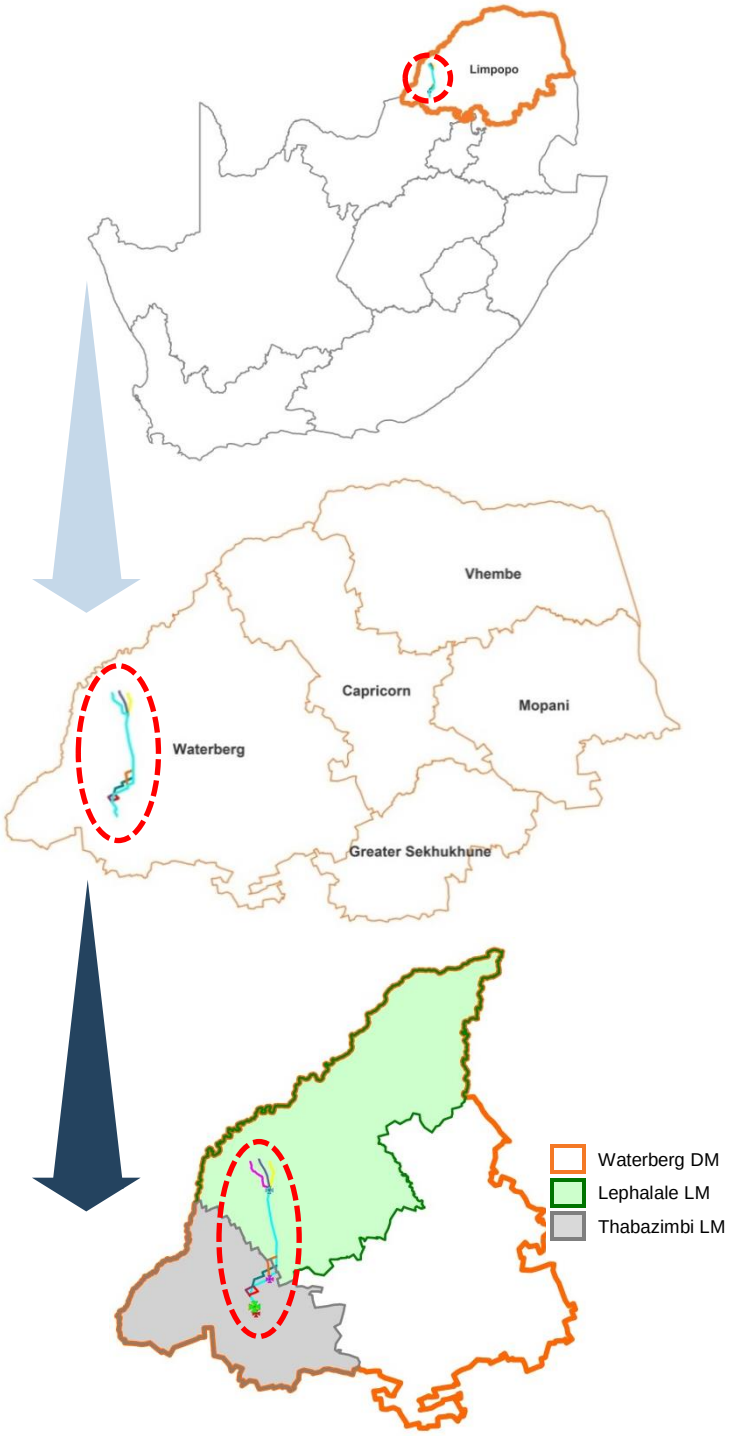


Figure 6: National, provincial and municipal maps of MCWAP-2A WTI

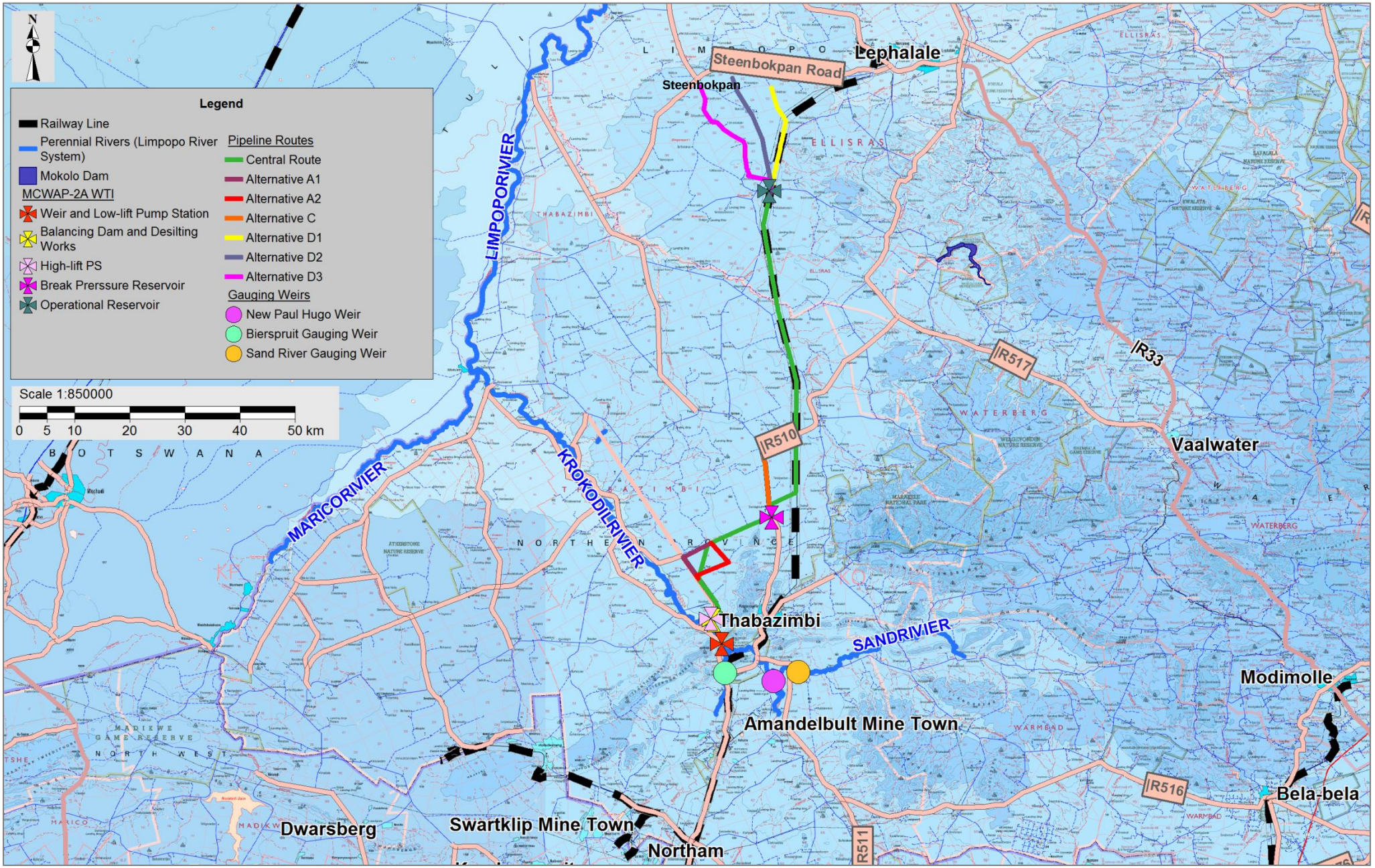


Figure 7: Locality map

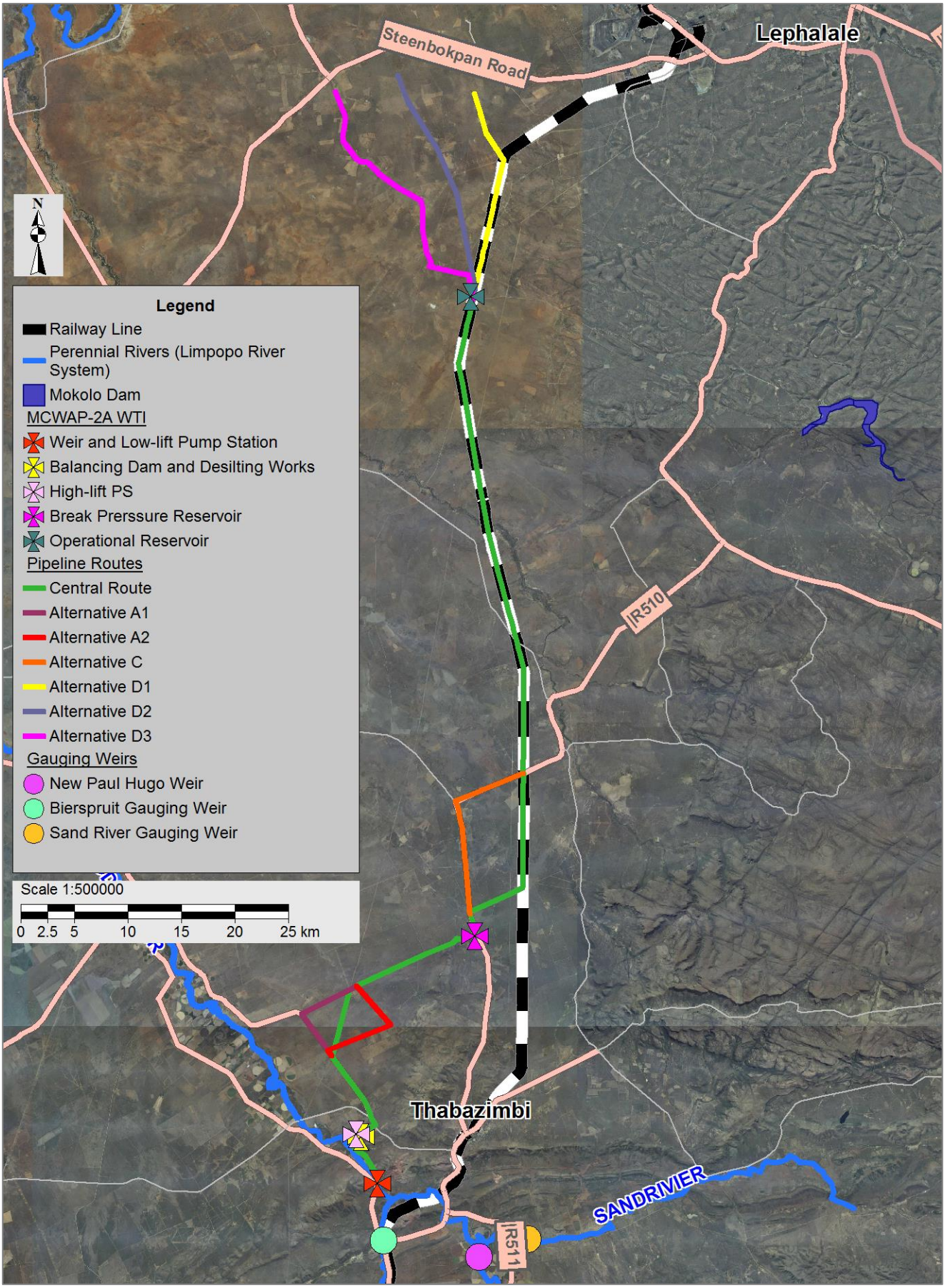


Figure 8: **Orthophotograph of MCWAP-2A WTI**

The proposed pipeline route commences from the Vlieëpoort Mountains at the weir site in the Crocodile River, in the south-western point of the project area. From there it runs in a predominantly northern direction along existing roads, farm boundaries and a railway line, until it reached its destination near Steenbokpan. A more detailed route description is provided in **Section 9.4.3** and detailed maps are contained in **Appendix B**.

Thabazimbi is situated approximately 10 km to the north-east of the Vlieëpoort weir site and Lephalale is situated approximately 30 km to the east of the Alternative D1 pipeline route's terminal point.

4.2 Affected Properties

The project infrastructure is mostly located on privately-owned properties that are primarily used for agricultural practices and game-farming.

Details of the properties that are directly affected by and adjacent to the proposed development are contained in **Appendix B**.

5 LEGISLATION AND GUIDELINES CONSIDERED

5.1 Legislation

5.1.1 Environmental Statutory Framework

The legislation that has possible bearing on the proposed project from an environmental perspective is captured in **Table 4** below. **Note:** *this list does not attempt to provide an exhaustive explanation, but rather represents an identification of the most appropriate sections from pertinent pieces of legislation*.

Table 4: Environmental Statutory Framework

Legislation	Description and Relevance	
Constitution of the Republic of South Africa, (No. 108 of 1996)	• Chapter 2 – Bill of Rights. • Section 24 – Environmental Rights.	
National Environmental Management Act (NEMA) (No. 107 of 1998)	• Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment). • Section 28 – Duty of care and remediation of environmental damage. • Environmental management principles. • Authorities – DEA (national) and Limpopo Department of Economic Development, Environment and Tourism (LDEDET) (provincial).	
GN No. R 982 of 4 December 2014	• Purpose - regulate the procedure and criteria as contemplated in Chapter 5 of NEMA relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to EIA, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto.	
GN No. R. 983 of 4 December 2014 (Listing Notice 1)	• Purpose - identify activities that would require environmental authorisations prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of NEMA. • The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of GN No. R 982 of 4 December 2014. However, according to Regulation 15(3) of GN No. R 982, S&EIR must be applied to an application if the application is for two or more activities as part of the same development for which S&EIR must already be applied in respect of any of the activities. • Activities under Listing Notice 1 that are relevant to this project follow.	
	GN No. R.983 – Activity no. 9: *The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water-* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;* *excluding where-* *(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or* *(b) where such development will occur within an urban area.*	*Water pipelines that form part of the transfer scheme, based on 75 million m^3/a transfer capacity. Pipe diameter up to 2400 mm.*
	GN No. R.983 – Activity no. 12: *The development of -* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs -*	*Various infrastructure with a physical footprint of 100 square metres or more within watercourse(s) / within 32 m from watercourse(s), including:* • *Abstraction works;* • *Gauging weirs;* • *Pipeline crossings;* • *Access roads' crossings; and*

Legislation	Description and Relevance	
	(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 -* *(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such development occurs within an urban area;* *(ee) where such development occurs within existing roads, road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.*	• *Encroachments by other project infrastructure (to be confirmed).*

	GN No. R.983 – Activity no. 13:
	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.
		• *Balancing Dam:*
		  ○ *Size - 620 x 440 m;*
		  ○ *Storage capacity – 3 days, 68 0000m³ for 75 million m³/a transfer*
		• *Break Pressure Reservoir –*
		  ○ *Dimensions - 260 x 300m;*
		  ○ *Storage capacity – 8 hours, 90 000 m^3 for 75 million m³/a;*
		• *Operational Reservoir-*
		  ○ *Dimensions - 260 x 300m;*
		  ○ *Storage capacity - 8 hours, 90 000 m^3 for 75 million m³/a.*

	GN No. R.983 – Activity no. 14: *The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.*	*"Dangerous goods" that are likely to be associated with the greater project, are fuel stores, as well as any dangerous goods to be used during the construction phase. Threshold of 80 m^3 expected to be exceeded.* *Fuel and other dangerous goods will be stored at all site establishments.*
	GN No. R.983 – Activity no. 19: *The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;* *but excluding where such infilling, depositing, dredging, excavation, removal or moving -* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or* *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.*	*Various infrastructure within watercourse(s) / within 32 m from watercourse(s), including:* • *Abstraction works;* • *Gauging weirs;* • *Pipeline crossings;* • *Access roads' crossings; and* • *Encroachments by other project infrastructure (to be confirmed).*

Legislation	Description and Relevance	
	GN No. R.983 – Activity no. 24: *The development of a road -* *(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or* *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;* *but excluding a road -* *(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;* *(b) where the entire road falls within an urban area; or* *(c) which is 1 kilometre or shorter.*	*Access roads to the various sites (construction and operational phases) are expected to exceed thresholds. Dimensions to be confirmed.*
	GN No. R.983 – Activity no. 27: *The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.*	*Clearance of large areas associated with the construction footprint, which includes the following large project components:* • *Balancing Dam - 620 x 440 m;* • *Break Pressure Reservoir - 260 x 300m;* • *Operational Reservoir - 260 x 300m;* • *Laydown areas, and* • *General site establishment.* *Status of vegetation to be confirmed as part of the Terrestrial Ecological Study.*
	GN No. R.983 – Activity no. 28: *Residential, mixed, retail, commercial, industrial or institutional developments where* *such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:* *(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or* *(ii) <u>will occur outside an urban area, where the total land to be developed is bigger than 1 hectare</u>;* *excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.*	*Footprint of project on agricultural land. This includes the Balancing Dam which is 600 m x 370 m and mostly occurs on land used for agricultural purposes, outside of an urban area.*
	GN No. R.983 – Activity no. 30: *Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).*	*Possible occurrence of sensitive biodiversity features at affected areas. To be confirmed as part of the Terrestrial Ecological Study.*
	GN No. R.983 – Activity no. 56: *The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-* *(i) where the existing reserve is wider than 13,5 meters; or* *(ii) where no reserve exists, where the existing road is wider than 8 metres;* *excluding where widening or lengthening occur inside urban areas.*	• *Access roads to the various sites (construction and operational phases). Dimensions to be confirmed.* • *Relocation of roads that will be inundated by abstraction weir.*
	GN No. R.983 – Activity no. 67: *Phased activities for all activities -* *(i) listed in this Notice, which commenced on or after the effective date of this Notice or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices;* *excluding the following activities listed in this Notice-* *17(i)(a-d);* *17(ii)(a-d);* *17(iii)(a-d);* *17(iv)(a-d);*	*Possible phased activities that may collectively trigger this listed activity.*

Legislation	Description and Relevance	
	17(v)(a-d); *20;* *21;* *22;* *24(i);* *29;* *30;* *31;* *32;* *34;* *54(i)(a-d);* *54(ii)(a-d);* *54(iii)(a-d);* *54(iv)(a-d);* *54(v)(a-d);* *55;* *61;* *64; and* *65; or* *(ii) listed as activities 5, 7, 8(ii), 11, 13, 16, 27(i) or 27(ii) in Listing Notice 2 of 2014 or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices;* *where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold*	
GN No. R. 984 of 4 December 2014 (Listing Notice 2)	• Purpose - identify activities that would require environmental authorisations prior to commencement of that activity and to identify competent authorities in terms of sections 24(2) and 24D of NEMA. • The investigation, assessment and communication of potential impact of activities must follow a Scoping and EIA process, as prescribed in regulations 21 - 24 of GN No. R 982 of 4 December 2014. • Activities under Listing Notice 2 that are relevant to this project follow.	
	GN No. R.984 – Activity no. 4: *The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.*	*"Dangerous goods" that are likely to be associated with the greater project, are fuel stores, as well as any dangerous goods to be used during the construction phase.* *Fuel and other dangerous goods will be stored at all site establishments.*
	GN No. R.984 – Activity no. 6: *The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding -* *(i) activities which are identified and included in Listing Notice 1 of 2014;* *(ii) activities which are included in the list of waste management activities published in* *terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;* *(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or* *(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.*	*Approval will be required for the scouring of sediment back to the Crocodile River from the desilting works in terms of the National Water Act (No. 36 of 1998).*

Legislation	Description and Relevance	
	GN No. R.984 – Activity no. 11: *The development of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following -* *(i) water catchments;* *(ii) water treatment works; or* *(iii) impoundments;* *excluding treatment works where water is to be treated for drinking purposes.*	*Transfer scheme from Crocodile River (West) to Lephalale with a capacity of 75 million m^3/a.*
	GN No. R.984 – Activity no. 15: *The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-* *(i) the undertaking of a linear activity; or* *(ii) maintenance purposes undertaken in accordance with a maintenance management plan.*	*Cumulative area to be cleared for entire project (except linear components) exceeds 20 hectares.* *Status of vegetation to be confirmed as part of the Terrestrial Ecological Study.*
	GN No. R.984 – Activity no. 16: *The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the highwater mark of the dam covers an area of 10 hectares or more.*	*Abstraction weir at Vlieëpoort. The lowest part of weir would be approximately 4 m - 6 m high above the river bed level.*
GN No. R. 985 of 4 December 2014 (Listing Notice 3)	• Purpose - list activities and identify competent authorities under sections 24(2), 24(5) and 24D of NEMA, where environmental authorisation is required prior to commencement of that activity in specific identified geographical areas only. • The investigation, assessment and communication of potential impact of activities must follow a Basic Assessment process, as prescribed in regulations 19 and 20 of GN No. R 982 of 4 December 2014. However, according to Regulation 15(3) of GN No. R 982, S&EIR must be applied to an application if the application is for two or more activities as part of the same development for which S&EIR must already be applied in respect of any of the activities. • Activities under Listing Notice 3 that are relevant to this project follow.	
	GN No. R.985 – Activity no. 2(e)(ii): *The development of reservoirs, excluding dams, with a capacity of more than 250 cubic metres.*	*Threshold exceeded by Break Pressure Reservoir, Operational Reservoir and Balancing Dam.* *Activity to be confirmed following Terrestrial Ecological Study.*
	GN No. R.985 – Activity no. 4(e)(i): *The development of a road wider than 4 metres with a reserve less than 13,5 metres.*	*Access roads to the various sites (construction and operational phases) are expected to exceed thresholds. Dimensions to be confirmed.* *Activity to be confirmed following Terrestrial Ecological Study.*
	GN No. R.985 – Activity no. 10(e)(i): *The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres.*	*"Dangerous goods" that are likely to be associated with the greater project, are fuel stores, as well as any dangerous goods to be used during the construction phase. Threshold of 30 m^3 expected to be exceeded. Fuel and other dangerous goods will be stored at all site establishments.* *Activity to be confirmed following Terrestrial Ecological Study.*
	GN No. R.985 – Activity no. 12(e)(i – ii): *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.*	*Clearance of large areas associated with the construction footprint.* *Activity to be confirmed following Terrestrial Ecological Study.*
	GN No. R.985 – Activity no. 14(e)(i): *The development of—* *(i) dams or weirs, where the dam or weir, including*	*Various infrastructure within watercourse(s) / within 32 m from watercourse(s), including:*

Legislation	Description and Relevance	
	infrastructure and water surface area exceeds 10 square metres; or *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.*	• *Abstraction works;* • *Gauging weirs;* • *Pipeline crossings;* • *Access roads' crossings; and* • *Encroachments by other project infrastructure (to be confirmed).* *Activity to be confirmed following Terrestrial Ecological Study.*
	GN No. R.985 – Activity no. 18(e)(i): *The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.*	*Access roads to the various sites (construction and operational phases) are expected to exceed thresholds. Dimensions to be confirmed.* *Activity to be confirmed following Terrestrial Ecological Study.*
	GN No. R.985 – Activity no. 23(e)(i): *The expansion of -* *(i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more;* *where such expansion occurs -* *(a) within a watercourse;* *(b) in front of a development setback adopted in the prescribed manner; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.*	*Upgrade of existing bridge(s) along access road(s).* *Activity to be confirmed following Terrestrial Ecological Study.*
	GN No. R.985 – Activity no. 26: *Phased activities for all activities -* *i. listed in this Notice and as it applies to a specific geographical area, which commenced on or after the effective date of this Notice; or* *ii. similarly listed in any of the previous NEMA notices, and as it applies to a specific geographical area, which commenced on or after the effective date of such previous NEMA Notices -* *where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold; -* *excluding the following activities listed in this Notice—* *7;* *8;* *11;* *13;* *20;* *21; and* *24.*	*Possible phased activities that may collectively trigger this listed activity.* *Activity to be confirmed following Terrestrial Ecological Study.*
National Water Act (Act No. 36 of 1998)	• Chapter 3 – Protection of water resources. • Section 19 – Prevention and remedying effects of pollution. • Section 20 – Control of emergency incidents. • Chapter 4 – Water use. • Authority – DWS.	
National Environmental Management Air Quality	• Air quality management • Section 32 – Dust control.	

Legislation	Description and Relevance
Act (Act No. 39 of 2004)	• Section 34 – Noise control. • Authority – DEA.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)	• Management and conservation of the country's biodiversity. • Protection of species and ecosystems. • Authority – DEA.
National Environmental Management: Protected Areas Act (Act No. 57 of 2003)	• Protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes.
National Environmental Management: Waste Act (Act No. 59 of 2008)	• Chapter 5 – licensing requirements for listed waste activities - GN No. R. 921 of 29 November 2013. • Authority – Minister (DEA) or MEC (provincial authority)
National Forests Act (No. 84 of 1998)	• Section 15 – Authorisation required for impacts to protected trees. • Authority – Department of Agriculture, Forestry and Fisheries (DAFF)
Minerals and Petroleum Resources Development Act (Act No. 28 of 2002)	• Permit required for borrow pits and quarries. • Authority – Department of Mineral Resources (DMR).
Occupational Health & Safety Act (Act No. 85 of 1993)	• Provisions for Occupational Health & Safety • Authority – Department of Labour.
National Heritage Resources Act (Act No. 25 of 1999)	• Section 34 – protection of structure older than 60 years. • Section 35 – protection of heritage resources. • Section 36 – protection of graves and burial grounds. • Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m^2 in extent, etc. • Authority – Limpopo Provincial Heritage Resources Authority (LIHRA)
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	• Control measures for erosion. • Control measures for alien and invasive plant species. • Authority – Department of Agriculture.
National Road Traffic Act (Act No. 93 of 1996)	• Authority – Limpopo Department of Public Works, Roads and Infrastructure.

The relationship between the project and certain key pieces of environmental legislation is discussed in the subsections to follow.

5.1.2 National Environmental Management Act

According to Section 2(3) of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), "*development must be socially, environmentally and economically sustainable*", which means the integration of these three factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.

The proposed MCWAP-2A WTI requires authorisation in terms of NEMA and the EIA is being undertaken in accordance the EIA Regulations of 2014 (as amended) that consist of the following:

- EIA procedure – GN No. R 982 (4 December 2014), as amended;
- Listing Notice 1 - GN No. R 983 (4 December 2014), as amended;
- Listing Notice 2 - GN No. R 984 (4 December 2014), as amended; and
- Listing Notice 3 - GN No. R 985 (4 December 2014), as amended.

The project triggers activities under Listing Notices 1, 2 and 3, and thus needs to be subjected to a Scoping and EIA process. The listed activities are explained in the context of the project in **Table 4**.

Note that the dimensions of the project infrastructure and components should be regarded as approximates due to the dynamic nature of the planning and design process. As a conservative approach, all possible activities that could possibly be triggered by the project were included in the Application Form (draft included in **Appendix C**) that will be submitted to the DEA with the Scoping Report, and a refinement of these activities will take place as the EIA process unfolds.

5.1.3 National Environmental Management: Waste Act

Amongst others, the purpose of the National Environmental Management: Waste Act (NEM:WA) (Act No. 59 of 2008) includes the following:

1. To reform the law regulating waste management in the country by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development;
2. To provide for institutional arrangements and planning matters;
3. To provide for specific waste management measures;
4. To provide for the licensing and control of waste management activities;
5. To provide for the remediation of contaminated land; and
6. To provide for compliance and enforcement.

No authorisation will be required in terms of NEM:WA, as the project will not include any listed waste management activities in terms of GN No. R. 921 of 29 November 2013.

The following is noted with regards to waste management for MCWAP-2A WTI:

- Construction phase –
  - Excess material will be used to as part of the filling and rehabilitation of borrow pits required as part of the project;
  - Temporary waste storage facilities will remain below the thresholds contained in the listed activities under Schedule 1 of NEM:WA;
  - The storage of general or hazardous waste in a waste storage facility will comply with the norms and standards in GN No. R. 926 of 29 November 2013;
  - The Environmental Management Programme (EMPr) will make suitable provisions for waste management, including the storage, handling and disposal of waste;
- Operational phase –
  - The intention is to scour the sediment from the desilting works back to the Crocodile River (explained in **Section 9.3.4**). DEA confirmed in writing on 12 April 2016 (refer to letter contained in **Appendix F**) that there is no need for a Waste Management Licence in this regard.

5.1.4 Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)

The purpose of the Mineral and Petroleum Resources Development Act (MPRDA) (Act No. 28 of 2002) is to make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources and to provide for matters related thereto. This act defines mining as "any operation or activity for the purposes of winning any mineral on, in or under the earth, water or any residue deposit, whether by underground or open working or otherwise and includes any operation or activity incidental thereto".

In terms of the MPRDA, as amended, a mining permit applies when the mineral in question can be mined in 2 years and the area does not exceed 5 hectares. For larger areas a mining right will need to be applied for.

Borrow areas have been identified to source construction material for the project. Sources of material suitable for use as bedding or soft backfill to the pipe were sought at a nominal spacing of 5 km along the pipeline. Under Section 106(1) of the MPRDA, and in accordance with GN No. R. 762 of 25 June 2004, DWS is exempt from the provisions of Sections 16, 20, 22 and 27 "*in respect of any activity to remove any mineral for road construction, building of dams or other purpose which may be identified in such notice*". However, Section 106(2) of the MPRDA was amended as follows: "*Despite subsection (1), the organ of state so exempted must submit relevant environmental reports required in terms of Chapter 5 of the National Environmental Management Act, 1998, to obtain an environmental authorisation*."

Based on a Memorandum of Understanding in 2007 between the then DWAF and Department of Mineral and Energy (DME), it was agreed between these parties that for the construction and maintenance of Government Waterworks undertaken by DWS's own Construction Unit, this Department shall be deemed to comply with the requirements of financial provision. Provided that the estimated costs for the management, rehabilitation and closure of such quarries and borrowed areas or works are provided for within the approved budget for such Government Waterworks.

The new EIA Regulations of 2014 (as amended) include a number of provisions in terms of the transition of the environmental regulation of mining from the MPRDA to NEMA and the introduction of the One Environmental System. Amongst others, this is facilitated by the inclusion of mining activities under the 2014 Listing Notices. Separate approval will be sought from the Department of Mineral Resources (DMR) for the borrow areas in terms of the activities triggered under the Listing Notices of 4 December 2014 (as amended).

5.1.5 National Water Act (Act No. 36 of 1998)

The project entails the following activities that constitute water uses in terms of Section 21 of the NWA:

- Section 21(a) - Taking water from a water resource (water abstraction from the Crocodile River (West) as part of the transfer scheme; taking water for construction purposes);
- Section 21(b) - Storing water (Vlieëpoort abstraction weir);
- Section 21(c) - Impeding or diverting the flow of water in a watercourse (instream works for abstraction works, gauging weirs, access roads' crossings, pipeline crossings, etc.);
- Section 21(i) - Altering the bed, banks, course or characteristics of a watercourse (instream works for abstraction works, gauging weirs, access roads' crossings, pipeline crossings, etc.); and
- Section 21(f) - discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit (scouring sediment back to the Crocodile River (West)).

An Integrated Water Use Licence Application will be submitted separately to the DWS Limpopo Regional Office. The following requirements of the NWA will be catered for:

- Provision for the Reserve requirements of the Crocodile River (West); and
- Ensure that existing lawful use is respected and protected.

5.2 Guidelines

The following guidelines were considered during the preparation of the Scoping Report:

- Integrated Environmental Management Information Series, in particular Series 2 – Scoping (DEAT, 2002);
- Guideline on Alternatives, EIA Guideline and Information Document Series (DEA&DP, 2010a);
- Guideline on Need and Desirability, EIA Guideline and Information Document Series (DEA&DP, 2010b);
- Integrated Environmental Management Guideline Series 7: Public Participation in the EIA Process (DEA, 2010); and
- Guidelines for Involving Specialists in the EIA Processes Series (Brownlie, 2005).

5.3 National and Regional Plans

The following regional plans were considered during the execution of the Scoping phase (amongst others):

- Municipal Spatial Development Frameworks (SDFs) (where available);
- Municipal Integrated Development Plans (IDPs);
- Relevant national, provincial, district and local policies, strategies, plans and programmes;
- Environmental Management Framework (EMF) for the Waterberg District Municipality (2010);
- Limpopo Provincial Conservation Plan version 2, September 2013;

- Limpopo Provincial Growth and Development Strategy (PGDS);
- Department of Energy's Integrated Resource Plan (IRP) 2010-30;
- Lephalale LM Water Services Development Plan (WSDP); and
- Crocodile River (West) Water Supply System Reconciliation Strategy.

5.4 Protocols

The Limpopo River Basin, of which the Crocodile River (West) is a tributary, is shared by a number of countries, namely, South Africa, Botswana, Zimbabwe and Mozambique. The international obligations in terms of water resource management thus need to be satisfied. This includes the Protocol on Shared Watercourse Systems in the Southern African Development community (SADC) and the SADC Regional Water Policy.

6 SCOPING AND EIA PROCESS

6.1 Previous Environmental Assessments

The MCWAP Environmental Module was originally initiated at the end of 2008 under the EIA Regulations of 2006. The status of each of the original MCWAP applications is shown in **Table 5**.

Table 5: Status of original MCWAP applications

MCWAP Component	Environmental Assessment Process	DEA Ref. No.	Status
Phase 1	Scoping and EIA	12/12/20/1465	Environmental Authorisation issued on 03 December 2010
Phase 2	Scoping and EIA	12/12/20/1466	EIA application withdrawn following Scoping phase due to uncertainty with regards to water demands
De-bottlenecking	Basic Assessment	12/12/20/1467	Environmental Authorisation issued on 24 February 2010

MCWAP-2A was resuscitated for the following reasons:

- Government identified and approved 18 SIPs across the RSA to support economic development and address service delivery in the poorest provinces. SIP 1 entails the unlocking of the Northern Mineral Belt with Waterberg as the catalyst. Investment in rail, water and transmission infrastructure and energy generation will catalyse unlocking rich mineral resources in Limpopo resulting in thousands of direct jobs across the areas covered. The MCWAP includes the water infrastructure needed for SIP 1. Due to the priority accorded by Government to such SIP projects, it was prudent to give priority to the future water needs of the Lephalale area in support of the national development imperatives;
- MCWAP-1 augments the supply from Mokolo Dam and is already operational since June 2015. It serves as an interim measure to supply in the growing water requirements of Lephalale, Eskom and Exxaro. This solution will over the long term optimally utilise the full yield from Mokolo Dam. The sustainable yield of Mokolo Dam is not sufficient to meet the increased needs of the users including the pollution abatement measures which is an environmental and funding condition;
- A suitably sized transfer pipeline from the Crocodile River (West) can be implemented timeously to meet the increased requirements to support the RSA's economy. MCWAP-1 will be operated as a system together with proposed MCWAP-2A when the latter is completed. MCWAP-2A will also serve to provide the necessary assurance of water supply to the strategic end users from independent sources; and
- The water requirements have been finalised to the degree that is adequate to make informed economic decisions with respect to the transfer capacity of MCWAP-2A.

6.2 Environmental Assessment Practitioner

Nemai Consulting was appointed by DWS and TCTA (implementing agent) as the independent EAP to undertake the environmental assessment for the proposed MCWAP-2A WTI.

In accordance with Appendix 2, Section 2(1)(a) of GN No. R 982 of 4 December 2014 (as amended), this section provides an overview of Nemai Consulting and the company's experience with EIAs, as well as the details and experience of the EAPs that form part of the Scoping and EIA team.

Nemai Consulting is an independent, specialist environmental, social development and Occupational Health and Safety (OHS) consultancy, which was founded in December 1999. The company is directed by a team of experienced and capable environmental engineers, scientists, ecologists, sociologists, economists and analysts. The company has offices in Randburg (Gauteng) and Durban (KZN).

The core members of Nemai Consulting that are involved with the Scoping and EIA process for the project are captured in **Table 6** below, and their respective Curricula Vitae are contained in to **Appendix D**.

Table 6: Scoping and EIA Core Team Members

Name	Qualifications	Experience	Duties
Ms D. Naidoo	B.Sc Eng (Chem)	19 years	• Project Manager • Quality Control • EIA Process
Mr D. Henning	M.Sc (River Ecology)	15 years	• Project Leader • EIA Process • Scoping & EIA Reports
Mr S. Pienaar	B.Sc (Hons) (Environmental Studies)	6 years	• Public Participation • EIA Process
Mr C. Chidley	• B.Sc Eng (Civil); • BA (Economics, Philosophy) • MBA	20 years	• Quality Review • Technical Input • EMPr
Mr C. v. d. Hoven	B.Sc (Hons) (Environmental Studies)	2 years	• Public Participation • EIA Process

6.3 DEA Pre-application Consultation

A Pre-application Consultation Meeting was convened with DEA on 19 August 2015 (refer to **Appendix E** for a copy of the minutes of the meeting). The purpose of the meeting included the following:

- To introduce the overall MCWAP-2A to DEA;
- To seek clarification regarding certain matters that pertain to the EIA process;
- To determine DEA's requirements; and

- To confirm the process and timeframes.

A follow-up meeting was convened with DEA on 17 March 2016 (refer to **Appendix E** for a copy of the minutes of the meeting). The main purpose of the meeting included following up on matters raised during the DEA Pre-Application Consultation Meeting, providing an overview of the approach to the EIA and confirming the need for a Waste Management Licence.

Key outcomes of above pre-application consultation with DEA include the following:

- It was agreed that the Application Form and draft Scoping Report, which has been subjected to a 30-day review period, be submitted to DEA at the same time to avoid potential problems associated with the strict timeframes under the EIA Regulations of 2014 (as amended).
- Separate applications will be submitted for the following project components -
  - WTI;
  - Borrow Pits; and
  - River Management System.
- A broader Public Involvement Programme will be undertaken as part of the River Management System, which extends beyond the scope of the EIA's public participation process. This will entail engaging with the relevant interest groups, which include -
  - Formal agricultural groups (including the Hartbeespoort Irrigation Board, Crocodile-West Irrigation Board, Makoppa Farmers and the Transvaal Agricultural Union); and
  - Hartbeespoort Dam IAPs.
- DEA confirmed in writing on 12 April 2016 (refer to letter contained in **Appendix F**) that there is no need for a Waste Management Licence in terms of NEM:WA for scouring the sediment from the desilting works back to the Crocodile River (explained in **Section 9.3.4**).

6.4 Environmental Assessment Triggers

An Application for Environmental Authorisation in terms of NEMA will be made for the proposed development of MCWAP-2A WTI. Based on the outcomes of the pre-application consultation meeting with DEA, the Application Form and draft Scoping Report will be submitted to the Department at the same time (see **Section 6.3**). A copy of the Application Form is contained in **Appendix C**.

The process for seeking authorisation under NEMA is undertaken in accordance with GN No. R. 982 of 4 December 2014 (as amended), promulgated in terms of Chapter 5 of NEMA. Based on the types of activities involved the requisite environmental assessment for the project is a Scoping and EIA process. Refer to **Section 5** for the project's legal framework and specifically the activities triggered by the project in terms of Listing Notices 1, 2 and 3 of the EIA Regulations of 2014 (as amended).

6.5 Environmental Assessment Authorities

In terms of NEMA the lead decision-making authority for the environmental assessment is DEA, as the project proponent (DWS) is a national department. However, due to the geographic location of the project the LDEDET is regarded as one of the key commenting authorities in terms of NEMA during the execution of the EIA, and all documentation will thus be copied to this Department (amongst others).

Various other authorities with jurisdiction over elements of the receiving environment or project activities (refer to **Section 5.1**) will also be consulted during the course of the EIA. Refer to the database of Interested and Affected Parties (IAPs) contained in **Appendix I** for a list of the government departments that were notified during the EIA process to date.

6.6 Scoping Process

6.6.1 Formal Process

As mentioned, separate applications will be submitted for the WTI, Borrow Pits and River Management System. An outline of the Scoping and EIA process for the proposed MCWAP-2A WTI is provided in **Figure 9**.

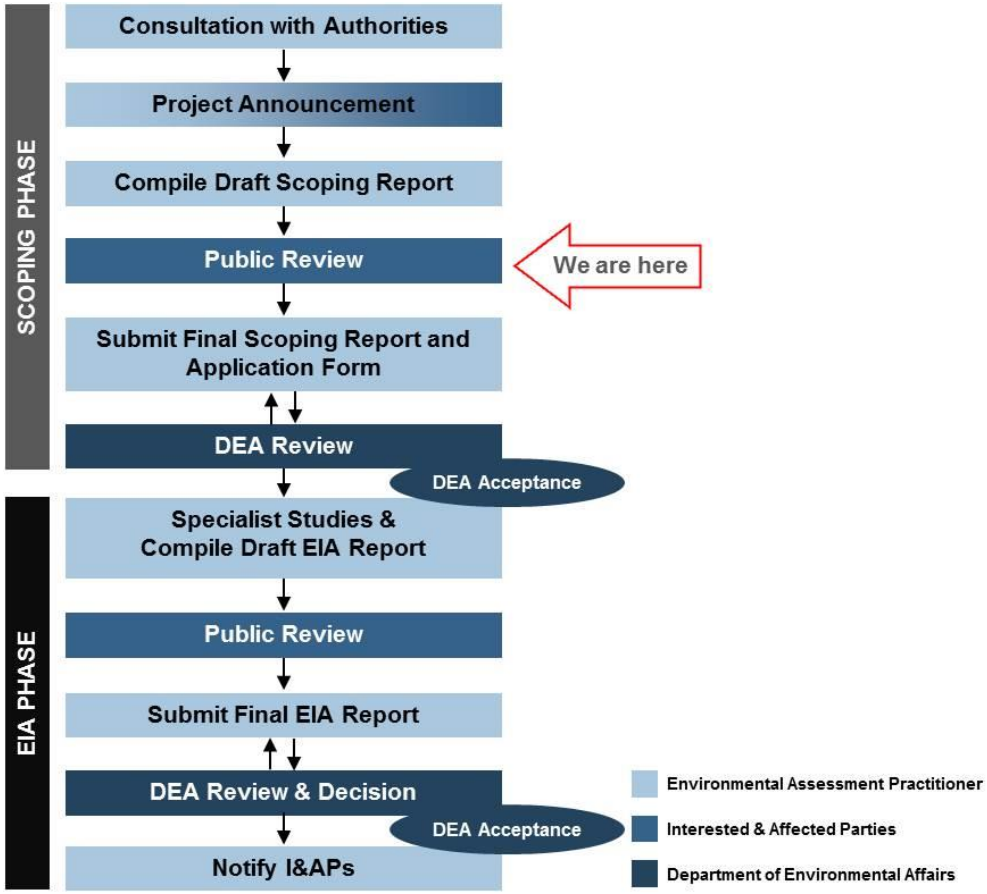


Figure 9: EIA process

The purpose of Scoping, which constitutes the first phase of the formal EIA process, is as follows:

- Identify the legal framework in terms of the proposed project;
- Identify and engage with IAPs and allow for adequate participation in the process;
- Duly consider alternatives for achieving the project's objectives;
- Identify significant issues to be investigated further during the execution of the EIA phase;
- Clarify the roles and responsibilities of various stakeholders in the process;
- Determine the scope of the ensuing EIA phase, in terms of specialist studies, public participation, assessment of impacts and appraisal of alternatives; and
- Allow for informed decision-making by DEA and other authorities with regard to the EIA process.

6.6.2 Landowner Consent

According to Regulation 39(1) of GN No. R 982 of 4 December 2014 (as amended), if the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.

This requirement does not apply *inter alia* for linear developments (e.g. pipelines, power lines, roads) or if it is a SIP as contemplated in the Infrastructure Development Act, 2014. MCWAP-2A qualifies under SIP 1 and landowner consent is thus not required.

6.6.3 Landowner Notification

The details of the various properties affected by the project as well as the landowners are provided in **Appendix B**.

Proof of written notification to the landowners / persons in control of the land is included in **Appendix M**.

6.6.4 Application Form

A copy of the Application Form, which will be submitted to DEA together with the Scoping Report, is provided in **Appendix C**.

The Application Form makes provision for all the activities associated with the project and the following associated works:

1. All the construction sites;
2. Construction camps;
3. Storage facilities;
4. Storage of hazardous materials;
5. Construction plant (e.g. concrete mixing, crushers, etc.);

6. Access roads and haul roads for construction purposes;
7. Power supply for construction purposes; and
8. River flow gauging.

The activities triggered in terms of Listing Notices 1, 2 and 3 were confirmed based on the following:

- Project description;
- Information contained in the Technical Feasibility Study reports, previous Scoping Report (DWA, 2011) and Environmental and Social Screening Report (DWAF, 2008d);
- Input received from DWS and the technical team; and
- Feedback received from DEA and the other environmental authorities.

6.6.5 Screening of Alternatives

Various options to meeting the project's objectives were considered during the Technical Feasibility Study, which eventually lead to the identification of alternatives to be investigated as part of the EIA. The "no go" option will also be evaluated to understand the implications of the project not proceeding.

The feasible options are taken forward in the impact prediction, where the potential positive and adverse environmental impacts are examined further. The EIA phase will include a detailed comparative analysis of the project's feasible alternatives that emanate from the Scoping exercise, which will include environmental (with specialist input) and technical evaluations. This will ultimately result in the selection of a Best Practicable Environmental Option (BPEO).

See **Section 10** for further discussions on alternatives.

6.6.6 Impact Prediction

The potential environmental impacts associated with the proposed project were identified during the Scoping phase through an appraisal of the following:

- Proposed locations and footprint of the project infrastructure and components, which included site investigations as well as a desktop evaluation with a Geographical Information System (GIS) and aerial photography;
- Activities associated with the project life-cycle (i.e. pre-construction, construction, operation and decommissioning);
- Profile of the receiving environment and the potential sensitive environmental features and attributes;
- Input received during public participation from authorities and IAPs; and
- Legal and policy context.

The Scoping exercise aimed to identify and qualitatively predict potentially significant environmental issues for further consideration and prioritisation during the EIA stage (see

Section 13). Note that “significance” relates to whether the effect (i.e. change to the environmental feature / attribute) is of sufficient importance that it ought to be considered and have an influence on decision-making.

During the EIA stage a detailed quantitative impact assessment will be conducted via contributions from the project team and requisite specialist studies, and through the application of the impact assessment methodology contained in **Section 13.4**. Suitable mitigation measures will be identified to manage (i.e. prevent, reduce, rehabilitate and/or compensate) the environmental impacts, and will be included in the EMPr.

6.7 Other Applications in Project Area

The following proposed developments, which are earmarked for the same properties that are affected by MCWAP-2A WTI, are known at this stage:

- Proposed upgrade of the rail network as part of the Waterberg Coal Project (multiple properties); and
- Proposed quarry on Portion 1 of the Farm Ruigtevley 97 KQ.

Further information with regards to the above or any additional developments that may influence the project footprint will be included in the EIA Report, as relevant.

7 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations accompany the Scoping exercise:

- In accordance with the purpose of Scoping, the report does not include detailed specialist investigations on the receiving environment, which will only form part of the EIA phase. The environment in the project area was primarily assessed in the Scoping phase through site visits and appraisals, desktop screening, incorporating existing information from previous studies, and input received from authorities and IAPs. A refinement of all maps will also be undertaken in the EIA phase, if necessary.
- As the design of the project components is still in feasibility stage, and due to the dynamic nature of the planning environment, the dimensions and layout of the infrastructure may change during the detailed design phase. Any amendments to the scheme will need to comply with the prevailing environmental legal requirements.

8 NEED AND DESIRABILITY

This section serves to expand on the motivation / need and desirability for the proposed development that is provided in **Section 3.2**. The format contained in the Guideline on Need and Desirability (DEA&DP, 2010b) was used in **Table 7**.

Table 7: Need and Desirability of the Project

No.	Question	Response
	NEED ('timing')	
1.	Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved Spatial Development Framework (SDF) agreed to by the relevant environmental authority? (i.e. is the proposed development in line with the projects and programmes identified as priorities within the IDP).	The IDP for the Lephalale LM (2016) acknowledges the need for MCWAP and specifically states the following: "*It is imperative to note that the outcome of the MCWAP project need to be implemented to address expected water shortages before any development in node area 1 will be viable, as currently the area does not have sufficient water resources to sustain any new development*". MCWAP-2A is also included as one of the strategic projects in terms of Key Performance Area 2: Basic Services and Infrastructure investment. It is noted that Thabazimbi LM's water supply is from Magalies Water. According to the spatial vision presented in the IDP for the Thabazimbi LM (2017), the proposed footprint of MCWAP-2A falls primarily within the activity and government corridor, which extends northwards from the town of Thabazimbi (similar to Zone 11 of the Waterberg DM EMF).
2.	Should development, or if applicable, expansion of the town/area concerned in terms of this land use (associated with the activity being applied for) occur here at this point in time?	• The timing of the project is driven by the water demands associated with the development of the Waterberg Coalfields, where the water users include power generation, coal mining to support power generation, other industrial / mining activities and urban use by the Lephalale LM. • Several possible weir sites along the Crocodile River (West) were evaluated for suitability with respect to topography, access, founding conditions and river morphology. This led to the selection of two possible sites, namely the Vlieepoort Upper Site and the Boschkop Lower Site. The choice of the final abstraction point was largely determined by the extent of river losses and additional costs associated with river management actions, as well as the need for and benefit of implementing a phased approach to deliver water to the end users. • To minimise impacts, the proposed pipeline route attempts to remain alongside existing linear-type infrastructure, such as roads (main roads and dirt roads), the railway line (i.e. section of approximately 56km), transmission lines, industrial corridors and farm boundaries where the environment is regarded as less sensitive.

No.	Question	Response
3.	Does the community/area need the activity and the associated land use concerned (is it a societal priority)? This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate)	• MCWAP-2A features prominently on SIP 1, which aims to unlock SA's northern mineral belt in one of the poorest provinces (Limpopo). • The assurance of water supply to the current power stations near Lephalale is not acceptable and places the country's power supply at risk. • The concerns raised by IAPs with regards to the proposed project primarily fall into the following categories: ○ Concerns related to the footprint of the physical infrastructure and associated impacts to land use as well as existing structures and infrastructure; ○ Concerns related to water availability in the Crocodile River (West); and ○ Concerns related to the cumulative impacts associated with the various developments that are linked to the Waterberg Coalfields.
4.	Are the necessary services with appropriate capacity currently available (at the time of application), or must additional capacity be created to cater for the development?	Bulk power is required for the operation of the high-lift and low-lift pump stations associated with the MCWAP-2A WTI. Eskom has confirmed that the proposed MCWAP-2A substation can be accommodated into the network without any capacity constraints. The proposed substation will be supplied from the new planned Thabatshipi – Thabazimbi Combined 132kV Power Line. A separate application will be submitted by Eskom to seek approval for the bulk power required for MCWAP-2A. The services required for the development are explained in **Section 9.10**.
5.	Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services)?	The project aims to supply bulk water to a number of strategic end users. The Lephalale LM, as one of the intended water users, will need to ensure that it is able to optimally utilise this water as part of infrastructure planning. See the response in item no. 1 above in terms of the reference to MCWAP-2A contained in the IDP for the Lephalale LM.
6.	Is this project part of a national programme to address an issue of national concern or importance?	Yes. Refer to response provided above for item no. 3 in terms of the project's SIP status.
7.	Is the development the best practicable environmental option (BPEO) for this land/site?	The site selection for the project infrastructure is discussed in item no. 2 above. The BPEO will only be determined following a comparative analysis of the feasible alternatives during the EIA phase.
8.	Would the approval of this application compromise the integrity of the existing approved municipal IDP and SDF as agreed to by the relevant authorities?	It is not anticipated that the proposed project will contradict or be in conflict with the municipal IDPs and SDFs (refer to response provided above to item no. 1).

No.	Question	Response
9.	Would the approval of this application compromise the integrity of the existing environmental management priorities for the area (e.g. as defined in EMFs), and if so, can it be justified in terms of sustainability considerations?	In terms of the EMF for the Waterberg DM (Environomics & NRM Consulting, 2010b), the project falls within the following Environmental Management Zones (refer to **Section 11.16.3**): • Zone 4: Game and cattle farming (including hunting) areas with commercial focus; • Zone 5: Mining and industrial development focus areas; • Zone 6: Restricted mining focus areas in aesthetic and/or ecological resource areas; and • Zone 11: Major infrastructure corridors. It is noted that Zone 11 facilitates the routing of bulk infrastructure, such as the pipeline associated with MCWAP-2A. The EIA will further assess whether MCWAP-2A is incompatible with the desired state established for the remaining zones. The compatibility of the project with the Limpopo Provincial Conservation Plan (2013) and other environmental management and planning tools will be considered in detail during the EIA phase, following the undertaking of the relevant specialist studies. Refer to **Section 11.9.3** for a discussion of the project in relation to Critical Biodiversity Areas.
10.	Do location factors favour this land use (associated with the activity applied for) at this place? (this relates to the contextualisation of the proposed land use on this site within its broader context).	As part of the technical analysis a number of locational factors were considered in selecting the abstraction site and pipeline route, as discussed in item no. 2 above. The specialist studies, as part of the EIA phase, will further investigate the location based on sensitive environmental features and receptors.
11.	How will the activity or the land use associated with the activity applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?	See compilation of significant environmental issues associated with the proposed project contained in **Section 13**.
12.	How will the development impact on people's health and wellbeing (e.g. in terms of noise, odours, visual character and sense of place, etc.)?	
13	Will the proposed activity or the land use associated with the activity applied for, result in unacceptable opportunity costs?	The affected land is rural in nature and primarily used for agricultural and game farming purposes. Opportunity costs, which are associated with the net benefits forgone for the development alternative, will be considered in the Socio-economic Study during EIA phase.
14	Will the proposed land use result in unacceptable cumulative impacts?	Cumulative impacts, as considered in **Section 13.3**, will be evaluated in the EIA phase.

9 PROJECT DESCRIPTION

9.1 General

The information presented in this section was primarily sourced from the Technical Feasibility Study reports.

Note: The sizing and location of the project-related infrastructure takes place within a dynamic planning environment, with various role-players, affected landowners, authorities and other stakeholders. Subsequent project modifications that emanate from discussions with the IAPs, findings from specialist studies and technical considerations will be conveyed during the public participation of the EIA phase and will be incorporated into the Draft EIA report, which will be lodged in the public domain.

9.2 MCWAP-2A WTI Components

The major scheme components for MCWAP-2A WTI are listed in **Table 8**. Refer to location alternatives and coordinates provided in **Table 9**, with selected points shown in **Figure 10**.

Table 8: MCWAP-2A WTI Components

Component	Main Features
Vlieëpoort Abstraction Weir on the Crocodile River (West)	Type: Mass gravity concrete structure Spillway: Stepped Ogee Height: approximately 4 – 6 m above river bed level to be optimised during tender design stage Two 2 m^3/s pump inlets plus 1 standby Abstraction capacity: 125 million m^3/a Energy dissipation: Roller bucket
Low-lift Pumping Station	Construction: Concrete Capacity Civil: 125 million m^3/a Capacity Mechanical and Electrical: 75 million m^3/a with provision to increase to max 125 million m^3/a Power requirement: 4MVA Continuous abstraction aligned with releases Size: 25 x 70 m
Low-lift Rising Main (2 pipes)	Type: Steel pipes with welded joints Length: 5 340 m Diameter: ND1300 Capacity Civil: 75 million m^3/a
Sedimentation Works	Type: 8 Concrete channels each 120 m long x 2,5 m wide x 5 m deep Capacity: Civil: 75 million m^3/a
Balancing Reservoir	Type: Earth fill Size: 620 x 440 m Compartments: 5 each 400 m long x 100 m wide by 10,5 to 13 m deep Capacity Civil: 75 million m^3/a state storage volume
High-lift Pumping Station	Construction: Reinforced concrete, masonry and steel frame structure Capacity: 75 million m^3/a pumped over 95% of time (Q=3.1 m^3/s) Power requirement: 20MVA Size: 120 x 300 m

Component	Main Features
High-lift Rising Main to Break Pressure Reservoir (BPR)	Type: Steel pipes with welded joints Length: 29 000 m Diameter: ND1300 Capacity Civil: 75 million m^3/a
BPR	Type: Lined earth fill embankment Capacity Civil: 90 000 m^3 (Three compartments of 30 000 m^3)
Gravity Pipeline from BPR to Operational Reservoir (OR)	Type: Steel pipes with welded joints Length: 63 570 m Capacity Civil: 75 million m^3/a Diameter: ND1700
OR	Type: Lined earth fill embankment Capacity Civil: 90 000 m^3 (Three compartments of 30 000 m^3)
Gravity pipeline from Operational Reservoir to Medupi Tee-off via Steenbokpan	Type: Steel pipes with welded joints Diameter / Length: ND2200 – 9 200 m ND1400 – 17 000 m ND1200 – 18 250 m ND900 – 14 560 m Capacity Civil: 75 million m^3/a
Ancillary infrastructure	Gauging Weirs Crocodile (West) River management system Access roads Accommodation, offices, workshops and security measures

The main MCWAP-2A WTI components and the related alternatives are discussed in the sections to follow. Note the following:

1. As discussed, the dimensions and layout of the infrastructure may change as the technical study advances through the detailed design stage if Environmental Authorisation is obtained. All dimensions should thus be regarded as approximates;
2. All property descriptions are based on 2013 cadastral information; and
3. All distances and coordinates provided should be regarded as approximates, as they are based on a desktop estimate from GIS.

Table 9: MCWAP-2A WTI Components with alternative and coordinates

Project Components	Alternatives	Coordinates		
Vlieëpoort abstraction weir	-	1)	Central point:	24°38'00.80"S, 27°18'59.63"E
Low-lift pump station	-	2)	Central point:	24°37'59.66"S, 27°18'59.68"E
Low-lift rising main	-	3)	Start point:	24°38'00.31"S, 27°19'00.39"E
		4)	End point:	24°35'54.47"S, 27°18'05.05"E
Balancing dam	-	5)	Central point:	24°35'43.72"S, 27°17'59.18"E
Desilting works	-	6)	Central point:	24°35'51.49"S, 27°18'06.98"E
Sediment Storage Compartments	-	7)	Central point:	24°35'39.62"S, 27°18'12.42"E
High-lift pump station	-	8)	Central point:	24°35'33.54"S, 27°17'50.80"E
Pipeline (rising main, gravity main and delivery line)	Central Route	9)	Start point:	24°35'30.68"S, 27°17'55.45"E
		10)	End point:	23°53'41.79"S, 27°24'12.09"E
		11)	Bend point 1:	24°35'06.27"S, 27°18'53.69"E
		12)	Bend point 2:	24°34'40.13"S, 27°18'31.42"E
		13)	Bend point 3:	24°34'30.36"S, 27°18'35.41"E
		14)	Bend point 4:	24°31'38.55"S, 27°16'30.32"E
		15)	Bend point 5:	24°28'19.01"S, 27°17'28.58"E
		16)	Bend point 6:	24°25'55.64"S, 27°23'09.38"E
		17)	Bend point 7:	24°25'46.21"S, 27°23'37.23"E

Project Components	Alternatives	Coordinates		
		18)	Bend point 8:	24°25'33.97"S, 27°24'13.39"E
		19)	Bend point 9:	24°25'31.98"S, 27°24'25.69"E
		20)	Bend point 10:	24°24'24.48"S, 27°24'02.18"E
		21)	Bend point 11:	24°23'12.01"S, 27°26'55.36"E
		22)	Bend point 12:	24°12'18.29"S, 27°26'59.22"E
		23)	Bend point 13:	23°56'55.01"S, 27°23'26.22"E
	Route A1	24)	Start point:	24°31'38.53"S, 27°16'30.19"E
		25)	End point:	24°28'08.53"S, 27°17'51.07"E
		26)	Bend point 1:	24°29'31.41"S, 27°14'51.08"E
	Route A2	27)	Start point:	24°31'38.53"S, 27°16'30.19"E
		28)	End point:	24°28'08.53"S, 27°17'51.07"E
		29)	Bend point 1:	24°31'20.41"S, 27°16'15.31"E
		30)	Bend point 2:	24°30'03.67"S, 27°19'41.27"E
	Route C	31)	Start point:	24°24'30.47"S, 27°24'03.26"E
		32)	End point:	24°17'26.57"S, 27°26'54.98"E
		33)	Bend point 1:	24°18'51.28"S, 27°23'13.73"E
	Route D1	34)	Start point:	23°53'35.59"S, 27°24'13.39"E
		35)	End point:	23°43'24.68"S, 27°24'18.13"E
		36)	Bend point 1:	23°46'42.99"S, 27°25'52.56"E
		37)	Bend point 2:	23°45'22.16"S, 27°24'56.07"E
	Route D2	38)	Start point:	23°53'35.59"S, 27°24'13.39"E
		39)	End point:	23°42'28.25"S, 27°20'05.92"E
		40)	Bend point 1:	23°53'07.87"S, 27°24'20.09"E
		41)	Bend point 2:	23°48'27.32"S, 27°23'19.97"E
		42)	Bend point 3:	23°46'10.98"S, 27°22'16.62"E
		43)	Bend point 4:	23°43'47.85"S, 27°20'38.77"E
	Route D3	44)	Start point:	23°53'35.59"S, 27°24'13.39"E
		45)	End point:	23°43'18.15"S, 27°16'40.67"E
		46)	Bend point 1:	23°52'27.67"S, 27°23'56.32"E
		47)	Bend point 2:	23°52'01.52"S, 27°21'49.58"E
		48)	Bend point 3:	23°51'52.09"S, 27°21'55.16"E
		49)	Bend point 4:	23°51'20.40"S, 27°21'39.51"E
		50)	Bend point 5:	23°50'18.68"S, 27°21'28.88"E
		51)	Bend point 6:	23°48'44.29"S, 27°21'20.79"E
		52)	Bend point 7:	23°46'50.94"S, 27°18'29.68"E
		53)	Bend point 8:	23°46'46.14"S, 27°17'58.92"E
		54)	Bend point 9:	23°45'36.39"S, 27°17'04.95"E
		55)	Bend point 10:	23°44'34.35"S, 27°17'13.94"E
BPR	BPR (Central Route)	56)	Central point:	24°25'36.02"S, 27°24'19.42"E
OR	-	57)	Central point:	23°53'33.95"S, 27°24'07.22"E
Bierspruit Gauging Weir	-	58)	Central point:	24°40'53.10"S, 27°19'20.62"E
Sand River Gauging Weir	-	59)	Central point:	24°40'47.22"S, 27°27'12.75"E
New Paul Hugo Gauging Weir	-	60)	Central point:	24°41'40.86"S, 27°24'32.92"E

Route Alternative B of the proposed pipeline route was discarded during the Feasibility Study, based on considerations related to the suitable location for the BPR.

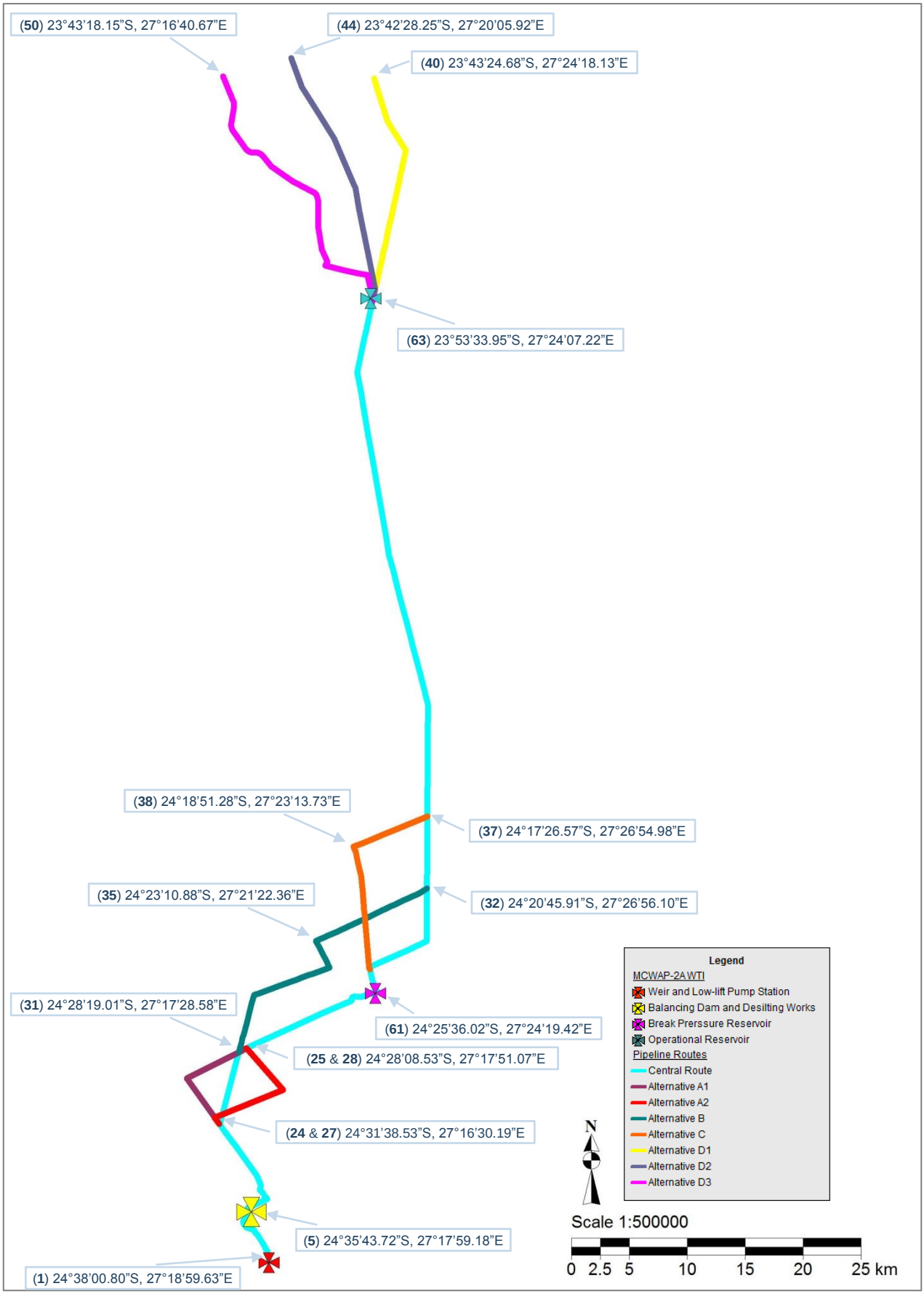


Figure 10: MCWAP-2A WTI layout with selected coordinates

(Note: Pipeline Route Alternative B was discarded; gauging weirs not shown)

9.3 Abstraction Works

9.3.1 Abstraction Weir

9.3.1.1 Alternative Sites Considered

According to DWAF (2010), a large number of possible sites for an abstraction weir were identified during the Conceptual and Pre-feasibility stages using aerial photography, which were tested against the following predetermined selection criteria (see **Figure 11**):

1. Weir to be located downstream of main supply dams in Crocodile River (West) being Vaalkop, Roodekopjes and Klipvoor Dams. Consequently, only the weir sites downstream of Pienaars River confluence will meet with this criterion;
2. Weir to be located at a bend in the river with the abstraction works on the outside of the bend. The river bend helps the generation of secondary flow patterns to facilitate coarse sediment diversion past the pump station intakes;
3. Abstraction works to be located on the same side of the river as the main pipeline route to avoid an expensive river crossing of the pipeline;
4. River valley to be narrow as possible to simplify flood management and to make the footprint of the works in the flood plain as small as possible. Nearby high ground to locate balancing dam and high lift pumps above the Probable Maximum Flood (PMF) level is essential;
5. Potential for outflanking by the river changing course to be manageable or not present;
6. River channel to be narrow as possible to minimise the cost of the weir;
7. Founding conditions. Bed rock to be present to avoid costly foundation treatment and to ensure structural integrity during flood conditions;
8. Weir basin to be as small as possible to reduce evaporation losses and minimise impacts on upstream landowners;
9. The location of the weir to result in the shortest possible length of pipeline to the users;
10. Weir to be as close as possible to sources of water to curtail river losses;
11. Proximity (positive) of existing infrastructure such as access roads, power lines, etc., resulting in potential cost savings in the extent of additional infrastructure to be provided;
12. Presence (negative) of existing infrastructure such as other structures in the river, provincial roads, power lines, mining activities, etc., to be avoided as far as possible in the upstream reach of influence of the abstraction weir; and
13. Lowest potential for flood damage. Damage at the abstraction works under extreme flood conditions should not cause the supply of water from to be interrupted for any prolonged periods, because of the strategic importance of the water requirements to be supplied. The forms of flood damage that would fall into this category include loss of structural integrity, clogging of the Works by debris, outflanking, isolation of the works due to loss of access and interruption of power supply to the Works.

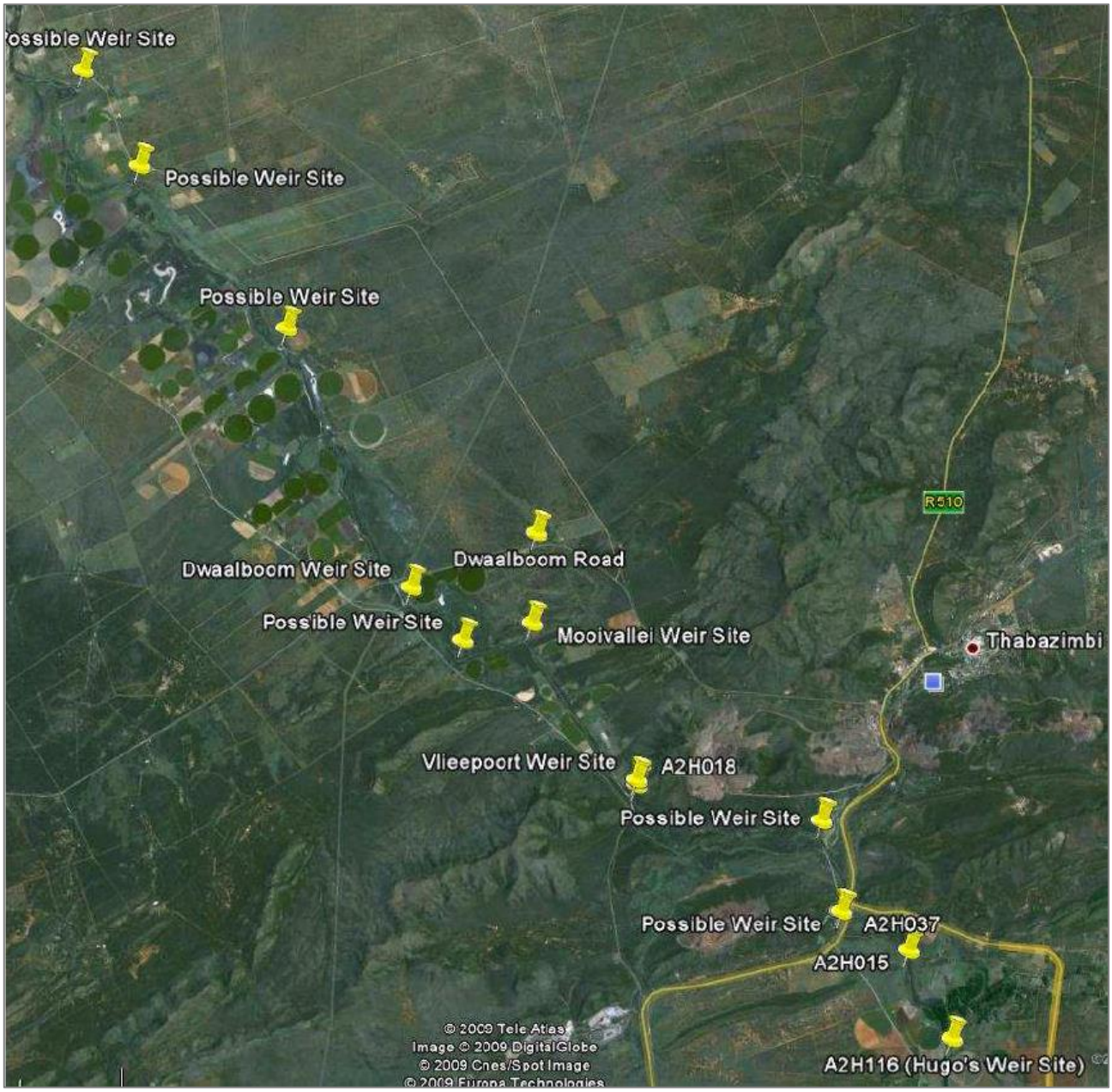


Figure 11: Abstraction Sites considered along the Lower Crocodile River (West) (DWAF, 2010)

The sites between Boschkop and Vlieëpoort and those downstream of Mooivallei (Makoppa reach) were discounted after the first round of evaluations.

9.3.1.2 Faure Site

Based on engagements with farmers from the Makoppa area during the EIA to date, various queries were raised in terms of locating the abstraction weir further downstream. The Faure Site is the location of the present DWS gauging weir A2H128. The site is approximately 50,7 km downstream of the Vlieëpoort Weir site (river channel distance) and is located on the wide flood plain forming the bottom reach of the lower Crocodile River (West) (DWAF, 2010).

A general feature along the Crocodile River is the deep alluvial sands and silts that filled the river valleys and flood plains with depths of 10 to 20m reported. Rock exposures along the river are a rarity (DWAF, 2010).

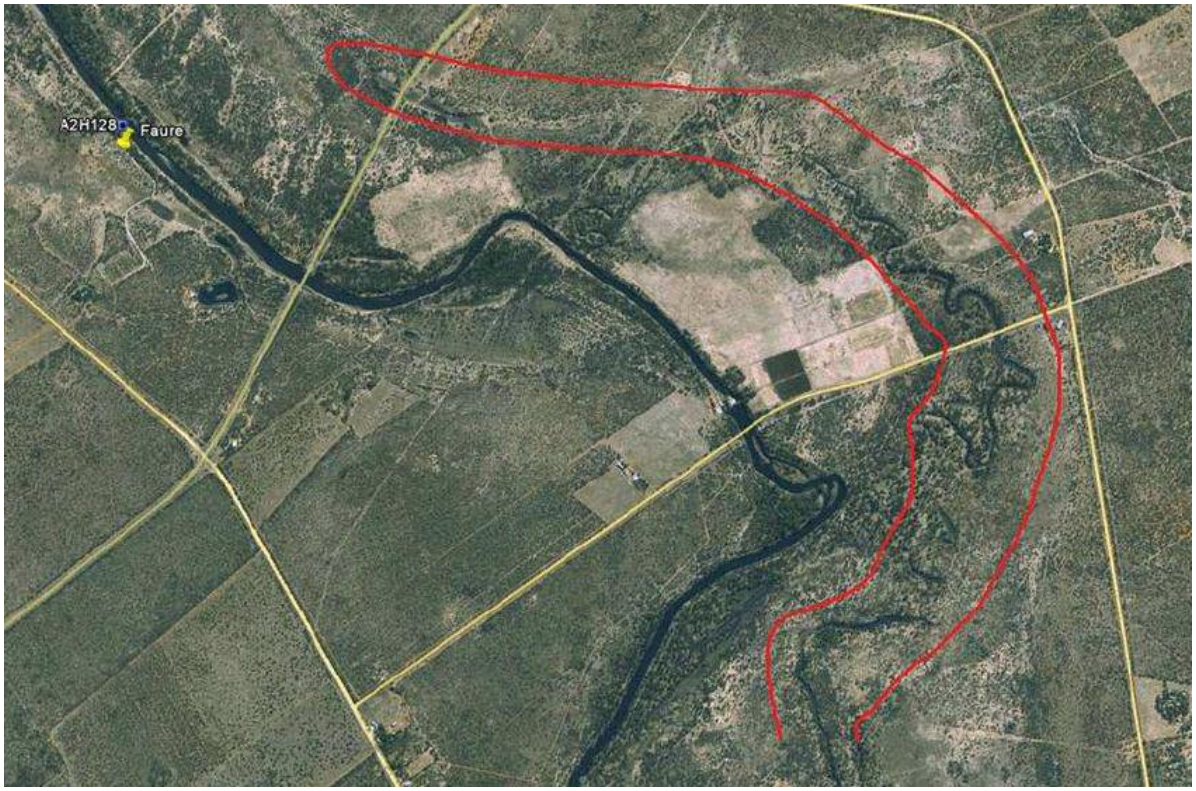


Figure 12: Plan view of the Faure Site (DWAF, 2010)

An evaluation of the Faure Site is provided in **Table 10**.

Table 10: Site Evaluation Summary for Faure Weir (DWAF, 2010)

Criterion No.	Description	Comments
1	Downstream of Pienaars River Confluence	Yes.
2	Abstraction works on outside of river bend	The existing Faure gauging weir is located on a straight section of river, with only a very slight bend to the right.
3	Abstraction works on same side of river as pipeline	The abstraction works would have to be on the other side of the river, requiring an expensive river crossing.
4	Narrow river valley or flood plain	Very wide, open floodplain. A 20m deep flood would flow about 9km wide. The minimum structure length across the river channel is estimated to be 2,5km.
5	Potential for outflanking to be manageable	High risk of outflanking. From aerial photography it is clear that the river channel has migrated in the past, just upstream of the site.
6	Narrow river channel	Yes, approximately 30m wide.
7	Good founding conditions	No information available, but should be similarly situated on deep sands.
8	Small weir basin	Hard to gauge depth of the channel, but assuming it is not very deep, even a low weir structure will result in very shallow weir basin with large surface are resulting in high evaporation losses.
9	Pipeline length to users as short as possible	Approximately 10km shorter pipeline than from Vlieëpoort might be required, but no detailed routes were looked at, some obstacles or

Criterion No.	Description	Comments
		deviations might increase the length of the pipeline.
10	Upstream river length as short as possible to curtail losses	Very long river conveyance, 50km longer than to Vlieëpoort.
11	Proximity of access roads, power lines etc.	Good access roads are located close to the site, power lines are also present.
12	Upstream infrastructure affected by higher flood levels	Irrigated farmlands and a road bridge 1km upstream.
13	Potential for flood damage	High, situated in the middle of the floodplain. High risk of outflanking, from aerial photography it is clear that the river channel has migrated in the past, just upstream of the site. Access to the site would not be possible during a flood due to the very wide and flat floodplain.

Due to non-compliance with evaluation criteria (2), (3), (4), (5), (10) and (13) this site was not regarded as suitable.

9.3.1.3 Boschkop Lower Site and Vlieëpoort Upper Site

The following two abstraction locations were identified as viable for further consideration during the pre-feasibility stage of the project (see **Figure 13**):

- Boschkop Lower Site on the farm Boschkop 138 JQ (25°05'37.3''S, 27°31'54.0''E); and
- Vlieëpoort Upper Site on the farm Mooivalei 342 KQ (24°38'00.80"S, 27°18'59.63"E).

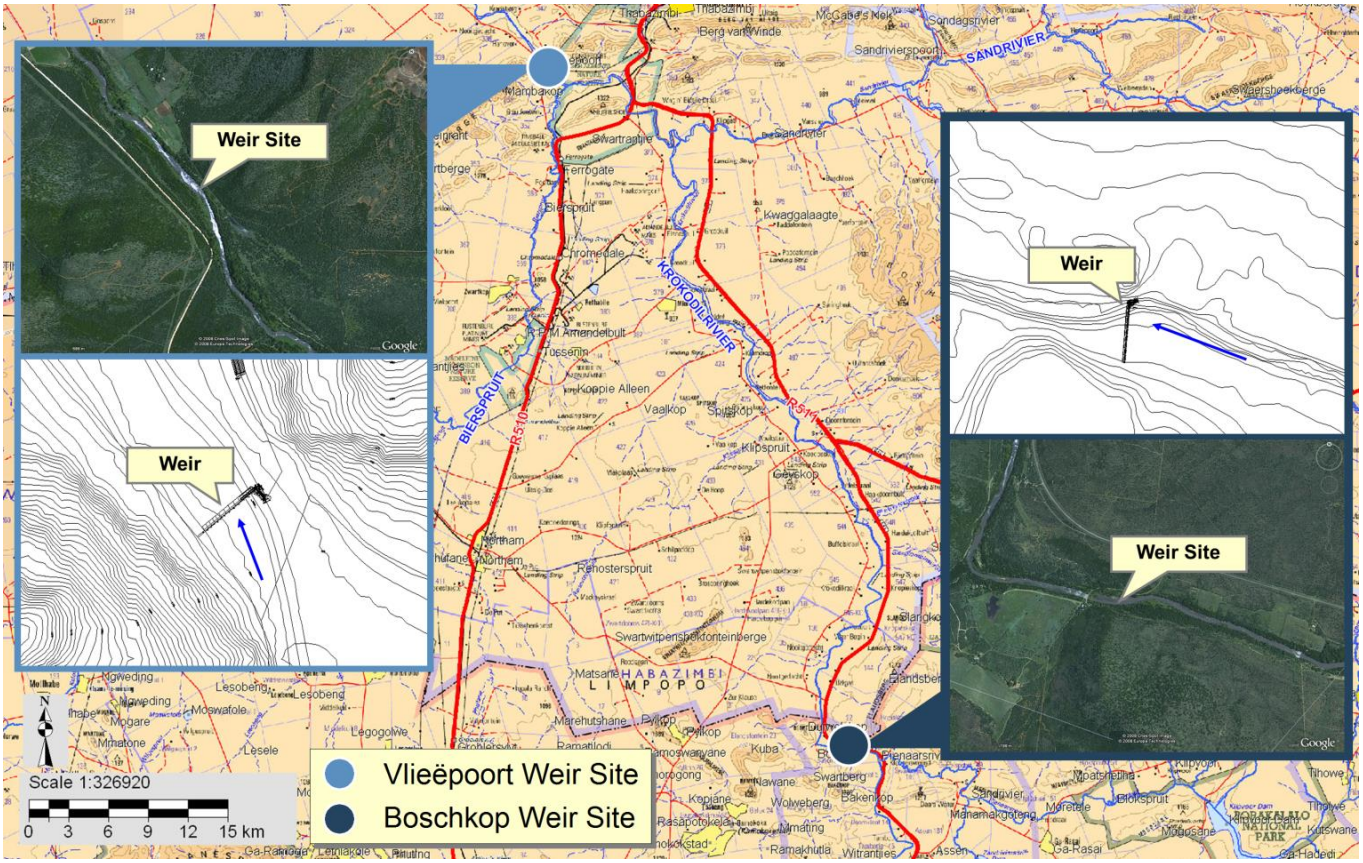


Figure 13: Boschkop Lower Site and Vlieëpoort Weir Sites

The choice of abstraction point was largely determined by the extent of river losses and additional costs associated with river management actions between the abovementioned two abstraction sites, as well as the need for and benefit of implementing a phased approach to deliver water to the end users. Based on these criteria, the Vlieëpoort site is regarded as the preferred option due to the following:

- More favourable topographical conditions;
- Shorter rising main to BPR; and
- Better founding conditions.

9.3.1.4 Vlieëpoort Abstraction Weir

Layout

Refer to **Figure 14** and **Figure 15** for photographs of the proposed site for the Vlieëpoort abstraction weir and a general layout, respectively.

Figure 14: Upstream (top) and downstream (bottom) view at Vlieëpoort weir site

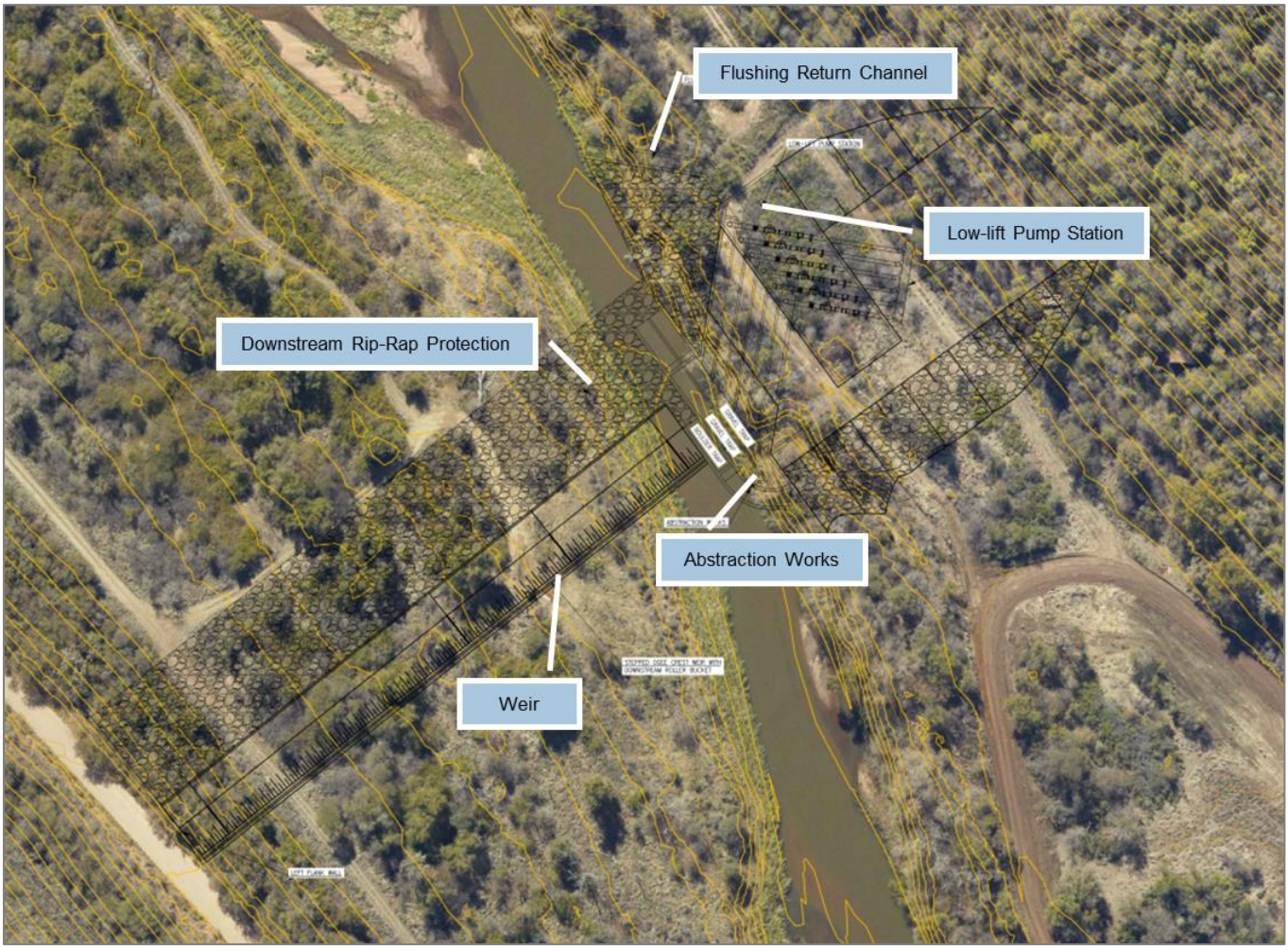


Figure 15: General layout - Vlieëpoort weir

Description

Refer to the drawing for the Vlieëpoort abstraction weir contained in **Appendix H**. Pertinent sizing data for the Vlieëpoort River Abstraction Works are summarised below.

Table 11: Vlieëpoort abstraction weir design and sizing data

No.	Design Data	Value
1	Recommended Design Flood (RDF) (1:200 year Recurrence Interval Flood)	5 740 m^3/s
2	Safety Evaluation Flood (SEF) (PMF)	11 180 m^3/s
3	1:20 year Recurrence Interval Flood	2 870 m^3/s
4	1:50 year Recurrence Interval Flood	4 020 m^3/s
5	River bed Level	890.0 masl
6	Lowest OC Level	893.2 masl
7	Non-overspill Crest (NOC) Level (PMF plus 0.5m Freeboard).	912.8 masl
8	Overspill Crest (OC) Length	153 m
9	Total Length of Structure	308 m

The Vlieëpoort abstraction weir has a significant hazard rating and can be classified as category II structure based on the Regulations Regarding the Safety of Dams in terms of Section 123(1) of the NWA. The Recommended Design Discharge (RDD) for the weir is the 1:100 year flood and the Safety Evaluation Discharge (SED) the Regional Maximum Flood (RMF). Due to the economic importance of the project however, it was decided that the all electrical equipment and access to the sites be located above the PMF level.

The lowest part of Vlieëpoort abstraction weir would be about 4m - 6 m high, depending on the number of pump bays and will be located nearest to the low-lift pump station. The mass concrete weir structure's height gradually increases towards the left bank (looking downstream) following the original ground level to a level above the PMF flood level in order to prevent outflanking. A concrete roller bucket energy dissipation structure may be required just downstream of the weir.

Initial geotechnical investigations indicate that significant work will be required to prepare the foundation for the weir. Foundation work must be deep enough to prevent seepage and piping underneath the weir.

The Vlieëpoort abstraction weir is not designed for storage and it is assumed it will silt up. Sedimentation will however not affect the abstraction works.

The areas immediately upstream and downstream of the Vlieëpoort abstraction weir will be cleared and suitable erosion protection measures such as grassing and rip-rap will be applied. The existing gravel road (D727) on the left bank will need to be raised locally at the weir.

The Vlieëpoort abstraction weir will make provision for a gauging facility to monitor flows downstream of the abstraction works.

The methodology for the construction of the abstraction weir will be as follows:

- River diversion works;
- Clear and grub, remove and stockpile topsoil;
- Excavate using heavy equipment to foundation level;
- Foundation construction;
- Construction of mass and reinforced concrete structures;
- Backfill excavations;
- Place rip-rap and other erosion protection measures; and
- Reinstate and rehabilitate all disturbed areas.

Pictures during the construction phase of a similar weir structure are provided in the figures to follow.

Figure 16: Example of site clearance and earthworks in progress (weir on Ash River)

Figure 17: Example of construction of mass concrete weir structure (on Ash River)

Figure 18: Example of downstream rip-rap protection placement (weir on Ash River)

Figure 19: Example of weir structure (on Ash River) soon after completion

9.3.1.5 Flood Hydrology

A HEC-RAS model of the Crocodile River (West) was set up to determine the flood levels in the Crocodile River. The model was also used to determine and check the impact of the proposed Abstraction Works on flood levels and on infrastructure up- and downstream of the Works. The calculated flood levels are summarised in **Table 12** below. The calculated floodlines are shown in the drawings contained in **Appendix H**.

Table 12: Crocodile River Flood Levels

Flood Event	Flow rate (m^3/s)	Flood level at Weir (masl)	Flood level at Balancing Dams (masl)
1:100	4995	908.54	904.39
1:200	5741	909.10	904.73
RMF	7456	910.26	905.42
PMF	10789	912.01	906.59

The model was also used to determine the impact of the proposed abstraction weir on existing upstream infrastructure, specifically a low level mine haul road and railway bridge crossing the river some 7,5km upstream of the proposed weir. The baseline model shows that the existing haul road bridge currently overtops at flow rates exceeding 130 m^3/s. The proposed weir has the effect of reducing the flow rate to 90 m^3/s at which the bridge will overtop. This is a significant effect and will increase the frequency at which the road is not usable and further investigation is required to determine a suitable solution (as required). The effect on the railway bridge is not as significant. The model indicated that the railway bridge will overtop between 4 000 and 4 100 m^3/s with or without the proposed weir. These and other matters within the weir basin will be dealt with when the land is acquired in terms of the Expropriation Act for the construction of the abstraction weir including the impoundment up to the 1:100 year flood level and a buffer zone.

9.3.2 River Abstraction (Low-lift) Pump Station

The low-lift pump station building will be in concrete, about 25m high and will be situated on the eastern bank of the river. The structure will be approximately 70m long parallel to the right river bank, and will extend approximately 25m into the right bank.

A gravel trap, which is a low side weir, will be constructed in front of the pump wells. This gravel trap will allow coarser gravel particles to settle out before water reaches the low-lift pumps. The top of the gravel trap wall is below the lowest overspill crest of the weir. A radial gate is installed at the downstream end of the trap. The trap will be flushed from time to time back into the river downstream of the weir.

The low-lift pump station is divided into several (8 – 10) separate pumping bays. The inlet openings will be covered by trash racks to prevent debris from entering the pumps. A trash rack cleaning mechanism will be provided as cleaning will be required regularly. Larger debris, such as tree stumps, is expected to flow over the weir structure. Some silt and sand build-up is expected in the pumping bays. Each bay will be provided with a sluice gate on the downstream end to allow for flushing when required. The sluice gate discharges into a flushing channel which will direct the flushing water and silt back to the river. Flushing the bays regularly will ensure that the silt concentration is low and will not have a major impact on the silt load in the river. Flushing should ideally be done during minor flood events when the silt load in the river is already high.

Electrical supply to the site will be in the form of overhead cables to a switchyard, which will be situated sufficiently close to the pump station. Further distribution may be overhead power lines or underground cabling. A separate application will be submitted by Eskom to seek approval for the bulk power required for MCWAP-2A.

An earthfill embankment with a crest level above the PMF level will connect the structure to the right bank and prevent outflanking of the structure during large floods. Appropriate erosion and flood protection measures such as riprap on the slopes of the embankment may be required. The embankment will provide access to the low-lift pump station. The resulting floodlines will be checked during detail design. The aim is to minimise the upstream impacts and the embankment may be replaced with a bridge structure.

Where founding on rock is not possible, jet-grouting or other methods will be applied to provide a sufficient foundation.

The methodology for the construction of the low-lift pump station is as follows:

- Clear and grub, remove and stockpile topsoil;
- Excavate using heavy equipment to foundation level;
- Jet-grout rig to construct grouted curtain walls below the foundation level;
- Construction of mass and reinforced concrete structures;
- Backfill excavations;

- Construction of flank embankment;
- Place rip-rap and other erosion protection measures;
- Installation of mechanical and electrical equipment; and
- Replace topsoil, landscape and grass all disturbed areas.

Refer to **Figure 20** for an example of a Low-Lift Pump Station.

Figure 20: Example of Low-Lift Pump Station (Lower Thukela abstraction weir)

9.3.3 Low-lift Rising Main

The layout of the rising main from the low-lift pump station to the high-lift pump station is provided in **Appendix H**. The pipeline specifications are similar to what are provided in **Table 16**.

From the low-lift pump station the pipeline follows the alignment of a gravel road (see **Figure 21**), in a north-westerly direction. The following properties are crossed by this route:

- Remainder of the Farm Mooivalei 342 KQ - ± 800m;
- Portion 10 of the Farm Mooivalei 342 KQ - ± 400m;
- Portion 9 of the Farm Mooivalei 342 KQ - ± 250m;
- Portion 8 of the Farm Mooivalei 342 KQ - ± 420m; and
- Portion 7 of the Farm Mooivalei 342 KQ - ± 380m.

Thereafter the pipeline follows the following route, continuing in a north-western direction:

- Crosses Portion 6 of the Farm Mooivalei 342 KQ - ± 250m;
- Along boundary of Portion 24 of the Farm Mooivalei 342 KQ - ± 150m;
- Crosses Portion 5 of the Farm Mooivalei 342 KQ - ± 400m; and
- Crosses Portion 4 of the Farm Mooivalei 342 KQ - ± 450m.

Figure 21: Views along gravel road at Mooivallei Farms

The pipeline travels for ± 450m on Portion 3 of the Farm Mooivalei 342 KQ, initially following a north-western direction and then turning north-eastwards, before it reaches the balancing dam on Portion 2 of the Farm Mooivalei 342 KQ

The methodology for the installation of the pipeline is similar to what is explained in **Section 9.4.4**.

9.3.4 Desilting Works

Description

The desilting works with flushing facility will be located adjacent to the balancing dam within the earthfill embankment. The desilting works will consist of at least eight 120m long concrete channels, typically 2.5m wide with a depth varying from 4.0m to 5.5m and will protrude about 1 – 2m above the top of the balancing reservoir embankment. The outlet of each channel combines into a channel, feeding a steel gravity fed pipe to the balancing reservoir inlet works.

The layout of the desilting works is shown in **Figure 22** (drawing provided in **Appendix H**).

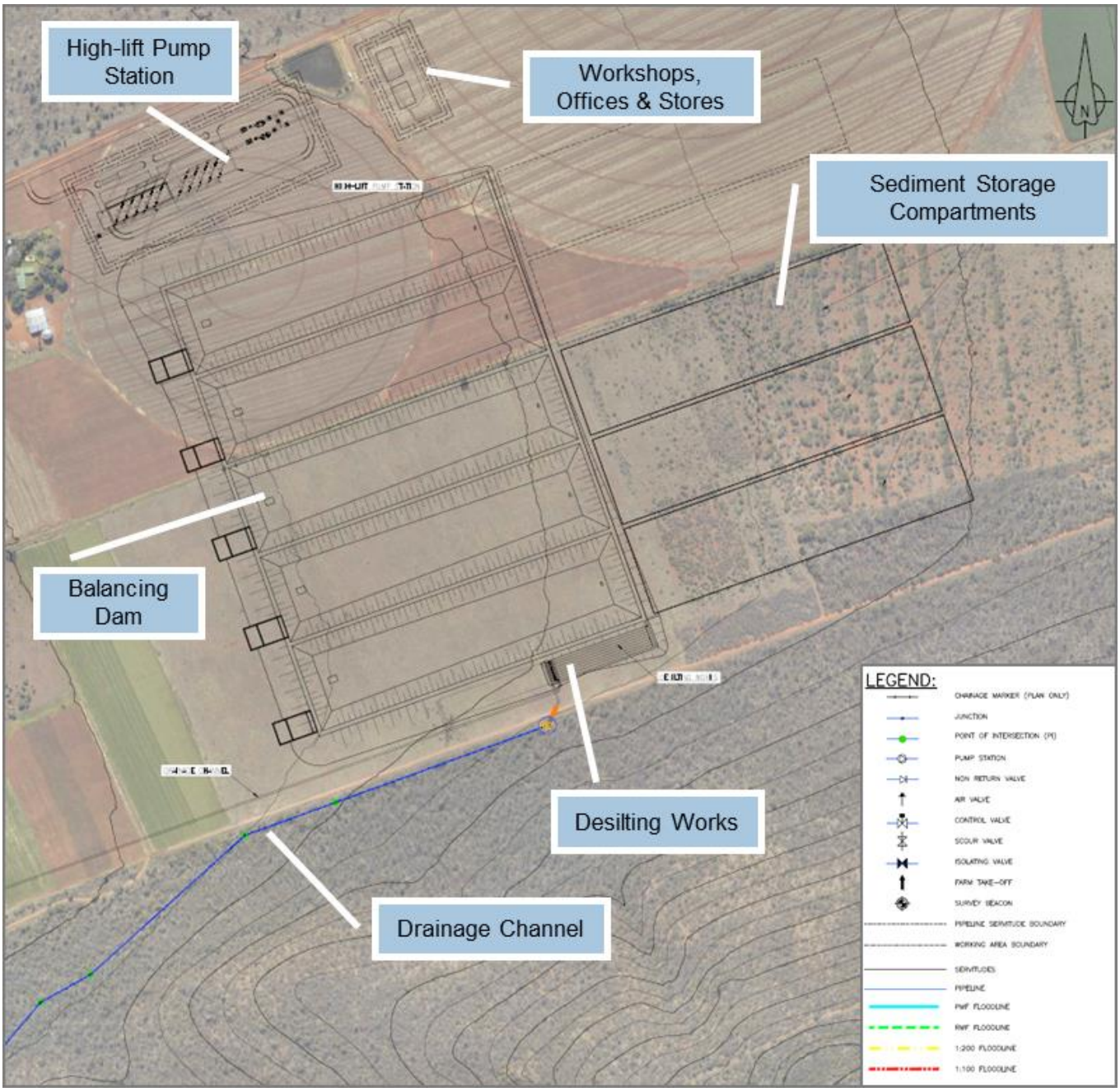


Figure 22: General layout – balancing dam, desilting works and high-lift pump station

The flushing facility will flush to a silt settling pond. The pond will allow the silt in the flushing water to settle out, and clear water will leave the pond and return to the river via a suitable river return conduit and outlet structure with erosion protection works. This return conduit will be combined with the reservoir spillway collector.

The structure will be constructed using the following methodology:

- Clear and grub, remove and stockpile topsoil;
- Excavate or build fill using heavy equipment to foundation level;
- Cast reinforced concrete structures;
- Install the inlet manifold and outlet pipes inside the balancing reservoir embankments with concrete valve and access chambers;
- Complete fill around structures and pipework;
- Install mechanical (sluice gates, valves etc.) and electrical equipment; and
- Replace topsoil, landscape and grass all disturbed areas and embankment/cut slopes.

Refer to the pictures to follow for similar type infrastructure.

Figure 23: Lebalelo Weir Desilting Works (example)

Figure 24: View towards inlet end of Lebalelo Weir Desilting Works (example)

Figure 25: View of inside of channel at Lebalelo Weir Desilting Works (example)

Figure 26: River return channel at Lebalelo Weir Desilting Works (example)

Sediment Management

The bulk water transfer process requires careful management of the dynamic sediment load conditions in the Crocodile River (West) system. The sediment load during base flow or low flow conditions are insignificant. This was verified by actual sampling during base flow conditions over the last 5 years by the project's technical team. The bulk of the annual expected sediment load is transported during flood events. The option exists to limit water abstraction during the rising stages of floods to reduce the volume of abstracted suspended sediment. However, for the purpose of reviewing the potential impact of a desilting facility, it was conservatively assumed that pumping will continue during floods.

The annual sediment load consists largely of natural soil particles classified as having a gravel fraction, a sand fraction, a silt fraction and a clay fraction based on the particle size distribution. Sediment will deposit upstream of the proposed abstraction weir. The sediment will thus be effectively stored in the river. When abstracting water for MCWAP-2A, up to 4% of the sediment load that is in suspension will be abstracted as well. When scouring the approach channels of the proposed abstraction works, some of the sand and gravel fraction deposits will be washed down stream. It is important to maintain a holistic view of all the sediment interfacing processes associated with the MCWAP-2A infrastructure.

The up to 4% of the sediment load that is abstracted in suspension is foreseen to require the following management interventions:

1) The volume of fine sand and silt fraction entering the balancing dams at the high-lift pump station needs to be limited. This is done using a proposed desilting facility. Should this not be done an additional silt storage facility will be required. (Approximately 400 000m^3 over a projected 50 year period);
2) Introducing a desilting facility upstream of the balancing dams at the high-lift pump station will remove on average 15 000t of fine sand and silt annually. It also means that annually 15000t of sediment needs to be scoured back to the river;
3) The desilting facility has a capacity of approximately 10 000m^3. As mentioned, the proposed facility consists of eight channels of 120m long 2.5 m wide and between 4 and 5.5m deep. Six of the channels provide sufficient silt storage capacity to allow a single scouring operation each year. The scouring process is flood event driven;
4) Provision is made in the balancing dams to permanently store approximately 5000t of sediment per annum; and
5) Allowance is also made to pump approximately 2000t of sediment in suspension (clay fraction) each year.

An analysis was undertaken to establish a quality profile of the silt to be abstracted from the Crocodile River. A copy of the analysis is contained in **Appendix J**. The test results for heavy metals were found to be well within allowable limits in terms of the following:

- Netherlands National Institute of Public Health and the Environment;
- South African Water Quality Guidelines (Irrigation); and
- Waste Discharge Standards (DWA 2010 Guidelines).

An important factor to bear in mind is that the abstracted suspended sediment is less than 4% of total average annual sediment load in the river and that only up to 2% is planned to be returned. In addition, it is understood that the chemical characteristics of sediment in river are the same as for the sediment to be returned.

DEA confirmed in writing on 12 April 2016 (refer to letter contained in **Appendix F**) that there is no need for a Waste Management Licence for the scouring of the sediment back to the river.

9.3.5 Balancing Dam

Alternatives

The following alternative sites were initially identified for the proposed balancing dam (see **Figure 27**):

- **Option 1:** Portions 1 and 2 of the Farm Mooivalei 342 KQ; and
- **Option 2:** Portions 5, 6, 7 and 23 of the Farm Mooivalei 342 KQ.

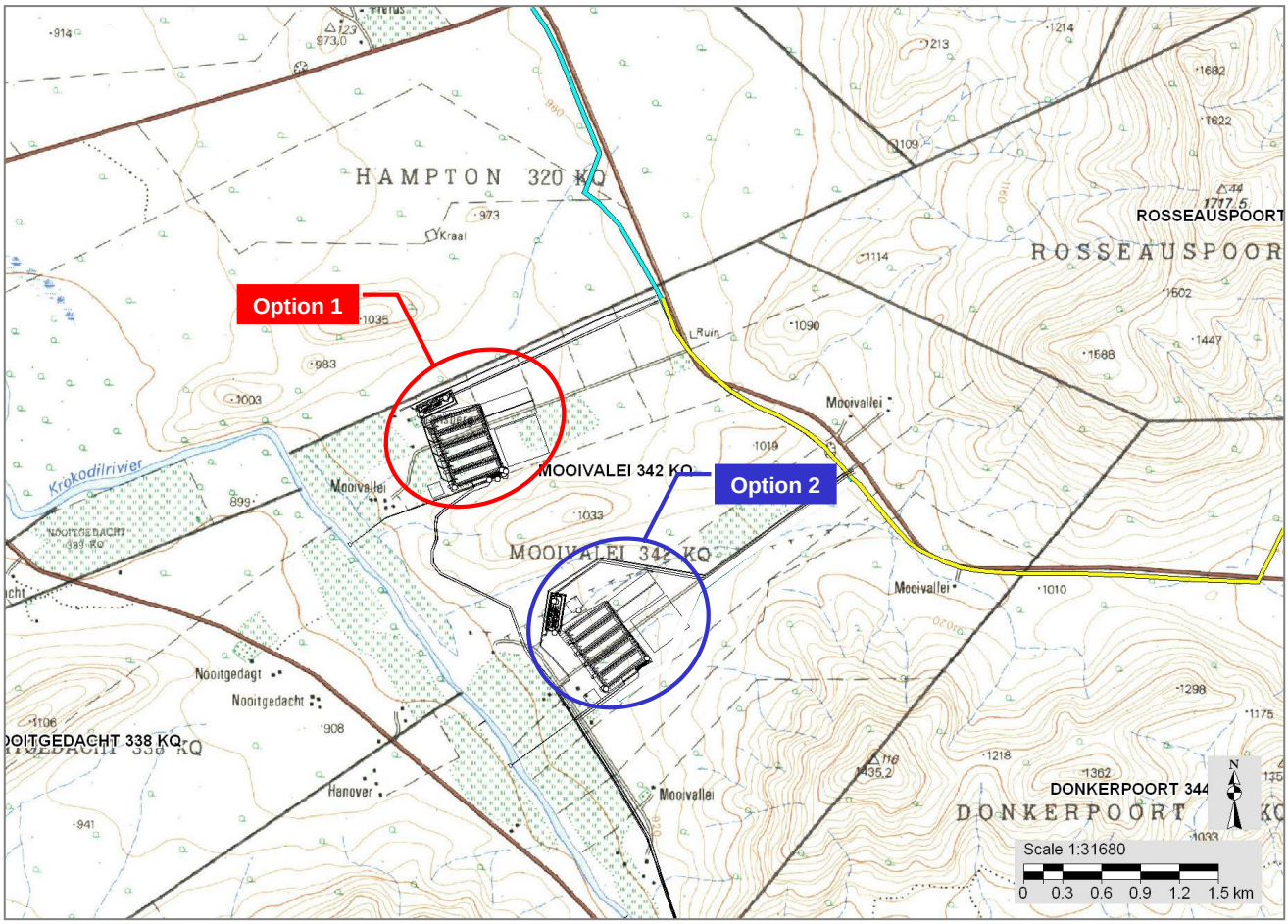


Figure 27: Potential alternative sites for balancing dam

Option 2 was discarded due to geotechnical constraints (dolomitic conditions) associated with the underlying geological conditions.

Description

The balancing dam (or reservoir) will be in the form of an artificial dam formed by shallow excavation and surrounding earthfill embankments (see examples in **Figure 28** and **29**). The footprint area of the reservoir including the desilting works is expected to be approximately 620m x 440m. The reservoir will be divided into 5 compartments, each with top dimensions of approximately 400m x 100m. The depth varies from 13,0m at the inlet side to 10,5m at the outlet side.

An outlet structure from each compartment connects to the intake manifold of the high-lift pump station. Each compartment will require a 25m wide concrete spillway which discharges into collector which will return any spilled water to the river. An erosion protected outlet structure will be provided where the water is discharged into the river.

The balancing dam will also be equipped with a silt flushing facility although only infrequent use, perhaps once every 10 years, is expected. The silt settling pond provided as part of the desilting works will also be used to separate the silt and the water flushed from the dam.

The reservoir will be lined with an appropriate waterproof lining (HDPE or similar material). Should the reservoir be located on dolomite, additional measures to prevent leakage include a double waterproof liner with a leakage detection system.

The embankment facing the river will be approximately 15m high, gradually decreasing in height as the dam extends up the hill. All embankment and cut slopes will be grassed.

The layout of the balancing dam is shown in **Figure 27** (drawing provided in **Appendix H**).

The structure will be constructed using the following methodology:

- Clear and grub, remove and stockpile topsoil;
- Excavate using heavy equipment to foundation level;
- Construct earthfill embankments;
- Construct reinforced and mass concrete structures;
- Apply lining system;
- Lay required pipework;
- Backfill excavations; and
- Replace topsoil, landscape and grass all disturbed areas.

See examples of similar infrastructure in the figures to follow.

Figure 28: A long-distance view of the balancing reservoirs at Lebalelo Weir (example)

Figure 29: A close-up view of one compartment at Lebalelo Weir (example)

9.3.6 High-lift Pump Station

The high-lift pump station will be located adjacent to the balancing dam. Footprint area of the pump station will be approximately 120m x 300m, with a height of 13,5m. The pump station will be a reinforced concrete, masonry and steel frame structure. Other structures located within the pump station area will include a guardhouse, electrical building, various reinforced concrete valve chambers, stores and maintenance facilities. The area perimeter will be secured by security fencing.

The pump station will be designed to deliver water at a wide range of flows at high efficiency by means of variable speed drives (VSDs). All pumps will be controlled via a Programmable Logic Controller (PLC) from either locally or from the control centre.

The pump station superstructure will be designed such that noise from the machines is dissipated within the structure. Facade detailing will be such that the structure blends as well as possible with the natural environment.

A drawing of the high-lift pump station is provided in **Appendix H**. Pictures during the construction phase of a similar pump station are provided below.

Figure 30: Excavation (left) and foundation (right) for a High-lift Pump Station (example)

Figure 31: Steelwork and completed structure for a High-lift Pump Station (example)

9.3.7 General

- Site accommodation for abstraction works – the intention is to not provide any accommodation on site. Alternative accommodation (e.g. in Thabazimbi) will be sought.
- The contractor will require areas for site establishment such as offices and stores. Two areas will be required, one at the abstraction weir site and one at the balancing dam site.
- The low-lift pump station as well as the balancing dam, desilting works and high-lift pump station will be manned 24 hours a day, 7 days a week by both security personnel and operators.
- All structures will be fenced off (except the pipelines) with a permanent security fence.
- All relevant structures will be provided with hand rails and other safety measures as required to ensure the safety of all personnel.
- Access to the site will be provided by a new access road which will follow the existing access roads as far as possible. The existing alignment will need to be diverted around the balancing dam and high-lift pump station. It will then again follow the existing alignment of the access road to the farms of Mooivallei. An additional section of about 1,5km of road will be required along the low pressure pipeline to the low-lift pump station from where the existing road ends.

9.3.8 Operation and Maintenance

Since it is envisaged that both transfer systems, i.e. MCWAP-1 (Mokolo Dam) and MCWAP-2A (Crocodile River), will be managed by the same MCWAP Scheme Management Authority (SMA), it is proposed that both the transfer schemes are controlled and managed from one operational control centre.

The following operational functions will be performed at the Phase 2 abstraction works, desilting works and balancing dam:

1) Abstraction weir -
    - Low flows over the stepped overspill crest of the weir will be measured and become part of the data informing the River Management System. This will allow for the monitoring of the flow downstream thereby allowing verification that the minimum downstream water requirements are met;
2) Low-lift pump station -
    - Monitoring of river releases and flows as provided by the Crocodile (West) River Management Authority (CR CMA);
    - Monitoring of the water level over the abstraction weir;
    - Monitoring of the “general health” of all the mechanical & electrical equipment;
    - Monitoring of all security and control access;
    - Monitoring of the flow out of the low-lift pump station;
    - Control of gravel trap radial gate and pump bay sluice gates;
    - Control of automatic trash rack cleaning system;

- On/Off control of individual submersible pumps in various configurations to deliver a specific total abstraction rate.

3) Low Pressure Pipeline -
   - Monitor cathodic protection system;
   - Open or close relevant interconnecting valves as may be required.
4) Desilting Works -
   - Monitoring of silt levels;
   - Monitoring of the “general health” of all the mechanical & electrical equipment;
   - Control of inlet manifold valves;
   - Control of outlet sluice gates/valves;
   - Control of flushing sluice gates/valves;
   - Systematic removal or discharge of silt from infrastructure.
5) Balancing Dam -
   - Monitoring of flow into reservoir;
   - Monitoring of flow out of reservoir
   - Monitoring of water levels in all compartments;
   - Monitoring of leakage detection system;
   - Monitoring of all security and control access;
   - Monitoring of the “general health” of all the mechanical & electrical equipment;
   - Control of inlet manifold valves;
   - Control of outlet valves; and
   - Control of silt flushing valves.

9.4 Pipeline

9.4.1 Previous Options Considered

Conveyance Options

The following conveyance options to transfer water from the Crocodile River (West) to the end users were investigated during the MCWAP Pre-Feasibility Study (DWAF, 2008b):

- River conveyance;
- Canal conveyance; and
- Pipeline conveyance.

Due to the high cost and environmental impact of implementing the pipeline conveyance along the full conveyance route, it was decided to do partial conveyance via the Crocodile River (West). Consideration was also given to the technical and environmental feasibility of a canal system. The table to follow summarises the main points considered.

Table 13: Comparison: Pipeline vs. Canal

Pipelines	Canals
1. Requires narrower servitude. 2. Does not require intermediate balancing storage. 3. Can be re-lined after 20 to 30 years without significant implications 4. Pipeline problems can be repaired in relative short periods. 5. Minimal environmental impact during operation.	1. Wide servitude – approximately 40m. 2. Requires large intermediate balancing storage. 3. Canal must be re-built or replaced with pipeline system when it reaches the end of its useful life. 4. Failure of a canal section in fill can have catastrophic consequences. 5. Major environmental impact. 6. Fragmentation of land. 7. Impacts on water quality 8. Higher maintenance costs.

Taking the above aspects into consideration it was decided not to consider options involving canal conveyance further in the pre-feasibility assessment and that only the pipeline / river conveyance options would be investigated.

Phased Approach

During the Pre-Feasibility Study, the following approach to the transfer scheme was considered:

- Un-phased (full capacity) scheme implemented in a single construction phase with an ultimate net transfer capacity of ± 200 million m^3/a (excluding system losses).
- Phased approach where the capacity is provided through two parallel pipes constructed during two consecutive construction phases.
  - Phase 2A – First phase pipeline from Vlieëpoort weir with a net transfer capacity of 110 million m^3/a; and
  - Phase 2B – Second phase pipeline from Vlieëpoort weir to achieve ultimate required net transfer capacity of ± 200 million m^3/a.

Route Options

The basic options initially considered during the Pre-Feasibility Study to convey water from the Crocodile River (West) to the Terminal Dam / Balancing Reservoir are summarised in **Table 14**.

Table 14: Crocodile River (West) Basic Transfer and Delivery Options

Approach	Phase	Description
Vlieëpoort Weir Abstraction Options		
Un-Phased	2	• Abstraction at Vlieëpoort Weir • Conveyance to Terminal Dam/BPR • Supply end users via the delivery system
Phased	2A	• Abstraction at Vlieëpoort Weir • Conveyance to Terminal Dam/BPR • Supply end users via delivery system
	2B	• Augment transfer capacity from Vlieëpoort Weir with parallel pipeline • Conveyance to Terminal Dam/BPR • Supply end users via delivery system

Approach	Phase	Description
Boschkop Weir Abstraction Options		
Un-Phased	2	• Abstraction at Boschkop Weir • Conveyance to Terminal Dam/BPR • Supply end users via delivery system
Phased	-	• Abstraction at Boschkop Weir • Conveyance to Terminal Dam/BPR • Supply end users via delivery system
	-	• Augment transfer capacity from Boschkop Weir with parallel pipeline • Conveyance to Terminal Dam/BPR • Supply end users via delivery system
Boschkop/Vlieëpoort Weir Abstraction Options		
Phased	2A	• Abstraction at Vlieëpoort Weir • Conveyance to Terminal Dam/BPR • Supply end users via delivery system
	2B	• Augment transfer capacity from Vlieëpoort Weir with parallel pipeline • Conveyance to Terminal Dam/BPR • Supply end users via delivery system
	3	• Abstraction from Boschkop Weir • Conveyance to Vlieëpoort Weir to reduce river losses and transfer further to Terminal Dam/BPR

Another option that was considered during the Reconnaissance Study entailed a transfer from Boschkop to Mokolo River which would discharge into the headwaters of the river upstream of Mokolo Dam. This option was discarded due to water quality impacts, where the transferred water is of poorer quality than that of the Mokolo River.

Alternative pipeline routes were identified in accordance with the above basic options. The following aspects were considered in defining and evaluating the different pipeline routes:

- Possible abstraction and delivery locations;
- Existing roads, as well as boundaries between land owners along the routes;
- Historical and planned future mining activities in the area;
- Existing and planned future services and infrastructure;
- Site constraints, potential river/stream crossings, and road and railway crossings;
- Geotechnical conditions based on a high level geotechnical screening;
- Cathodic protection requirements with special consideration of the impact that the potential future 765 kV overhead power line corridors might have on the AC mitigation requirements;
- Environmental overview; and
- Social impact of the proposed pipe route

Based on the two abstraction weir sites (Boschkop and Vlieëpoort), water from the Crocodile River (West) can be delivered along alternative route(s) to either one of the two identified Terminal Dam sites (Sites 1 or 3), or via a break pressure balancing reservoir (24 hr storage) to Terminal Reservoirs at the major consumer sites. **Figure 32** is a schematic diagram of the alternative pipeline route options and system nodes that were initially considered.

A total of 8 route options were investigated at pre-feasibility level. Geotechnical, cathodic protection, environmental and social reviews were undertaken for each of the routes and considered in the selection of the preferred alignment (i.e. Central Route with pipe sections 24, 7, 19, 18, 16 and 31).

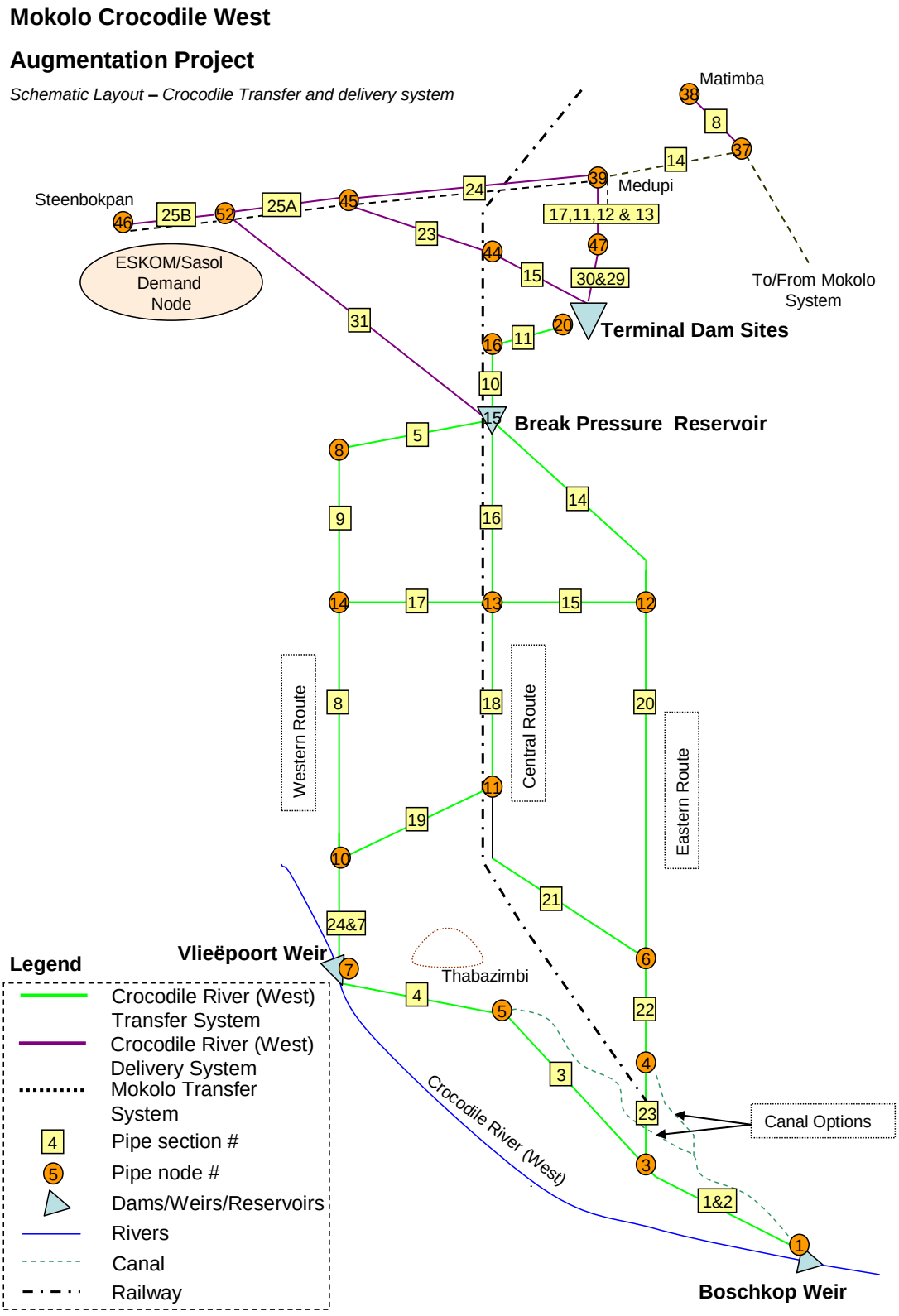


Figure 32: Schematic diagram of Crocodile River (West) transfer and delivery system

Three basic operational configurations of the Central Route Alternative rising and gravity main and reservoirs were considered. These are described below.

Central Route Alternative 1 – Configuration 1a (see Figure 33):

Pump station and rising main via the **Central Route**. Pump from Vlieëpoort Weir via the balancing dam to a BPR at chainage 32000 (PI 48). The BPR was sized for 4 hours of storage (at peak flow). From the BPR water flow under gravity to the OR, sized to provide 8 hours storage. The flow is distributed from the OR under gravity to the end user Terminal Reservoirs (TR).

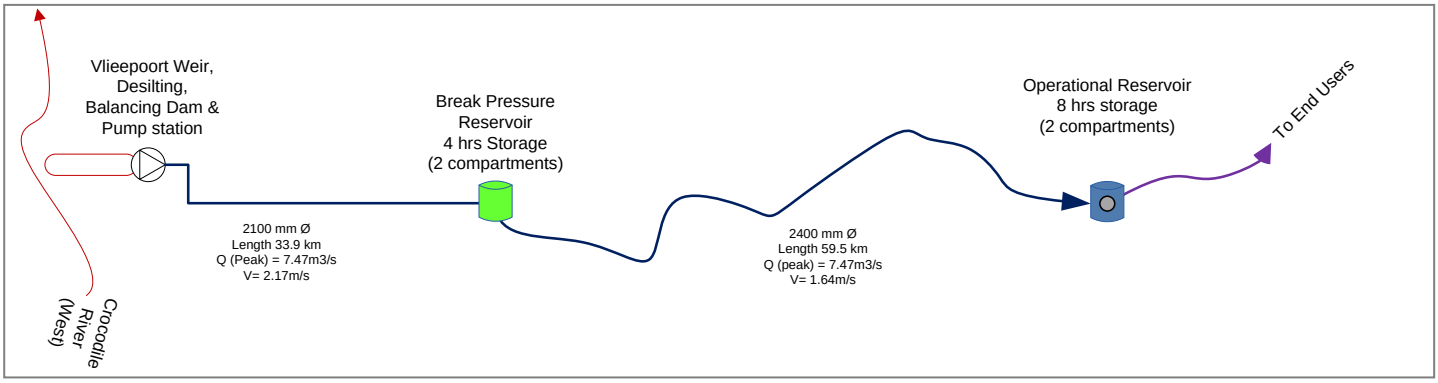


Figure 33: **Schematic diagram of Central Route Alternative 1 – Configuration 1a (Q = flow in m^3/s; V = flow velocity in m/s)**

Central Route Alternative 2 – Configuration 1b (see Figure 34):

Pump station and rising main via **Central Route**. Pump from Vlieëpoort Weir via the balancing dam directly to the OR. A 20 Ml Surge Reservoir (SR) is required at chainage 32000 (PI 48). The flow is distributed from the OR under gravity, to the end user's TR.

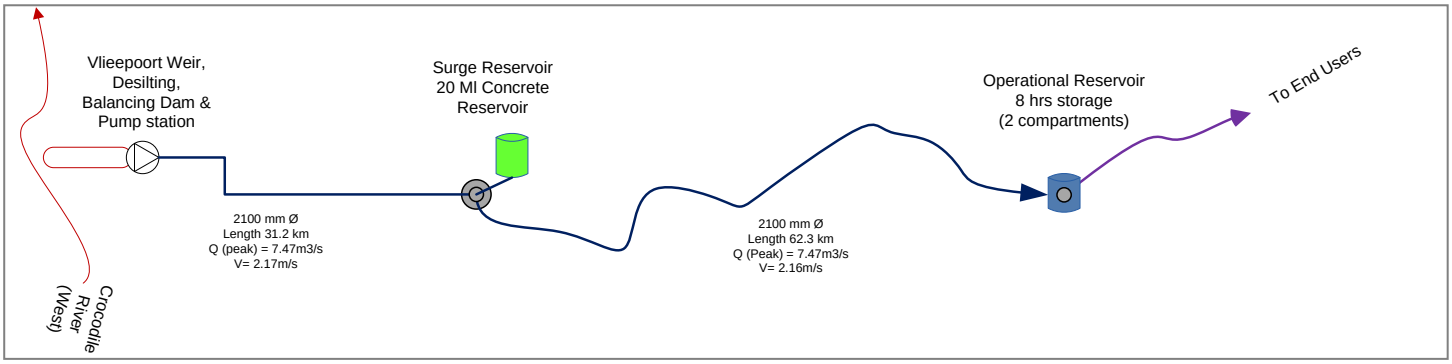


Figure 34: **Schematic diagram of Central Route Alternative 2 – Configuration 1b (Q = flow in m^3/s; V = flow velocity in m/s)**

Central Route Alternative 3 – Configuration 2b (see Figure 35):

This scenario is similar to Scenario 1b, however it follows **alternative route 1** towards the west from Vlieëpoort Weir to the OR. A 20 Ml Surge Reservoir (SR) is included at chainage 42000 (PI 38) on alternative route 1.

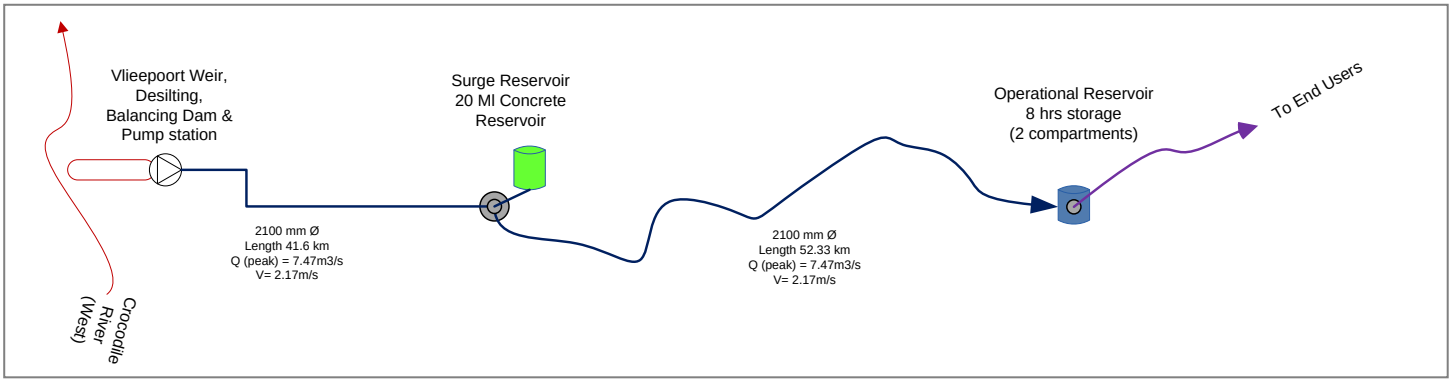


Figure 35: Schematic diagram of Central Route Alternative 2 – Configuration 1b (Q = flow in m^3/s; V = flow velocity in m/s)

Configuration 1a was recommended for implementation by the MCWAP Technical Team for the following reasons:

- Minor difference in the total life cycle cost compared to scenario 1b. This difference will be reduced further if the price of steel pipes reduces.
- Due to the flat Hydraulic Gradient Line (HGL) during low flow conditions, a BPR must be provided in the vicinity of chainage 32000m for operational reasons to prevent negative pressures in the pipeline.
- Significant advantages can be gained by reducing the length of the rising main and avoid 'downhill pumping', thereby improving the operational control of the system.
- Easier future upgrade capability to increase the capacity of the system in order to achieve up to 50% more throughput.

Options assessed as part of previous EIA

During public participation as part of the previous EIA for MCWAP Phase 2 (refer to **Section 6.1**) and the broader Public Involvement Process, several additional alternative routes were identified through comments received from IAPs.

These routes are compared to the routes that are being assessed under the current EIA for MCWAP-2A WTI in **Table 15** (shown in **Figure 36**). As presented in the aforementioned table, the main change in terms of the routes that are currently being assessed is the discarding of the Regorogile Alternative (Alternatives C, C1, C2, C3 and E) due to the reasons presented. The alternative routes to the Central Route are also differently named to logically distinguish between the options.

Table 15: Status of pipeline routes assessed as part of previous EIA

Pipeline Routes – previous EIA	Pipeline Routes – current EIA	Comments
Transfer System - Vlieëpoort Abstraction Site to OR		
Alternative – Central Route	Unchanged	
Alternative A	Alternative A1	Name changed.
Alternative B	Alternative A2	Name changed.
Alternatives C, C1, C2, & C3	Discarded	• Geotechnical constraints. • Difficult conditions for construction in the densely populated built up area of the Regorogile Township. • Potentially insufficient quantities of borrow material along route. • Regorogile Alternative may take comparatively 11% longer. • Special surge mitigation measures will have to be installed on the Regorogile Alternative at the peak of the first ridge. • Potential occurrence of red data species may be present on the mountain slope south of Regorogile. • The social risk of flooding and catastrophic damage to houses due to a pipe failure in the Regorogile suburb is considered to be high. • Security and vandalism of the pipeline and fittings in the areas adjacent to the Regorogile suburb is considered to be a high risk. • Attempts at illegal connections may be fatal.
Alternative D	Alternative C	Name changed.
Alternative E	Discarded	Linked to Regorogile Alternative.
Alternative I	Alternative B	Route discarded as part of the Feasibly Study.
Delivery System - OR to Terminal Point		
Alternative F	Alternative D1	Name changed.
Alternative G	Alternative D2	Name changed.
Alternative H	Alternative D3	Name changed.

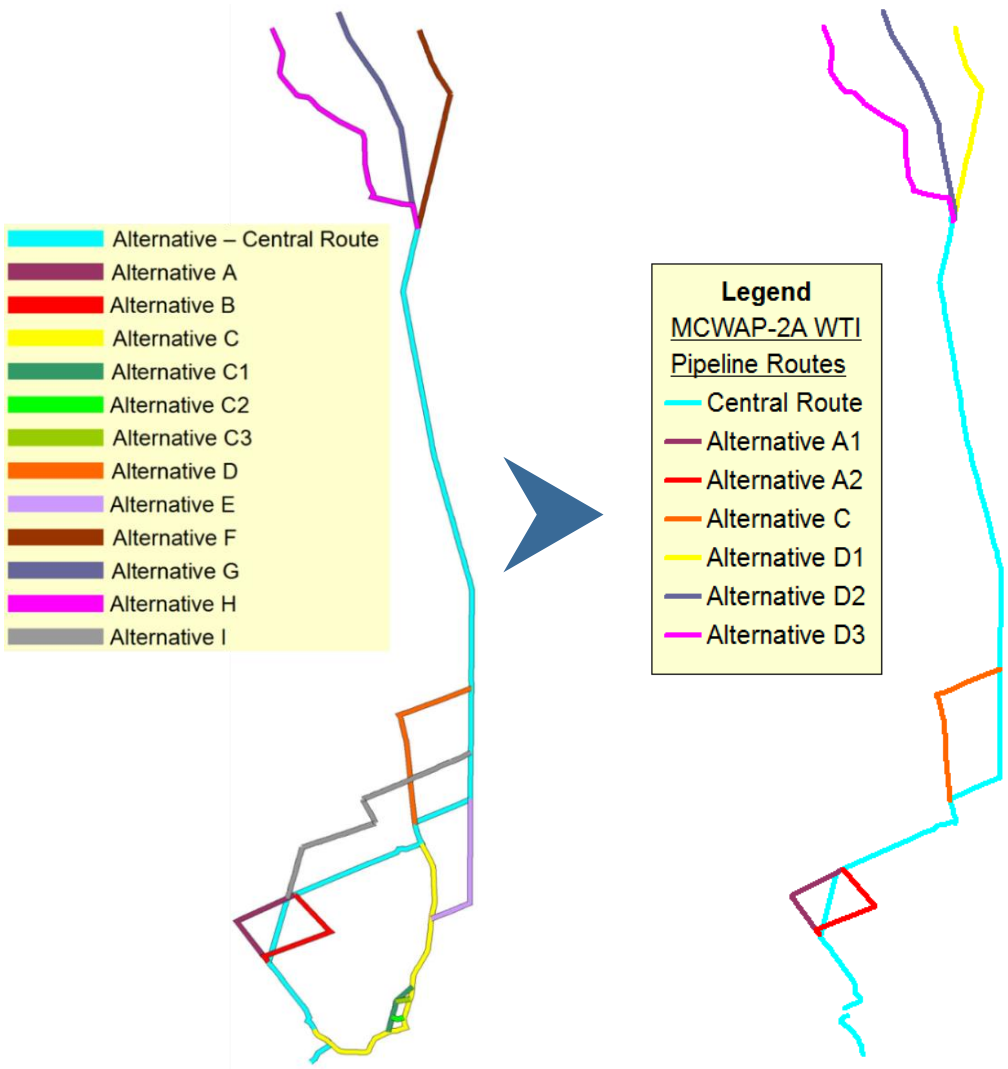


Figure 36: Pipelines routes – previous EIA (left) and current EIA (right)

9.4.2 Pipeline Specifications

The pipeline specifications are provided in **Table 16**.

Table 16: Pipeline specifications

Pipe diameter	Up to 2400 mm
Pipe material	Steel pipes with welded joints.
Installation	• Underground, with a minimum cover above the pipe of 1.0m. • Access/valve chambers will be located at approximately 500 m intervals along the route. It will be concrete structures protruding slightly above natural ground level.
Servitude Width	Typically 40 m during construction (temporary) (see **Figure 37**) and 25 m permanent.
Servitude Conditions	• Permanent access to the pipeline servitude will be required after construction. • Pipeline markers (concrete posts) will be installed at changes in direction and at regular intervals along the route. • Farming activities (stock and crop farming) can continue within the servitude area after rehabilitation (between 1 and 2 years after construction), taking cognisance of the need for permanent access to the pipeline servitude.

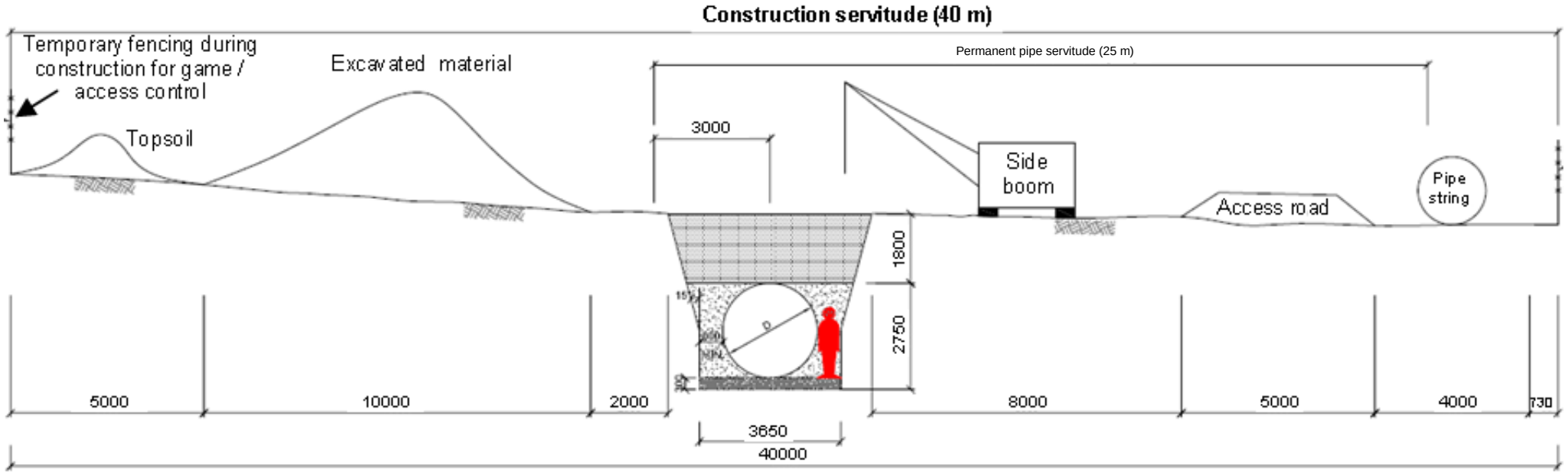


Figure 37: Typical construction servitude cross-section

(Note: not specific to MCWAP-2A – merely indicative)

9.4.3 Pipeline Routing

The following aspects were considered in defining the MCWAP-2A pipeline alternative routes:

- Abstraction and water supply locations;
- Existing linear infrastructure (e.g. roads, railway line, power lines) as well as boundaries between landowners along the routes;
- Environmental impacts;
- Social impact of pipeline location;
- Comments received from IAPs during the public participation for the Scoping phase and the broader Public Involvement Process;
- Existing servitudes;
- Historical and planned future mining activities in the area, both sub-surface and open cast;
- Site constraints, potential watercourse crossings, road and railway crossings; and
- Geotechnical overview.

In some instances where the pipeline follows linear infrastructure (e.g. railway line) and between farm boundaries, the exact route still needs to be finalised in terms of which side of the aforementioned features it will run alongside to. All feasible alternatives will be investigated in greater detail during the EIA phase through a technical and environmental comparative analysis. Note that it is not possible to locate the pipeline within servitudes or reserves of existing infrastructure, and it will thus need to be constructed on the adjoining private properties.

A coarse overview of the pipeline route options follows. As mentioned, all distances provided should be regarded as approximates, as they are based on a desktop estimate from GIS and 2013 cadastral data. For detailed maps on the pipeline alternative routes, please refer to **Appendix B**.

9.4.3.1 Transfer System - Vlieëpoort Abstraction Site to OR

Low-lift Rising Main

Refer to **Section 9.3.3** for a description of the route of the low-lift rising main.

Alternative – Central Route

From the high-lift pump station, the rising main travels in a north-easterly direction on Portion 1 of the Farm Mooivalei 342 KQ for approximately 1.8km. It then crosses underneath the D1649 and turns north-westerly to follow this road (on the eastern side) for ± 1km (see **Figure 38**), on the boundary of the Farm Stratford 462 KQ.

The route then turns to follow the Rooibokkraal Road for ± 6.7km (on eastern side), in a predominantly north-westerly direction along the following properties (see **Figure 39**):

- Stratford 462 KQ (± 1.6km);
- Meklenberg 311 KQ (± 3.3km); and

- Portion 1 of the Farm Mecklenburg 310 KQ (±1.9km).

Figure 38: View along D1469

Figure 39: View along Rooibokkraal Road

On Portion 1 of the Farm Mecklenburg 310 KQ the Central Route turns north-easterly to follow the existing power line servitude, crossing the following properties (see **Figure 40**):

- Portion 1 of Mecklenburg 310 KQ (± 800m);
- Portion 7 of the Farm Paarl 124 KQ (± 3km);
- Portion 6 of the Farm Paarl 124 KQ (± 150m); and
- Remainder of the Farm Paarl 124 KQ (± 2.2km).

Figure 40: View along power line servitude (Portion 1 of the Farm Mecklenburg 310 KQ)

Thereafter the route bends in a more easterly direction to follow a gravel road that runs between the following properties (see **Figure 41**):

- Remainder of the Farm Paarl 124 KQ (± 720m);
- Buffelsvley 127 KQ (± 7.8km);
- Karoobult 126 KQ (± 7km);
- Zondagskuil 130 KQ (± 4.9km); and
- Portion 1 of the Farm Leeuwbosch 129 KQ (± 3.7km).

Figure 41: View along gravel road

From the BPR on Portion 1 of the Farm Leeuwbosch 129 KQ the pipeline crosses underneath R510 and turns north-westerly to follow the road (on the eastern side) for ± 2.2km, along the boundary of Portion 2 of the Farm Diepkuil 135 KQ (see **Figure 42**).

Figure 42: View along R510

The route then turns more easterly to follow a dirt road between the following properties (see **Figure 43**):

- Portion 2 of the Farm Diepkuil 135 KQ (± 2.4km);
- Portion 1 of the Farm Tarantaalpan 132 KQ (± 470m);

- Portion 2 of the Farm Tarantaalpan 132 KQ (± 1.6km);
- Remainder of the Farm Tarantaalpan 132 KQ (± 3.2km); and
- Portion 3 of the Farm Diepkuil 135 KQ (± 3km).

Figure 43: View along dirt road (Portion 2 of the Farm Diepkuil 135 KQ on right)

Thereafter the route follows the railway line (on the western side) for ± 56km, affecting the following properties (see **Figure 44**):

- Remainder of the Farm Blaauwpan 133 KQ (± 4.5km);
- Portion 6 of the Farm Ruigtevley 97 KQ (± 2.3km);
- Portion 5 of the Farm Ruigtevley 97 KQ (± 3.8km);
- Portion 4 of the Farm Witklip 665 KQ (± 4.2km);
- Portion 37of the Farm Groenrivier 95 KQ (± 1.1km);
- Matsulan 98 KQ (± 2.8km);
- Matlabas 94 KQ (± 2.4km);
- Remainder of Haarlem Oost 51 KQ (± 1.2km);
- Portion 16 of Haarlem Oost 51 KQ (± 3.9km);
- Remainder of Grootfontein 50 KQ (± 1.9km);
- Portion 1 of Grootfontein 50 KQ (± 2.3km);
- Portion 1 of Welgevonden 16KQ (± 220m);
- Remainder of Welgevonden 16 KQ (± 1.3km);
- Portion 2 of Welgevonden 16 KQ (± 720m);
- Portion 9 of Welgevonden 16 KQ (± 1.3km);
- Portion 5 of Welgevonden 16KQ (± 380m);
- Portion 1 of Schoonwater 14 KQ (± 830m);
- Remainder of Rietfontein 15 KQ (± 3.4km);
- Portion 1 of Rietfontein 15 KQ (± 1.1km);
- Portion1 of Inkermann 10 KQ (± 2.3km);
- Groenland 397 LQ (± 1.9km);
- Mabulskop 406 LQ (± 3.5km);
- Diepspruit 386 LQ (± 1.4km);

- Portion 2 of the Farm Zandfontein 382 LQ (± 4.7km); and
- Portion 4 of the Farm Rooipan 357 LQ (± 2.1km) (site earmarked for OR).

Figure 44: Views along railway line

Alternative A1

Alternative A1 deviates from the Central Route option by continuing in a north-westerly direction along the Rooibokkraal Road, affecting the following properties:

- Portion 1 of the Farm Mecklenburg 310 KQ (for ± 660m);
- Portion 7 of the Farm Paarl 124 KQ (± 1.2km); and
- Portion 6 of the Farm Paarl 124 KQ (± 2.6km).

The route then turns north-easterly to follow the boundaries of the following properties before connecting to the Central Route:

- Portion 6 of the Farm Paarl 124 KQ (± 3.2km);
- Portion 11 of the Farm Tarentaalkraal 120 KQ (± 410m);
- Amsterdam 123 KQ (± 4.6km);
- Remainder of the Farm Paarl 124 KQ (± 2.5km); and
- Buffelsvley 127 KQ (± 730m).

Alternative A2

Alternative A2 deviates from the Central Route option by continuing in a north-westerly direction along the Rooibokkraal Road, alongside Portion 1 of the Farm Mecklenburg 310 KQ (for ± 660m). Thereafter the route turns in a north-easterly direction to follow the boundaries of the following properties:

- Portion 1 of the Farm Mecklenburg 310 KQ (for ± 6.2km);
- Portion 7 of the Farm Paarl 124 KQ (± 3.4km); and
- Portion 4 of the Farm Paarl 124 KQ (± 2.9km).

The route then turns north-westerly to follow the boundaries of the following properties before connecting to the Central Route:

- Portion 4 of the Farm Paarl 124 KQ (± 2.4km);
- Remainder of the Farm Paarl 124 KQ (± 2.4km); and
- Karoobult 126 KQ (± 4.8km).

Alternative B

Route Alternative B of the proposed pipeline route was discarded during the Feasibility Study, based on considerations related to the suitable location for the BPR.

Alternative C

Alternative C deviates from the Central Route by continuing in a north-westerly direction along the R510 (eastern side), potentially affecting the following properties:

- Portion 12 of the Farm Honingvley 99 KQ (± 1.4km);
- Portion 13 of the Farm Honingvley 99 KQ (± 1.5km);
- Portion 14 of the Farm Honingvley 99 KQ (± 1.8km); and
- Remainder of the Farm Honingvley 99 KQ (± 1.5km).

The pipeline then crosses underneath the R510 and turns in a north-eastern direction to continue following the R510 (on the northern side), running along the boundaries of the following properties before connecting to the Central Route and following the railway line:

- Portion 4 of the Farm Vaalpenspan 90 KQ (± 570m);
- Remainder of the Farm Vaalpenspan 90 KQ (± 2.1km);
- Portion 1 of the Farm Vaalpenspan 90 KQ (± 1.2km);
- Portion 1 of the Farm Witklip 665 KQ (± 1.5km);
- Remainder of the Farm Witklip 665 KQ (± 230m); and
- Portion 4 of the Farm Witklip 665 KQ (± 1.3km).

9.4.3.2 Delivery System - OR to Terminal Point

Alternative D1

From Portion 4 of the Farm Rooipan 357 LQ, where the OR is situated, the pipeline route for Alternative D1 continues alongside the railway line in a north-easterly direction, potentially affecting the following properties:

- Portion 2 of the Farm Rooipan 355 LQ (± 2.4km);
- Naauwpoort 363 LQ (± 2.4km);
- Portion 5 of the Farm Rhenosterpan 361 LQ (± 900m);
- Remainder of the Farm Rhenosterpan 361 LQ (± 960m);
- Portion 4 of the Farm Rhenosterpan 361 LQ (± 1.3km);
- Portion 6 of the Farm Rhenosterpan 361 LQ (± 3.1km); and
- Portion 1 of the Farm Zandnek 358 LQ (± 1.7km).

The route then turns away from the railway line in a north-westerly direction and passes the following properties before connecting to the link pipeline to Lephalale:

- Portion 1 of the Farm Zandnek 358 LQ (± 3km);
- Portion 1 of the Farm Geelhoutskloof 359 LQ (± 3km);
- Taaiboschpan 320 LQ (± 3.8km); and
- Enkeldraai 314 LQ (± 3.8km).

Alternative D2

From the OR the pipeline route for Alternative D2 runs along the following properties:

- Portion 2 of the Farm Rooipan 355 LQ (± 2.6km);
- Naauwpoort 363 LQ (± 600m);
- Portion 5 of the Farm Rhenosterpan 361 LQ (± 750m);
- Portion 2 of the Farm Rhenosterpan 361 LQ (± 2.5km);
- Portion 3 of the Farm Rhenosterpan 361 LQ (± 1.2km);
- Portion 6 of the Farm Rhenosterpan 361 LQ (± 2km);
- Portion 1 of the Farm Leliefontein 672 LQ (± 1.7km);
- Remainder of the Farm Zandnek 358 LQ (± 4.6km);
- Portion 3 of the Farm Zandheuvel 356 LQ (± 4.6km);
- Remainder of the Farm Zandheuvel 356 LQ (± 900m);
- Portion 1 of the Farm Zandheuvel 356 LQ (± 1km);
- Mooipan 325 LQ (± 5.2km);
- Remainder of the Farm Zyverbult 324 LQ (± 5.2km);
- Portion 2 of the Farm Toezicht 323 LQ (± 2.6km); and
- Minnaarspan 322 LQ (± 2.6km).

The route ends on the Remainder of the Farm Vangpan 294 LQ, where it connects to the link pipeline to Lephalale.

Alternative D3

From the OR, the route runs on the boundaries of the following properties:

- Portion 2 of the Farm Rooipan 355 LQ (± 3km);
- Remainder of the Farm Rooipan 355 LQ (± 4.3km);
- Portion 4 of the Farm Rooipan 357 LQ (± 3km);
- Remainder of the Farm Rooipan 357 LQ (± 2.7km); and
- Remainder of the Farm Grootlaagte 354 LQ (± 2.7km).

The route then follows the Steenbokpan – Sentrum Road (see **Figure 45**), potentially affecting the following properties, before connecting to the link pipeline to Lephalale:

- Portion 1 of the Farm Rooipan 355 LQ (± 2.4km);
- Remainder of the Farm Rooipan 355 LQ (± 2.4km);
- Portion 1 of the Farm Rooipan 357 LQ (± 2km);
- Portion 5 of the Farm Rooipan 357 LQ (± 2km);
- Portion 1 of the Farm Leliefontein 672 LQ (± 2.4km);
- Remainder of the Farm Leliefontein 672 LQ (± 2.4km);
- Portion 3 of the Farm Zandheuvel 356 LQ (± 1.2km);
- Remainder of the Farm Zandheuvel 356 LQ (± 1.3km);
- Portion 1 of the Farm Zandheuvel 356 LQ (± 1.4km);
- Remainder of the Farm Doornlaagte 353 LQ (± 3km);
- Remainder of the Farm Schuldpadfontein 328 LQ (± 2km);
- Portion 2 of the Farm Schuldpadfontein 328 LQ (± 2km);
- Portion 1 of the Farm Schuldpadfontein 328 LQ (± 2.2km);
- Portion 1 of the Farm Paardevley 329 LQ (± 1.6km);
- Portion 23 of the Farm Theunispan 293 LQ (± 690m); and
- Portion 11 of the Farm Theunispan 293 LQ (± 690m).

Figure 45: View along Steenbokpan – Sentrum Road

9.4.4 Construction Methodology

The methodology for the installation of the pipeline under normal conditions is as follows:

- Pegging of route;
- Marking of protected trees;
- Remove topsoil in the area where construction will take place and stockpile separately for later re-instatement;
- Excavate pipe trench (refer to the construction servitude diagram contained in **Figure 37** for an illustration of the typical trench geometry);
- Install and compact pipe bedding.
- Install pipe sections by means of side booms (special cranes) and weld joints (see **Figure 46**).

Figure 46: Typical trench excavation and pipe installation activities

- Repair field joints and backfill and compact pipe trench in layers;
- Construct air and scour valves. Air valves, which are generally positioned at high points along the route, release air from the pipeline as it fills, allow air into the pipeline when it is draining and 'bleed' off air during normal operations. The scour valves serve to drain water from the pipeline (typically during maintenance), and are located a low points along the route for drainage purposes. A detailed hydraulic analysis for the positioning of the valves will be performed as part of the detail design;
- Construct access chambers (see **Figure 47**);

Figure 47: Typical examples of chambers (left - during construction; right – completed)

- Re-shape the impacted area to its original topography and replace stripped topsoil (see **Figure 48**);

Figure 48: Typical views of reinstated (left) and rehabilitated (right) pipeline routes

- Install final Cathodic Protection;
- Install AC mitigation measures;
- Install pipeline markers at changes in direction and at regular intervals along the route; and
- Rehabilitation.

Watercourse crossings will generally consist of pipe sections encased in concrete in accordance with the relevant DWS criteria. The typical construction methodology for a river crossing is as follows (see **Figure 49**):

- An earthen berm (coffer dam) and temporary bypass canal is constructed to divert the water around the construction site.
- The trench is excavated across the dry river channel
- A concrete bedding is constructed first, followed by the installation and restraining of the pipe to prevent flotation. Encasement is completed by the construction of further concrete lifts.
- Once the concrete has set, the temporary coffer dam is removed and the bypass canal backfilled to re-instate the flow.
- The impacted area is re-shaped to its original topography.
- The disturbed area is rehabilitated.
- If erosion of the disturbed river banks is a concern, suitable measures will be implemented to ensure the stabilisation of the river structure.

Figure 49: Examples of typical river crossings

The pipeline will traverse the Matlabas River via a trenchless technique. Further details to be provided in the EIA Report.

9.4.5 First Order Cathodic Protection and AC Mitigation

Cathodic protection and AC mitigation will be necessary where the proposed pipeline route runs parallel to and crosses (a) existing and proposed future high voltage power line routes, and (b) electrified railway lines.

Mutual interference effects between the pipeline and a high voltage power line could result in danger to safety of personnel under normal operation and fault conditions, risk to the pipeline integrity under fault conditions, risk of AC-enhanced corrosion under normal operation and risk of damage to the coating from electrical stress under fault conditions. Hence, AC mitigation is necessary.

9.4.6 Operational phase

The key tasks during the operational phase for the pipeline include the following:

- Operation of the transfer scheme;
- Create access track along pipeline servitude;
- Conduct routine maintenance inspections of the project infrastructure;
- Scouring of pipeline, where the water conveyed and stored within this system will be released into the receiving watercourses along the alignment from scour valves. A detail hydraulic analysis will be conducted to determine the optimum positioning of the scour valves;
- Undertake maintenance and repair works, where necessary; and
- On-going consultation with directly affected parties.

9.4.7 Decommissioning phase

It is envisaged that the pipeline will be used indefinitely, under suitable maintenance. Decommissioning is thus not considered applicable to the scheme. However, should decommissioning be required the activity will need to comply with the appropriate and prevailing environmental legislation and best practices at that time.

9.5 Break Pressure Reservoir

The pipeline route from the Vlieëpoort high-lift pump station crosses over high ground. The elevation in this area is such that a BPR can be located to enable gravity flow onwards to the OR.

The proposed BPR is located on Portion 1 of the Farm Leeuwbosch 129 KQ (see photographs in **Figures 50 – 51**). A general layout is provided in **Figure 52** (drawing contained in **Appendix H**).

The BPR will generally be in the form of an artificial dam formed by shallow excavation and surrounding earthfill embankments. The final depth and size of the reservoirs will be determine by the site topography (cut and fill balance) with the aim of minimising surface area to reduce evaporation and maximum flow through to prevent stagnation of the water.

The reservoir will have to be lined with an appropriate waterproof lining system (HDPE or similar material) and suitable sub-surface drainage must be provided.

The reservoir will be compartmentalised to allow for normal operation, maintenance and cleaning, as well as the mitigating requirements relating to water quality that may be required.

Figure 50: **South-western view of site for BPR**

Figure 51: **View along road with site for BPR to the left**

DESCRIPTION	VALUE
NON SPILL OVER CREST	1105.00 mASL
BASE LEVEL	1097.96 mASL
	1100.00 mASL
EMBANKMENT HEIGHT	6.34 m (MAXIMUM)
	1.62 m (MINIMUM)
SLOPES	SIDE SLOPES 1 : 2
	FLOOR 1 : 100
COMPARTMENT VOLUME	50 000 m^3
WATER LEVEL	1104.00 mASL
FREE BOARD	1 m
WATER DEPTH	6.04 m (MAXIMUM)
	5.00 m (MINIMUM)
SPILLWAY DEPTH	0.6 m
SPILLWAY WIDTH	12 m

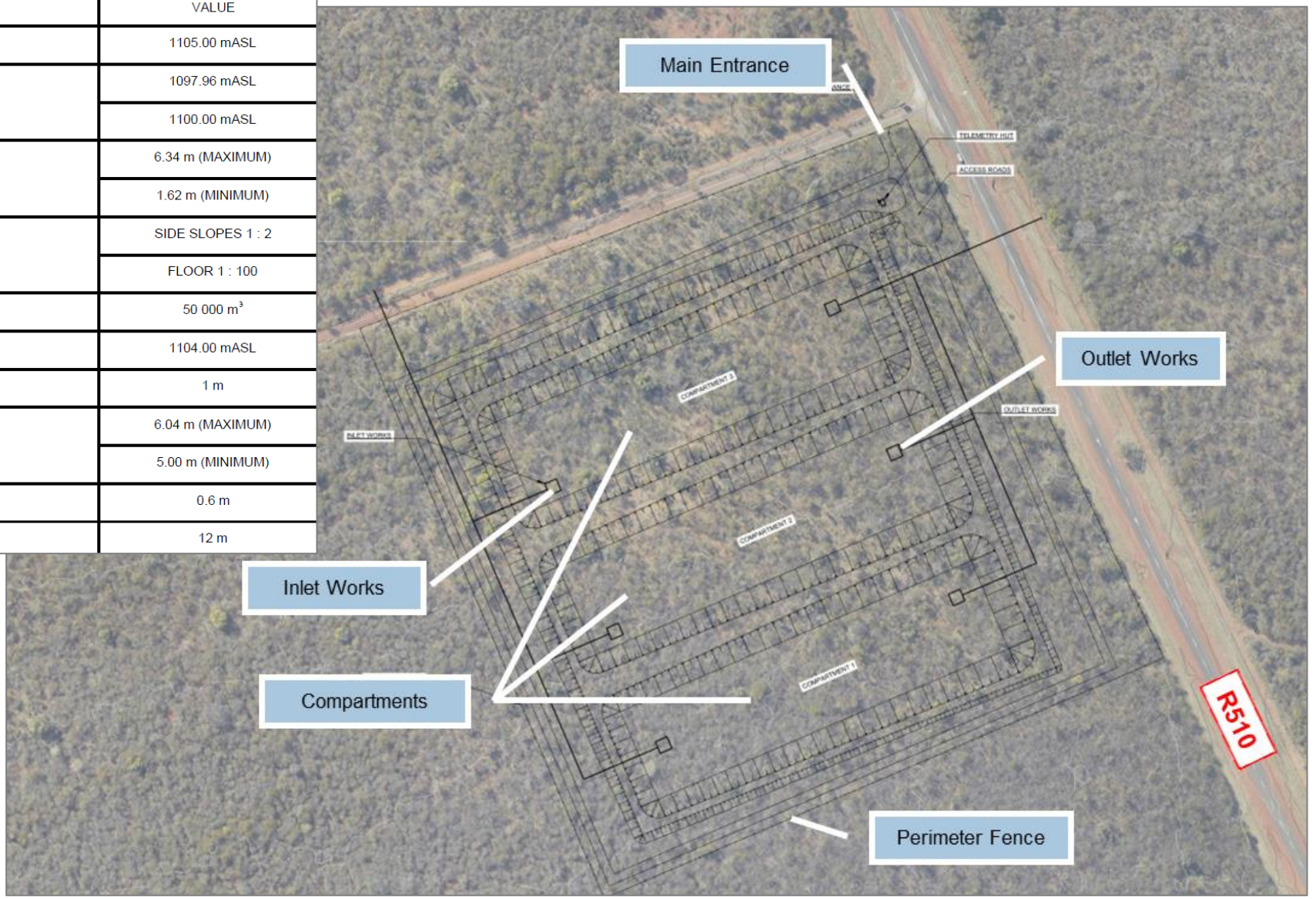


Figure 52: Layout - BPR

9.6 Operational Reservoir

9.6.1 Terminal Dams

Potential Terminal Dam (TD) sites were investigated as part of the feasibility study. TD storage provides the advantage that users can be supplied under gravity from a source located relatively close to the point of consumption. This reduces the risk of non-supply and simplifies the operation of the pump system used to transfer the water to the users.

Four sites were identified as possible sites for construction of a TD on the Farm Witvogelfontein 362LQ (see **Figure 53**), with Sites No 1 and 3 identified as most favourable (DWAF, 2008c). The identified potential dam sites are located at positions where the respective river valleys provide a storage basin, and a narrowing of the valley suggests the possibility of constructing a dam wall. The TD is essentially an off-channel storage dam which will be filled with water diverted from the Crocodile River; as such dam sites are not dependent on the expected run-off characteristics.

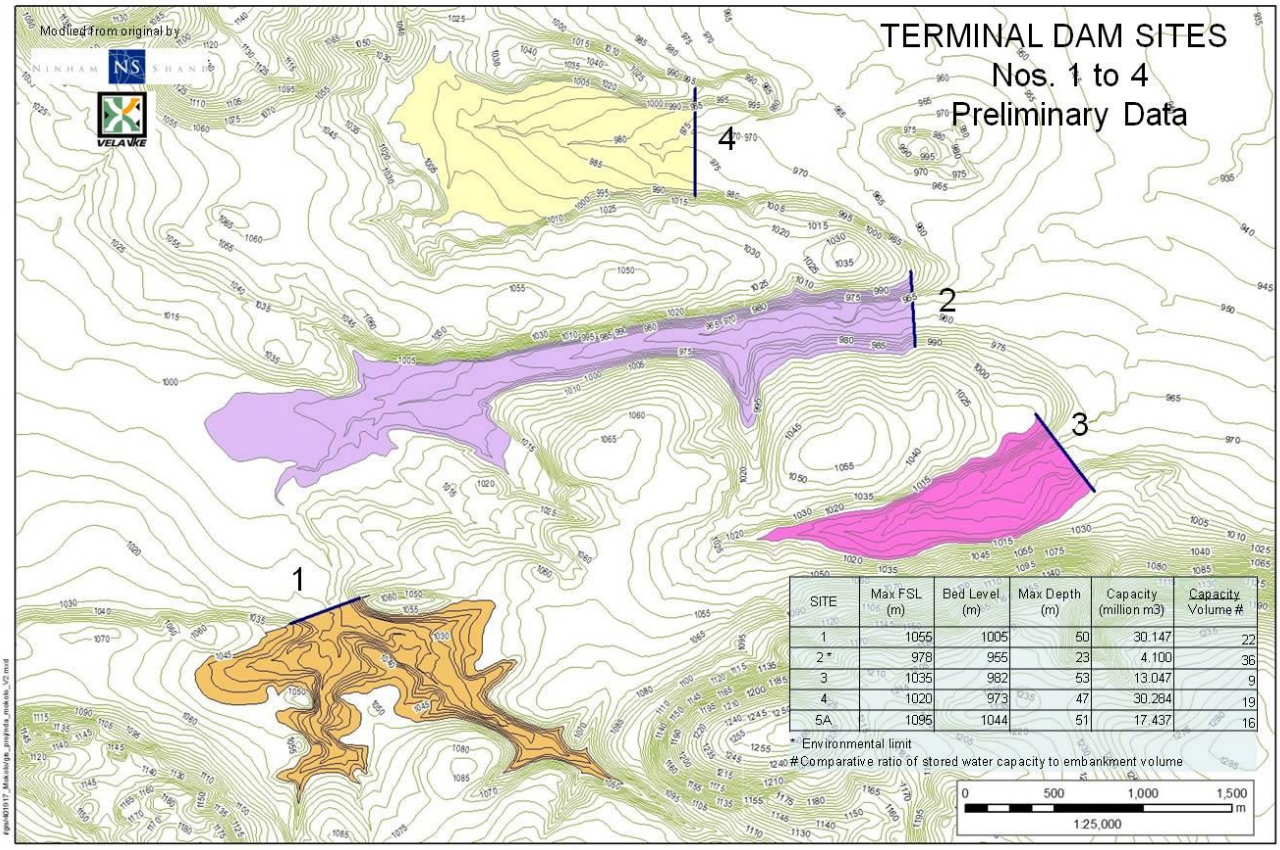


Figure 53: Terminal Dam Sites (DWAF, 2008c)

9.6.2 Terminal Reservoirs

As a more preferred alternative to TDs the use of Terminal Reservoirs located at the end user sites were investigated. This option comprises the Crocodile River (West) transfer pipeline

feeding into an OR from where a gravity pipeline will feed multiple users Terminal Reservoirs (at each of the large users) with 18 days storage capacity (see **Figure 54**).

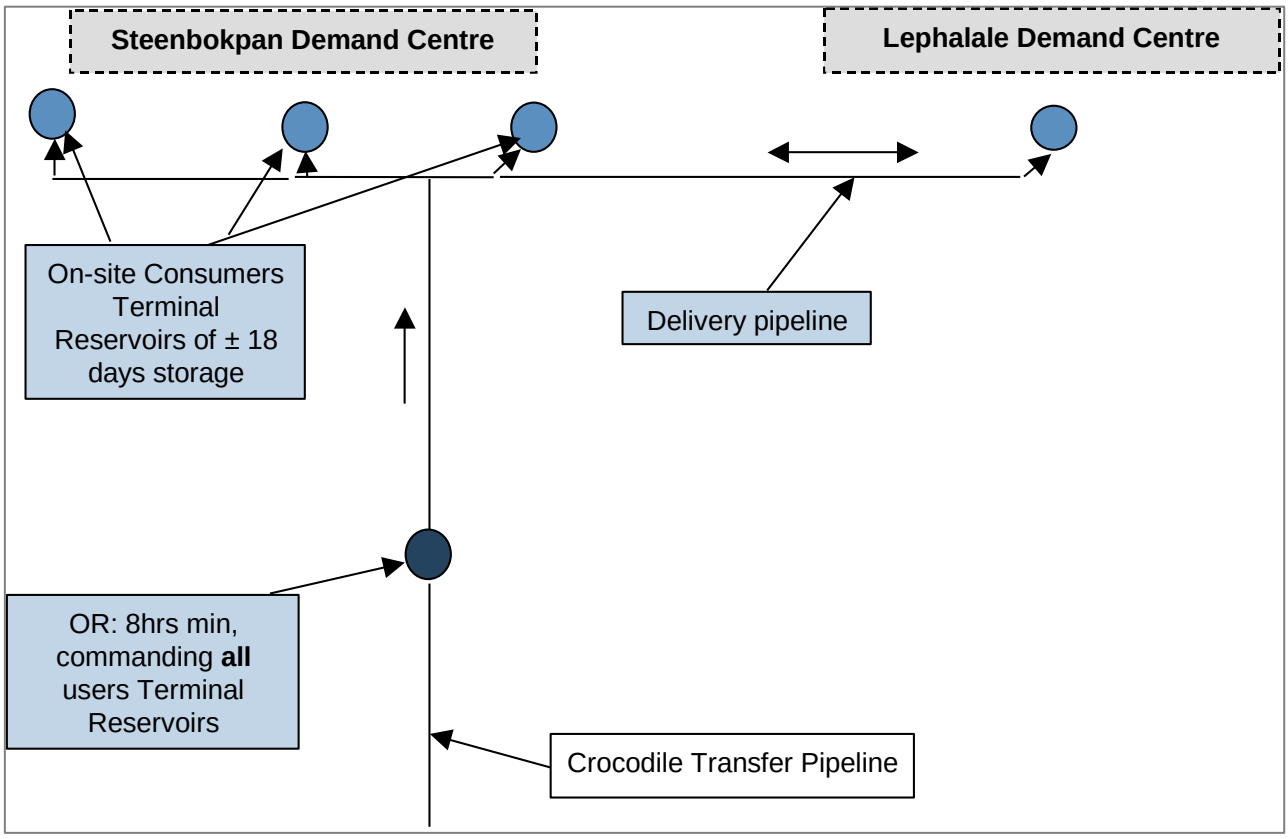


Figure 54: Multiple Terminal Reservoirs

The OR is located on Portion 4 of the Farm Rooipan 357 LQ (refer to photograph in **Figure 55**). A general layout is provided in **Figure 56** (drawing contained in **Appendix H**).

Figure 55: North-western view of site for OR

DESCRIPTION	VALUE
NON SPILL OVER CREST	1019.00 mASL
BASE LEVEL	1011.00 mASL
	1012.55 mASL
EMBANKMENT HEIGHT	5.49 m (MAXIMUM)
	2.95 m (MINIMUM)
SLOPES	SIDE SLOPES 1 : 2
	FLOOR 1 : 100
COMPARTMENT VOLUME	50 000 m^3
WATER LEVEL	1018.00 mASL
FREE BOARD	1 m
WATER DEPTH	7 m (MAXIMUM)
	5.45 m (MINIMUM)
SPILLWAY DEPTH	0.6 m
SPILLWAY WIDTH	12 m

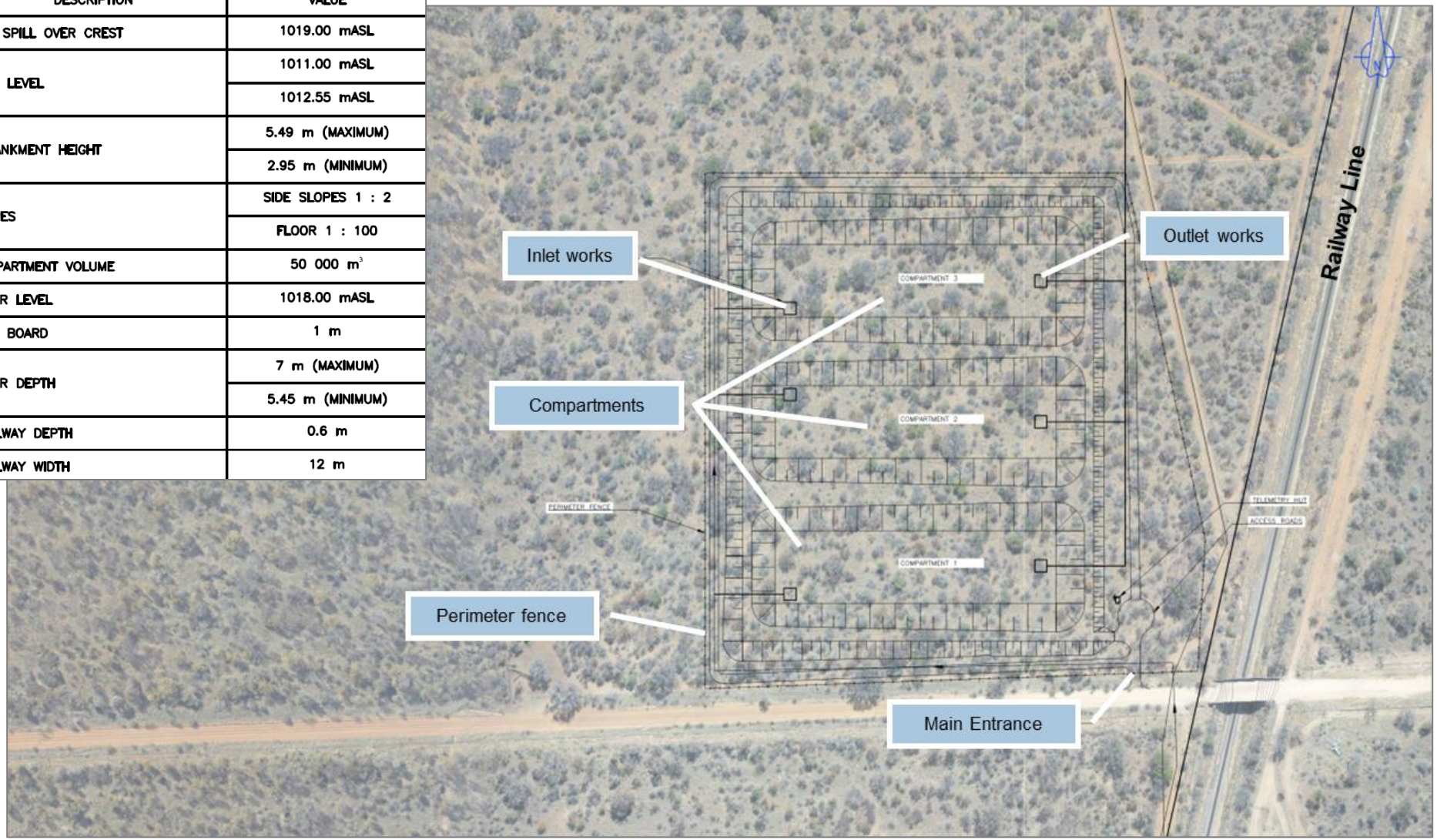


Figure 56: Layout - OR

The OR is located at the end of the transfer system and start of the delivery system. It serves to control water supply to the users from a point relatively close to the points of consumption to reduce the risk on non-supply. The depth of the reservoir excavation and the height of the earthfill embankment were optimised to balance the volume of cut and fill. It is further proposed that the reservoir be lined with an appropriate waterproof lining system (HDPE or similar material) and suitable sub-surface drainage provided.

The advantages of using Terminal Reservoirs include:

- The system retains the simplicity of operation;
- The overall pipeline lengths will be shorter and less costly than via the TDs option;
- Management of water quality will be simplified;
- The water can gravitate from the OR (assume 8 hrs storage) to the on-site consumer Terminal Reservoirs; and
- The overall impact on the environment will be less than for the TD option, and will be concentrated closer to the mining and other industrial areas.

9.7 Gauging Weirs

9.7.1 New Weirs on the Bierspruit and Sand River

The Bierspruit and Sand River are the only two remaining significant watercourses along the Crocodile River (West) downstream of Roodekopjes Dam that has not been dammed (or gauged). The confluences of these two rivers with the Crocodile River (West) are located downstream of Hugo's Weir and upstream of Vlieëpoort. This means that the contributions made by the Sand River and Bierspruit to the flow in the Crocodile River (West) are not known other than through run-off calculations and cursory visual observations. The flows and specifically floods emanating from the two catchments could therefore have a significant impact on river flow patterns and riverine environment along the Crocodile River (West) downstream of Vlieëpoort. Flows from the Bierspruit and Sand River should also be measured to ensure that these flows are allowed to pass the Vlieëpoort Abstraction Works.

According to DWS (2016), the following sites have been identified for gauging weirs, which will allow for water flow to be measured, have been identified as part of MCWAP Phase 2 (refer to **Figures 57 – 58**):

- Bierspruit - 24°40'53.10"S, 27°19'20.62"E; and
- Sand River - 24°40'47.22"S, 27°27'12.75"E.

Examples of typical crump weir structures used as flow measuring weirs are shown in **Figure 59** (see drawings of an example of a weir in **Appendix H**).

Figure 57: Possible sites for gauging weirs on the Bierspruit and Sand River

Figure 58: Photographs of Bierspruit (left) and Sand River (right) gauging weir sites

Figure 59: Examples of a crump weir gauging structure

9.7.2 New Paul Hugo Weir

The existing Paul Hugo Weir (A2H116), which is situated approximately 20 km upstream of the proposed Vlieëpoort Weir site on the Crocodile River, is an existing farmer abstraction weir.

According to DWS (2016), low flow gauging can be improved by the construction of a crump weir about 70 metres downstream of the diversion weir at the approximate location: 24°41'40.86"S, 27°24'32.92"E (shown in **Figure 60**). Suitable rock foundation is available within the bed of river channel at this point and the weir could be designed to measure flows accurately from 200 litres per second up to 8 cubic metres per second. The instrument housings will be located outside the river channel and proper erosion protection will be provided.

Refer to **Figure 59** for examples of typical crump weir structures that are similar to what is being proposed (see drawings of an example of a weir in **Appendix H**).

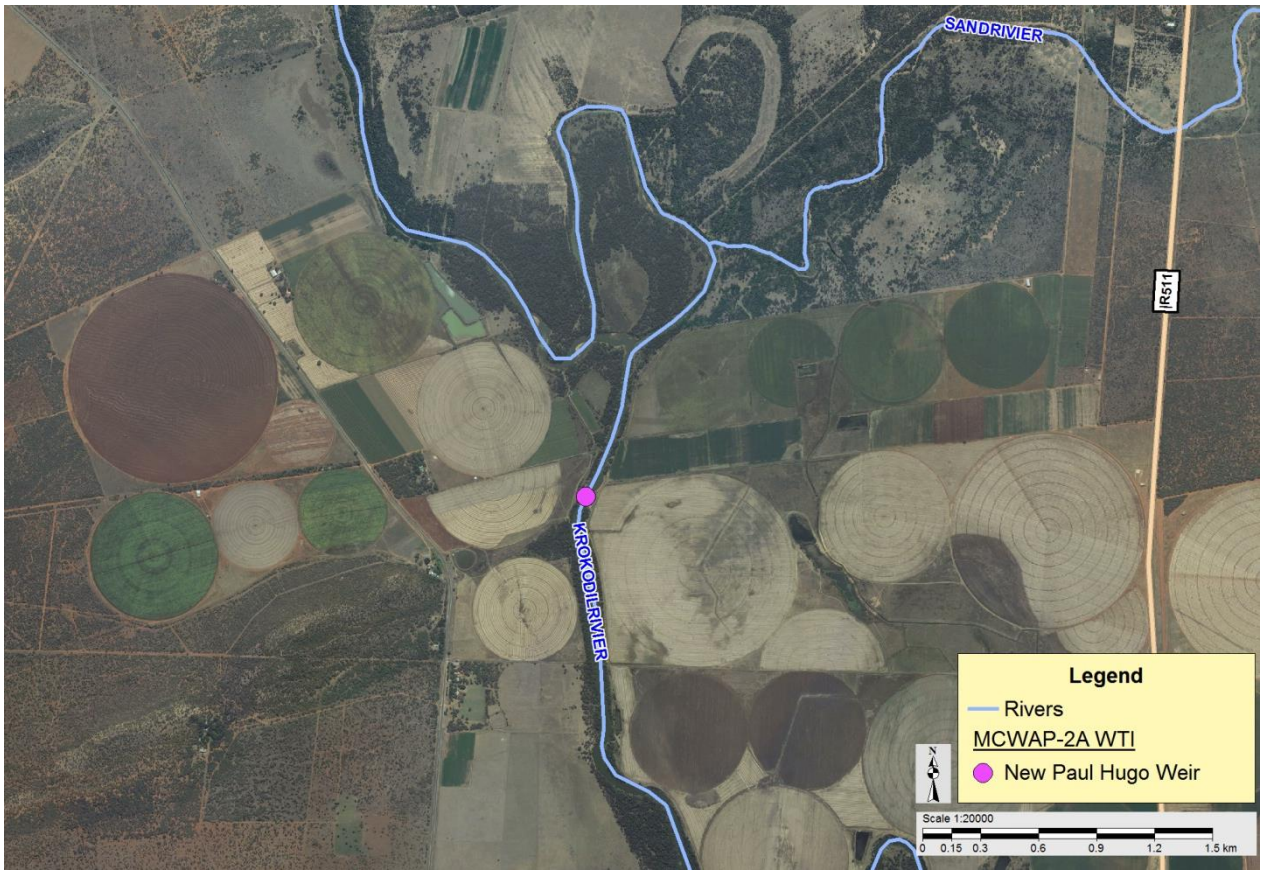


Figure 60: Possible site for gauging weir near Paul Hugo Weir

9.7.3 Existing Weir Downstream of Hartbeespoort Dam

The gauging structure (A4H083) immediately downstream of Hartbeespoort Dam (S 25.71892°, E 27.84381°), which is shown in **Figure 61**, will require structural changes to improve gauging accuracy.

Figure 61: Weir downstream of Hartbeespoort Dam

9.8 Bulk Power Supply

The capacity of the existing high and medium voltage networks in the area was investigated and the need for upgrading of the existing systems or the construction of new infrastructure to supply the sites was determined.

Additional infrastructure will be required to provide 132 kV loop in – loop out firm supplies to the Vlieëpoort site. The installation at Vlieëpoort will include a substation and transformer yard from which all power requirements will be serviced.

Eskom confirmed that the MCWAP 2 substation can be accommodated into the network without any capacity constraints. The proposed substation will be supplied from the new Thabatshipi – Thabazimbi Combined 132kV Power Line (shown in **Figure 62**).

The infrastructure associated with the MCWAP-2A Bulk Power Supply includes the following (shown in **Figure 63** in relation to MCWAP-2A WTI):

- Power lines - Two 132kV Kingbird lines running in parallel (approximately 4 km each). The servitude requirements per line will be 31 m (15.5 m from the centre line). Steel monopole structures may possibly be used for each line with the height of each structure dependent on the topography.
- Substation - The proposed substation will be situated at the balancing dam, near to the high-lift pump station. It will be equipped with 2x20MVA 132/11kV transformers, thus maintaining a 20MVA firm capacity at all times. The substation servitude will be 100 m x 100m.

As mentioned, Eskom will submit a separate application to DEA to seek approval for the bulk power required for MCWAP-2A. The details of the bulk power components will be covered within this application.

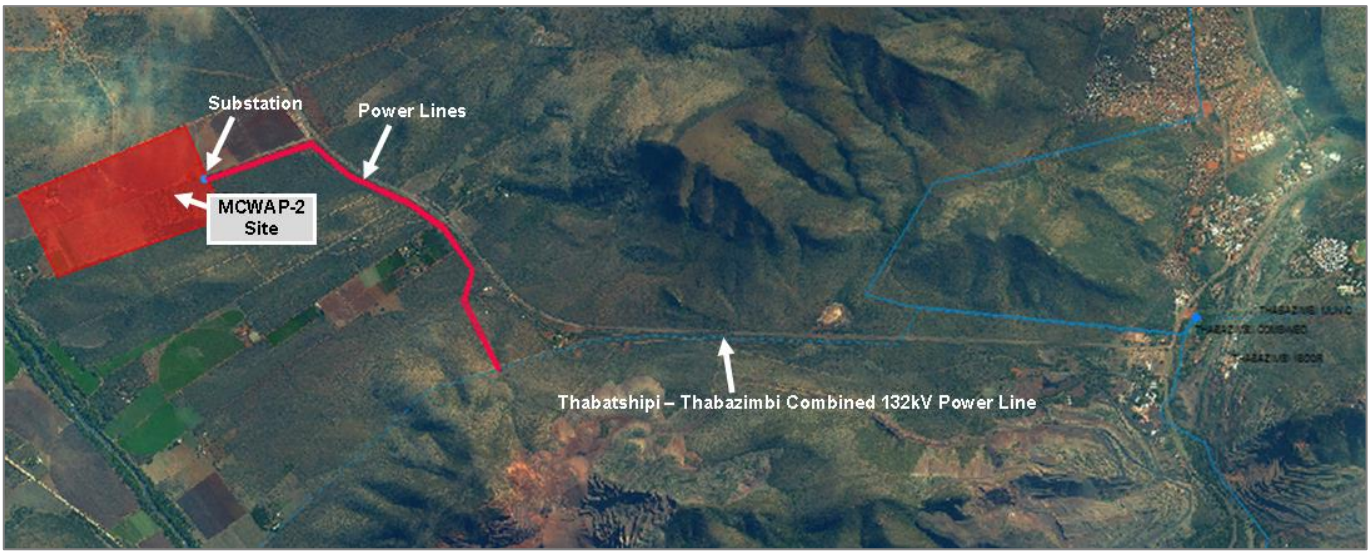


Figure 62: Supply of bulk power from the new Thabatshipi – Thabazimbi Combined 132kV Power Line

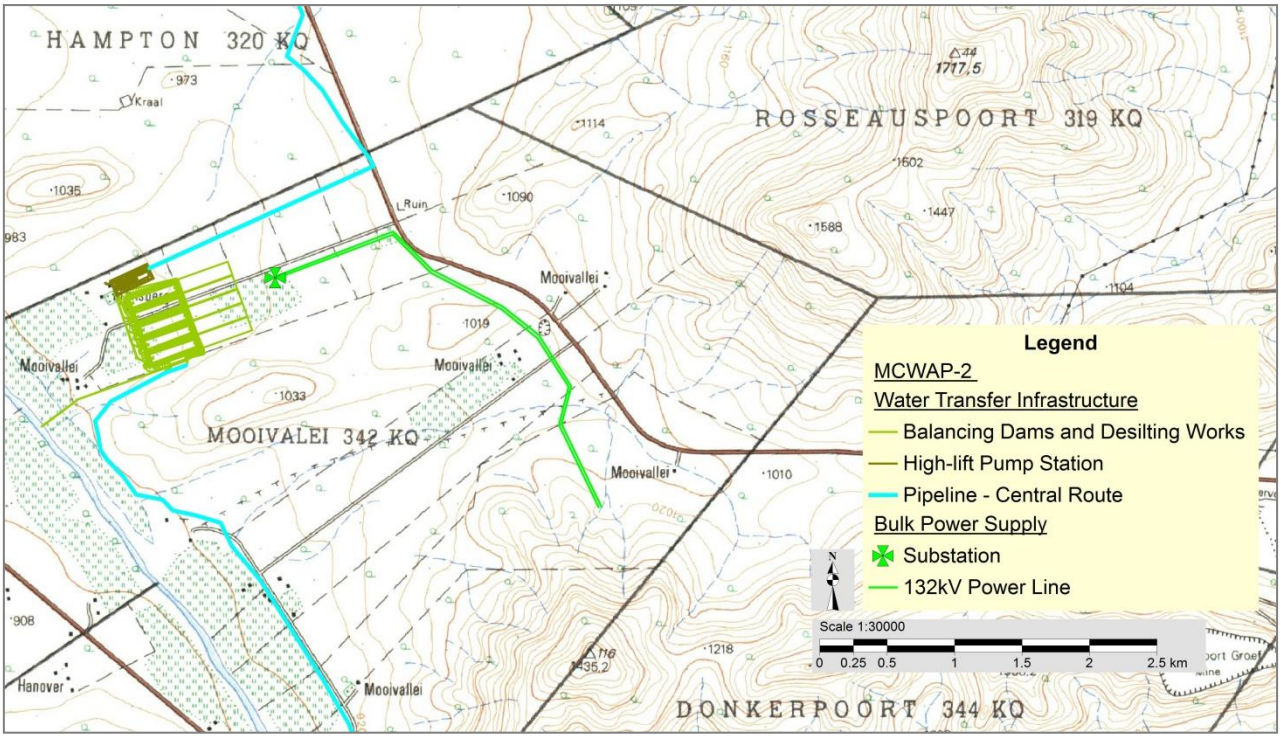


Figure 63: Bulk power supply in relation to MCWAP-2A WTI footprint

9.9 Implementation Programme

The indicative implementation dates for the construction phase of MCWAP-2A WTI are as follows:

- Commencement of construction : Fourth Quarter 2019
- Construction duration : 42 months
- Commissioning : Third Quarter 2023
- Site Closure & Rehabilitation : Fourth Quarter 2025

9.10 Resources Required for Construction and Operation

This section briefly outlines the resources that will be required to execute the project.

9.10.1 Water

During the construction stage, water will be required for various purposes, such as concrete batching, washing of plant and equipment in dedicated areas, dust suppression, potable use by construction workers, etc. Water for construction purposes will be sourced directly from watercourses on site and groundwater (boreholes) will also be utilised. Water tankers will also supply water to the site. Water for operational purposes will include domestic supply to the operational control centre.

All water uses triggered in terms of Section 21 of the NWA will comply with DWS' requirements. Further provisions will be included in the EMPr as part of the EIA Report.

9.10.2 Sanitation

Sanitation services will be required for construction workers in the form of chemical toilets, which will be serviced at regular intervals by the supplier. Conservancy tanks will be provided at the residential labour camps and site offices.

Ablution facilities will also be provided as part of the permanent infrastructure for the operational control centre. The locations of the tanks will be selected to minimise environmental impacts. The tanks will be properly maintained by the operator.

Further provisions will be included in the EMPr as part of the EIA Report.

9.10.3 Waste

Solid waste generated during the construction phase will be temporarily stored at suitable locations (e.g. at construction camps) and will be removed at regular intervals and disposed of at approved waste disposal sites within each of the local municipalities that are affected by the project. All the waste disposed of will be recorded.

According to the Integrated Waste Management Plan for the Thabazimbi LM (2016), the Thabazimbi landfill and the Northam landfill are both licenced. According to the IDP for the Lephalale LM (2016), there is a permitted landfill within the municipality.

All storage of general or hazardous waste in a waste storage facility (e.g. onsite waste transfer station) will comply with the national norms and standards (GN R. 926 of 29 November 2013). The waste storage facility will be established at the camp where waste from site will be collected, sorted, weighed and placed in skips and recycling containers for removal to service providers and appropriate registered landfill sites (hazardous and general sites, as required).

Wastewater, which refers to any water adversely affected in quality through construction-related activities and human influence, will include the following:

- Sewage;
- Water used for washing purposes (e.g. equipment, staff); and
- Drainage over contaminated areas (e.g. cement batching / mixing areas, workshop, equipment storage areas).

All wastewater discharges will comply with legal requirements associated with the NWA, including the General Authorisation that specifically deals with Section 21(f) and Section 21(g) water uses.

Suitable measures will be implemented to manage all wastewater generated during the construction period. Further provisions will be included in the EMPr as part of the EIA Report.

9.10.4 Roads

Permanent access roads will be required for the operational phase, whereas temporary access and haul roads will need to be created for construction purposes. Existing roads will be used as far as possible. Refer to the access to the Vlieëpoort Abstraction Site shown in **Figure 64**.

9.10.5 Electricity

The bulk power requirements during the construction and operational phases of the project are discussed in **Section 9.8**.

9.10.6 Construction Camps

It is anticipated that provision will be made for the following facilities at the construction camps:

- Concrete batching plant;
- Site offices;
- Parking;
- Materials testing laboratory;
- Workshops and stores;
- Reinforcing steel bending yard;
- Weather station;
- Sand and crushed stone stockpile areas;
- Areas for the handling of hazardous substances;
- An explosives storage magazine;
- Wash bays for construction plant;
- Radio communication infrastructure;
- Facilities for the bulk storage and dispensing of fuel for construction vehicles,
- Ablution facilities; and
- A solid waste disposal facility (main camps only).

The location of the construction camps will be identified and assessed as part of the EIA phase.

9.10.7 Construction Workers

The appointed Contractor will make use of skilled labour where necessary. In those instances where casual labour is required, DWS will request that such persons are sourced from local communities as far as possible.

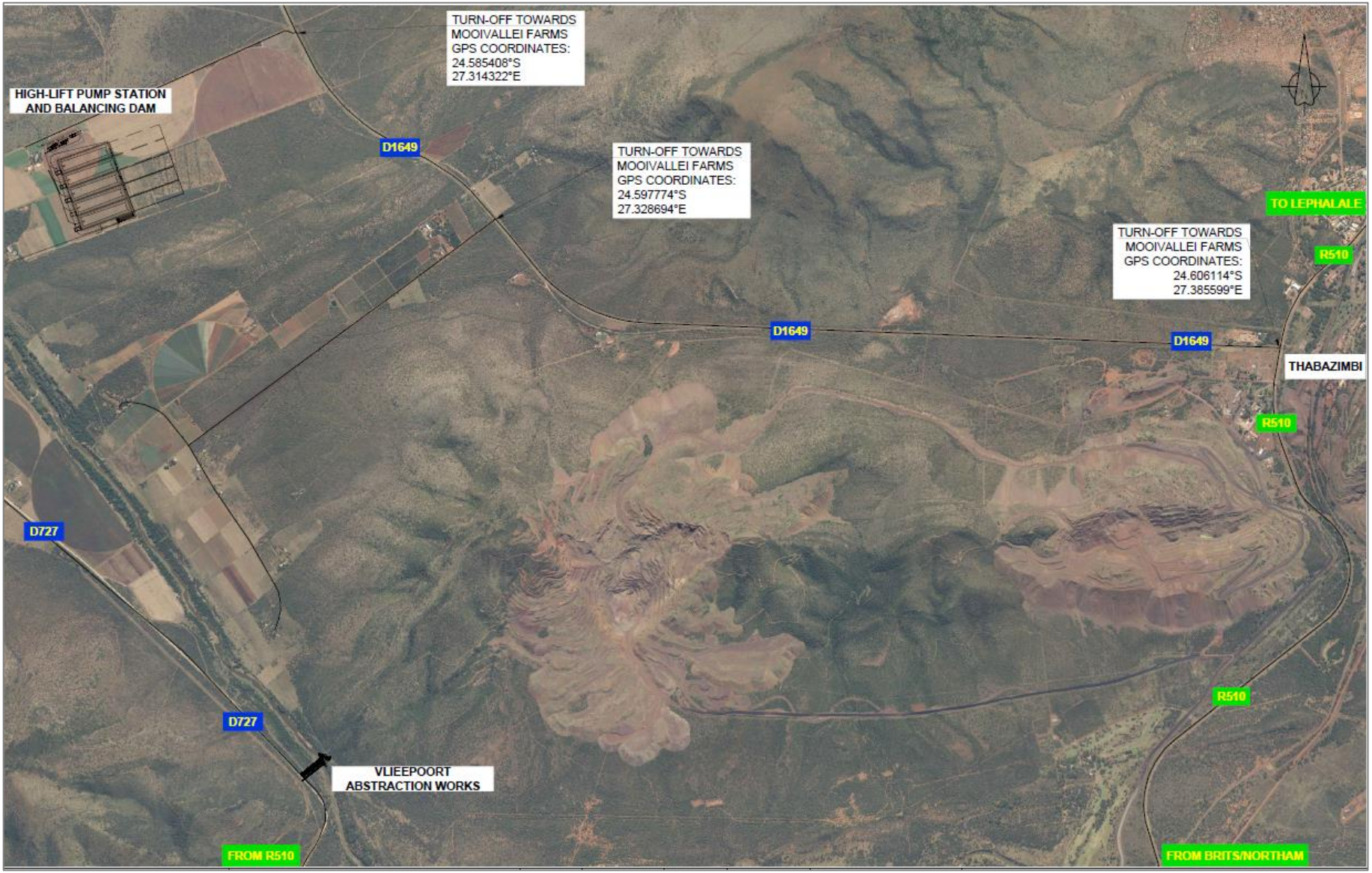


Figure 64: Access to Vlieëpoort Abstraction Site

9.10.8 Workshops, Offices and Stores

Provision is made for ancillary structures (including workshops, offices and stores) adjacent to the desilting works and high-lift pump station. Refer to the layout of the desilting works contained in **Appendix H**.

9.11 River Management

A River Management System is required to monitor, control and manage the releases into the river, the flows in the river and abstractions from the river. This will apply to the Crocodile River (West) between Hartbeespoort Dam and Vlieëpoort Abstraction Works, including the releases and spills from such Works, as well as the Moretele River from Klipvoor Dam to the confluence with the Crocodile River (West) and the Elands River from Vaalkop Dam to the confluence with the Crocodile River (West). It includes a servitude-of-aqueduct to be acquired as described in **Section 9.12** below over such stretches of the said rivers. The system should also include the management of all abstractions within the so-called “red-line” zone, which is considered to be abstractions from the river.

The water requirements between the four upstream dams (i.e. Hartbeespoort, Roodekopjes, Klipvoor and Vaalkop) and Vlieëpoort, the flows required past Vlieëpoort and the other factors that will affect the flow in the river at Vlieëpoort such as rainfall, evaporation from the river water surface, evapo-transpiration from the riverine vegetation, tributary and diffuse inflows and diffuse seepage outflows from the river, will need to be considered as part of the overall River Management System.

Operating rules of the Lower Crocodile (West) system with MCWAP 2 releases will be complex due to:

- Multiple users along the river stretch (irrigation, transfer and ecological reserve), with varying entitlements and assurance of supply criteria;
- Multiple dams from which releases for users need to be made;
- Cascading releases of water for transfer from Vlieëpoort;
- Dynamic water requirements and availability (e.g. return flows);
- Limited current gauging locations on Lower Crocodile (West) River;
- Some uncertainty around conveyance losses (including surface water groundwater interactions - sand aquifers);
- Limited storage potential to regulate water releases at Vlieëpoort; and
- Water quality concerns.

The factors be taken into consideration in the Crocodile River (West) Management System are shown in **Figure 65**.

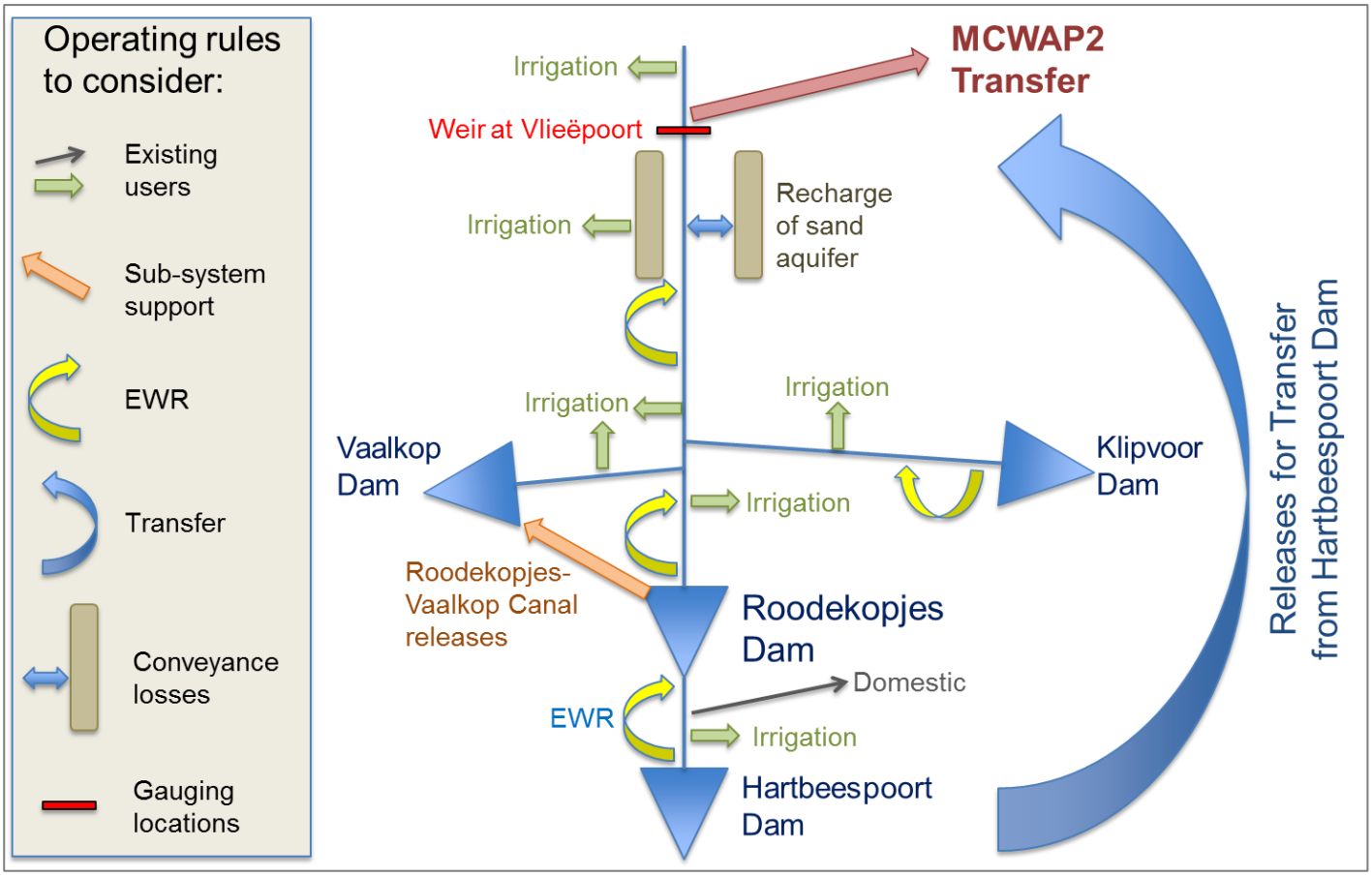


Figure 65: **Factors be taken into consideration in the Crocodile (West) River Management Plan (DWS, 2015)**

The components of the River Management System include the following (shown in **Figure 66**):

- 4 Existing dams;
- Possible new river outlet at Hartbeespoort Dam or revised operating procedures;
- Possible new river outlet at Roodekopjes Dam or revised operating procedures;
- 13 Existing river gauging stations;
- 4 new river gauging stations;
- Smart metering of direct abstraction;
- Smart metering of indirect abstraction (boreholes);
- Conveyance capacity in Crocodile River (West);
- Data communication network; and
- Integrated operational centre.

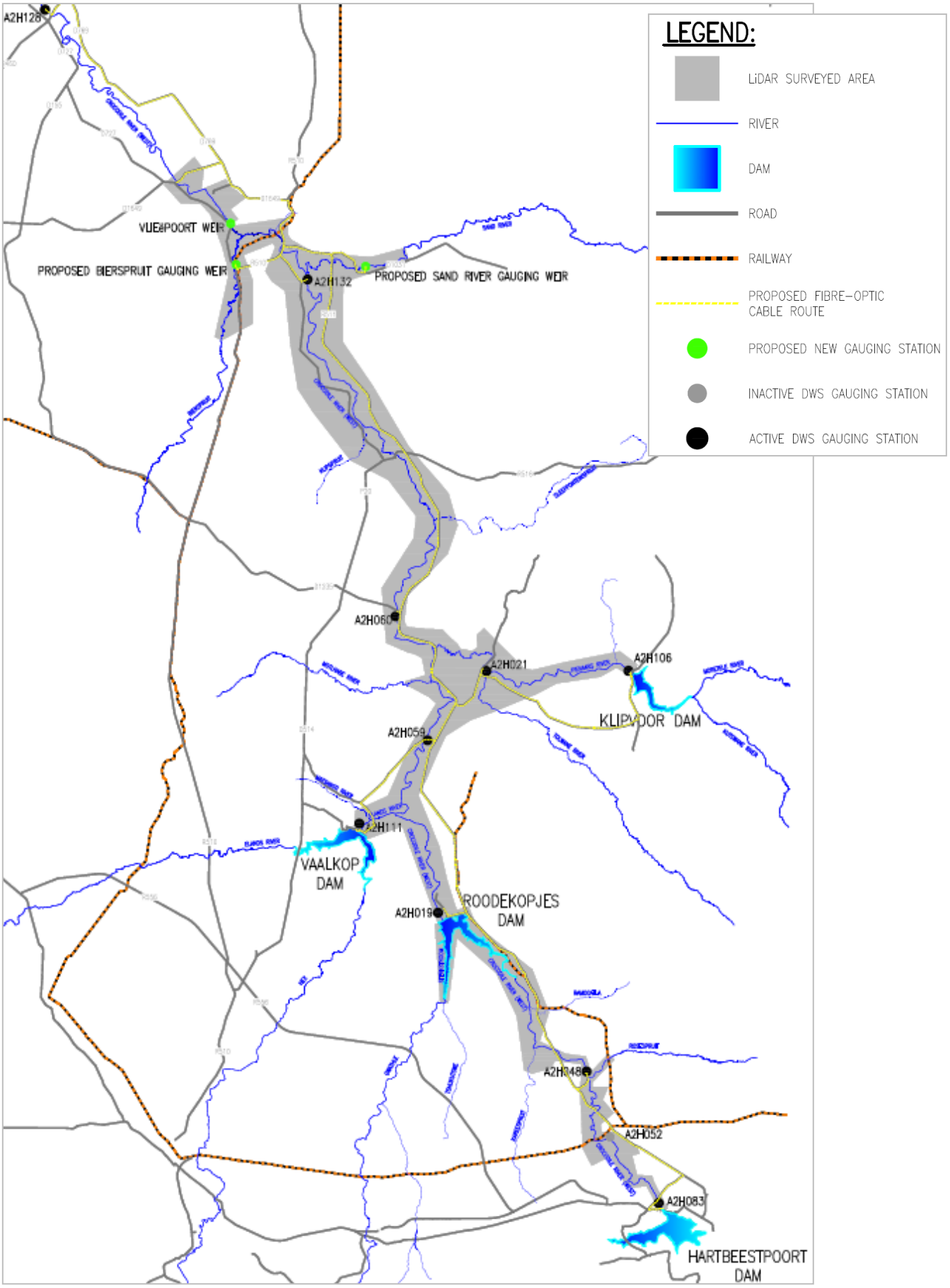


Figure 66: River Management System

9.12 Land Acquisition

Land is required for constructing the selected scheme. In addition, servitudes are required for operation and maintenance purposes.

The following will be required:

- The River Management System includes a perpetual servitude-of-aqueduct in terms of the NWA over such stretches of the rivers stated in **Section 9.11** above enabling the Minister to utilise such stretches as part of the government waterworks;
- Permanent servitudes for the new pipeline and accesses need to be acquired and registered in terms of the NWA. A permanent servitude of aqueduct (25 m minimum width) will accommodate the new pipelines. The defined area will not be fenced off following construction (unless requested by the landowner) and no improvements may be erected or established within such area. The defined area may only be used for grazing purposes or for the cultivation of crops with a weak (shallow) root system. Access to pipeline servitudes will not be controlled, but restrictions will be placed on activities inside the servitudes. Existing fencing will be reinstated and gates installed where these fences cross the servitude-of-aqueduct. A permanent right-of-way servitude to accommodate the permanent accesses, need to be acquired and registered. A service road (to basic standards) will be provided along the servitude for maintenance purposes and will be patrolled on a regular basis. Servitudes need to be marked with concrete servitude markers;
- A servitude-of-abutment where gauging facilities are implemented will be needed and also a right-of-way servitude to enable access to such facilities, and
- Land to accommodate the Vlieëpoort Abstraction Weir (including the basin) and Abstraction Works, as well as the ancillary structures (pumping stations, housing, workshops, BPR, OR) will need to be acquired (purchased) and gauging weirs.

Negotiations with the landowners to acquire and register the relevant land rights (servitudes and purchases) will be undertaken by TCTA, as the project's implementing agent. TCTA's land rights acquisition strategy will adhere to all statutory requirements prevailing at the time, as per the Promotion of Administrative Justice Act (No. 99 of 2000), the Expropriation Act (No. 63 of 1975) and the NWA as already delegated by the Minister of Water and Sanitation to TCTA.

Determination of compensation will be done in terms of the prevailing Expropriation Act when the acquisition is done (currently Section 12 of the Expropriation Act (No. 63 of 1975)), which in case of the servitude right will include an amount to make good actual financial losses caused by the acquisition of the right. In case of the servitude-of-aqueduct along the new pipeline rights, in principle, compensation is payable for both temporary (during construction and rehabilitation) and permanent servitude rights, as may be required. In the case of existing permanent servitudes (where applicable), the available rights will need to be investigated.

Although the Right of Use to the land will belong to the infrastructure custodian, the landowner will still be permitted access and certain use of the servitude area (depending on the limitations specified in the servitude agreement).

9.13 Offtake Points for Livestock and Game Watering

It is DWS' standing policy to only provide offtake points for livestock and/or game watering to authorised directly affected landowners. A limited volume of water will be set aside for this purpose. Such users will have to apply for a water use licence (Chapter 4 of the NWA) and enter into an agreement with DWS. Water tariffs will be payable in accordance with the prevailing Pricing Strategy. The water will be too expensive for irrigation purposes. This matter will form part of the negotiations with the individual landowners.

10 ALTERNATIVES

10.1 Introduction

Alternatives are the different ways in which the project can be executed to ultimately achieve its objectives. Examples could include carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project.

The sub-sections to follow discuss the project alternatives considered during the Scoping process. The EIA process will provide a detailed comparative analysis of feasible alternatives from environmental (including specialist input) and technical perspectives.

By conducting the comparative analysis, the Best Practicable Environmental Option (BPEO) can be selected with technical and environmental justification. Münster (2005) defines BPEO as the alternative that "*provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term*".

10.2 Screened Alternatives

Alternatives considered during the Technical Pre-Feasibility and Feasibility Studies and initial Environmental Screening are discussed in this section.

10.2.1 Alternative Water Resources

Alternative water resources to those described in this report were considered and found to be inadequate or not feasible. These water resources include:

- **Ground Water** -
  Drilling around the Lephalale area was undertaken by the DWA's Geo-hydrological Division as part of a Water Research Commission (WRC) research project. The aim was to establish the extent and potential of deep groundwater resources in this area. The drilling took place through the primary aquiver, where most of the local boreholes are situated, into the deep secondary aquiver. At this stage it is for exploratory purposes and if it shows potential, production boreholes might be developed, with close monitoring of a possible impact on the primary shallow aquifer, although such an impact is regarded as unlikely.

  This will however be only for primary use or during construction stage of new developments. The expected extent of this source is not even remotely within the range of the required industrial demands.

- **Re-use of Effluent in the Project Area** -
  The very high cost of the imported water will be a great incentive for the new water users to re-use water as far as possible. This as well as recycling of the treated effluent from the municipal Wastewater Treatment Works to industries has been taken into account in the determination of the water demand quantities. Relative to the total demand, it is not a very significant quantity, but may not be ignored. This will also mean that the principle of zero effluent will be applied to large users so that the risk of pollution of local streams is limited.

- **Mokolo Dam** -
  The potential to obtain additional water from this dam on a sustainable basis is limited. The spare yield has already been fully allocated in MCWAP-1.

- **Crocodile Water** -
  Based on current knowledge, it is not envisaged that irrigation water entitlements on the Crocodile River (West) will need to be obtained, even though the current legislation does make provision for the purchasing of such water entitlements.

- **Return Flows in Crocodile River (West) and Vaal River Catchments** -
  The water resources considered for the new development is to be mainly the growing volume of return flows originating from urban developments in the Gauteng and surrounding areas. This will be the first major source of water. Once the demand exceeds the available source in the Crocodile River (West), it will be augmented from the surplus available effluent emanating from sewage plants to the south of Johannesburg which will be transferred from the Vaal River catchment to the Crocodile River (West) to supplement these supplies.

- **Creating More Storage by Raising of Existing Dams and/or Building new Dams** -
  The Klipvoor and Vaalkop Dams were completed in the 1970's, Mokolo Dam was completed in 1980. The raising of Dams such as the Klipvoor Dam and Mokolo Dam, as well as the construction of additional dams on the Crocodile River system remains an option to be considered in the future for further water resources development. However, the creation of storage poses the following challenges:
  - It does not provide adequate yield;
  - It is costly and not viable in current circumstances;
  - It also has the further challenge in that the Crocodile and Mokolo catchments are part of the international river basin shared with three other countries. Agreement will have to be secured in terms of the Revised SADC Protocol on Shared Water Courses that will take a significant period of time to obtain;
  - In the Crocodile River System with a high percentage of return flows passing through, the ability of the dam to store high flows (floods) for later use is diminished and make it less effective; and
  - Filling times required.

The available storage in the Crocodile River (West) is not being used optimally at this stage due to the steady stream of return flows that has kept Hartbeespoort Dam spilling most of the time during the past decade and a half. This storage capacity will be better utilised once the transfer of water to the Lephalale area commences.

The raising of dams and the creation of additional storage on rivers are always options that DWS considers in their water resource planning activities and will be investigated further for the longer term water resource development. In this regard the Crocodile (West) Reconciliation Strategy propose the investigation of a possible balancing dam to reregulate the return flows. Due to the absence of suitable sites for a reregulation balancing dam and the factors mentioned above the project team opted for a River Management System as discussed in **Section 9.11** as the preferred option to be implemented at this stage.

- **Abstraction point at Faure Weir** -
  Various abstraction points have been analysed from the confluence of the Crocodile and Pienaars Rivers to the confluence of the Crocodile and Limpopo Rivers. Due to the geomorphology of the Crocodile River (West) and other evaluation criteria only two suitable sites were identified and investigated further. Due to non-compliance with 6 of the 13 evaluation criteria the Faure Weir site is not suitable. The estimated capital cost of the Faure Weir is 7,6 times more than the estimated cost of the Vlieëpoort Weir. There is also additional evaporation and seepage losses in the river reach between the two weir sites.

- **Water transfer from rivers beyond the borders of South Africa** -
  It was found that the cost and the time frames required for such development render this option unfeasible.

10.3 Alternatives to Project Components

10.3.1 General

The alternatives to the project components, which include the screened or initial alternatives assessed as part of previous studies, are listed in **Table 17**. This information is based on the discussions in **Section 9**.

Table 17: Alternatives of Project Components

Project Components	Screened / Initial Alternatives	Feasible Alternatives
Abstraction Weir	• Boschkop Upper Site (Original Dam Site) • Boschkop Lower Site • Nooitgedacht DWA Gauging Weir • Hugo's Weir (Existing Farmer Abstraction Weir) • Vlieëpoort Upper Site (Original Site) • Vlieëpoort Lower Site	Vlieëpoort Upper Site

Project Components	Screened / Initial Alternatives	Feasible Alternatives
Balancing Dam & Desilting Works	• Option 1: Portions 1 and 2 of the Farm Mooivalei 342 KQ; and • Option 2: Portions 5, 6, 7 and 23 of the Farm Mooivalei 342 KQ	Option 1
Conveyance	• River conveyance • Canal Conveyance • Pipeline conveyance	River and pipeline conveyance
Transfer System - Vlieëpoort Abstraction Site to OR	• Alternative – Central Route • Alternative A • Alternatives C, C1, C2, & C3 • Alternative D • Alternative E • Alternative I	• Alternative – Central Route • Alternative A1 • Alternative A2 • Alternative C
Delivery System - OR to Terminal Point	• Alternative F • Alternative G • Alternative H	• Alternative D1 • Alternative D2 • Alternative D3
BPR	• BPR (Central Route)	• BPR (Central Route)
OR	• Terminal Dam(s) • OR & Terminal Reservoirs	• OR & Terminal Reservoirs

10.3.2 No Go Option

The no go option (i.e. should MCWAP-2A WTI not proceed) will have the following implications:

- Under utilisation of the Waterberg coal reserves;
- The development of new power stations is of high strategic importance with tight timeframes. Without a suitable source of water, the new power stations will not be possible, with potential future energy shortages;
- The absence of water will suppress development, with associated socio-economic implications on a national scale; and
- Without MCWAP-2A Eskom will not be able to implement the Flue-Gas Desulphurisation (FGD) technology at the Medupi Power Station to reduce sulphur emissions, which will violate the related condition in Eskom's World Bank loan.

In contrast, should the proposed MCWAP-2A WTI not go ahead, any potentially significant environmental issues associated with the project (refer to **Section 13**) would be irrelevant and the status quo of the local receiving environment would not be affected by the project-related activities. The objectives of the project would, however, not be met.

10.3.3 Alternatives Suggested by Interested and Affected Parties

Alternatives suggested by IAPs as part of the previous EIA, as extracted from the Scoping Report (DWA, 2011), include the following:

1. Mr. T. Roux from the Remainder of the Farm Paarl 124 KQ recommended that the route follows existing roads along the western and northern boundary, rather than traverse the property alongside high voltage power lines. The lead to the adoption of the current Alternative A1.

2. Mr. J. Prinsloo from the Farm Mecklenburg 310 KQ suggested that the pipeline follow the road servitude between the farms Mecklenburg 310 KQ and Paarl 124 KQ. The lead to the adoption of the current Alternative A2.
3. Representatives from Thaba Tholo and other parties recommended that the pipeline should go through Thabazimbi / Regorogile and connect to the R510 road rather than following the original western route around the ridges. Although this option was initially included (referred to as Alternative C), it was discarded for the reasons provided in **Table 15***.*
4. Mr. D. Smit from the Farm Blaauwpan 133 KQ recommended that the pipeline follows the R510 road until it crosses the railway line. The lead to the adoption of the current Alternative C.
5. Mr. H. Boegman, in his capacity as the chairperson of the Steenbokpan Environmental Forum and the landowner of the Farm Mooipan 325 LQ, requested that existing infrastructure (i.e. railway line) be followed as far as possible instead of routing the pipeline through pristine bushveld. Mr. M. Barnard (landowner of Portion 1 of the Farm Rooipan 355 LQ and Portions 1, 2, 3 and 5 of the Farm Rhenosterpan 361 LQ) also recommended that the railway line be followed instead of the farm boundaries of the abovementioned farms since he is operating the farms as one unit and therefore does not have internal boundaries in place. The lead to the adoption of the current Alternative D1*.*

During public participation conducted as part of the Announcement Phase of the current EIA the following alternatives were suggested:

- Mr H Steenkamp (landowner of the Farm Doornlaagte 353 LQ) suggested that the route Alternative D3 rather be straightened to follow farm boundaries as opposed to the Steenbokpan – Sentrum Road in some sections to avoid coming close to existing farm houses.

Although alternatives weren't necessarily suggested by most IAPs, various concerns regarding the pipeline (e.g. impact on game during construction, loss of land from servitude, etc.) were raised by IAPs that are contained in the Comments and Responses Report (see **Appendix S**). These factors will also be considered during the comparative analysis of alternatives that will occur during the EIA phase.

A comparative analysis of all feasible options will be included in the EIA Report, where the technical and environmental criteria will be established to evaluate the various project options.

11 PROFILE OF THE RECEIVING ENVIRONMENT

11.1 General

This section provides a general description of the status quo of the receiving environment in the project area. This serves to provide the context within which the Scoping exercise was conducted. It also allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project.

The study area includes the entire footprint of the project components and related activities. A 100m corridor (i.e. 50m on either side of the centre line) was adopted as the study area for the pipeline during the Scoping phase, which allows for possible deviations from the proposed alignment within this corridor (e.g. avoidance of sensitive features, if possible).

Where necessary, the regional context of the environmental features is also explained, with an ensuing focus on the local surrounding environment. More in-depth discussions on the receiving environment will be provided in the EIA Report, where the findings of the requisite specialist studies will be incorporated into the document.

A brief overview is also provided of the manner in which the environmental features may be affected (positively or negatively) by the proposed project during the project life-cycle. Significant environmental issues are discussed further in **Section 13**. These preliminary impacts are only discussed concisely on a qualitative level, as part of the Scoping phase. The EIA Report will provide a comprehensive evaluation of the potential impacts, and will quantify the effects to the environment based on the methodology presented in **Section 13.4**.

11.2 Land Use & Land Cover

Status Quo

The dominant land use and land cover in the areas earmarked for the project infrastructure is shown in **Figure 67** and provided in **Table 18**. Further information will be included in the EIR.

The project area is of a rural nature. The proposed infrastructure is mostly located on privately-owned properties that are primarily used for agricultural practices and game-farming. Sensitive aspects associated with the aforementioned land uses include (amongst others) cultivated commercial fields, orchards and pivots (primarily in the Mooivallei area), agricultural infrastructure and facilities (e.g. pipelines, boreholes, dams), and sensitive game species (e.g. exotic game). In addition, agricultural activities are located downstream of the abstraction point that require water for irrigation and stock watering purposes.

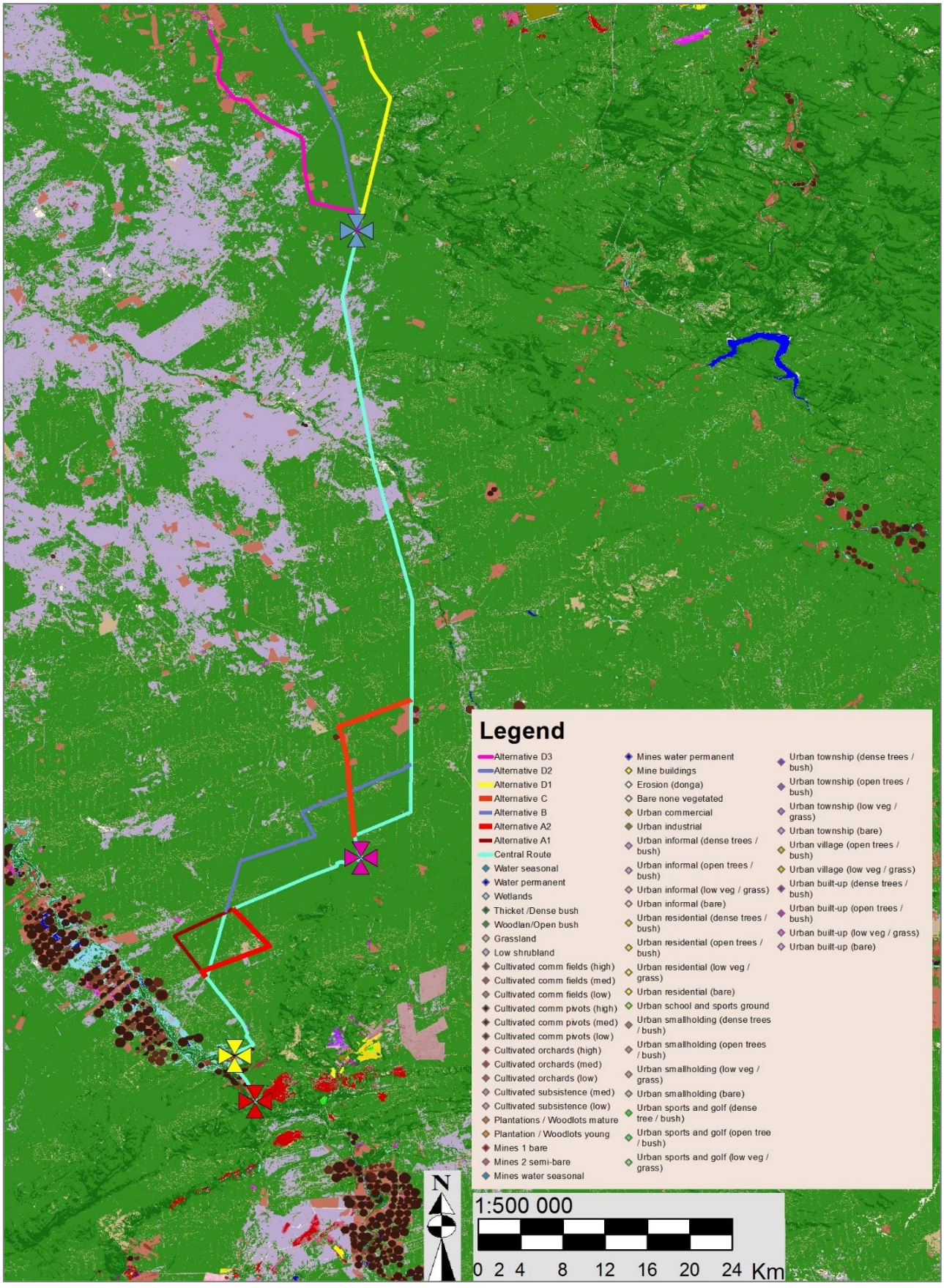


Figure 67: Land Cover

(Note: Pipeline Route Alternative B was discarded; gauging weirs not shown)

Table 18: Land use & land cover

Project Components	Alternatives	Dominant Land Use & Land Cover
Vlieëpoort abstraction weir	-	Natural grassland and woodland.
Low-lift pump station	-	Natural grassland and woodland.
Low-lift rising main	-	Natural grassland, woodland and cultivated land.
Balancing dam	-	Primarily cultivated land (including pivots). Minimal natural grassland and woodland along drainage channel.
Desilting works & Sediment Storage Compartments	-	Primarily cultivated land. Minimal woodland on land earmarked for sediment storage compartments.
High-lift pump station	-	Cultivated land.
Pipeline	Central Route	Natural grassland, woodland and cultivated land.
	Route A1	Primarily woodland.
	Route A2	Primarily woodland with some cultivated land.
	Route B	Natural grassland and woodland.
	Route C	Natural grassland and woodland. Some cultivated land.
	Route D1	Primarily woodland with some grassland.
	Route D2	Primarily woodland with some grassland and cultivated land.
	Route D3	Primarily woodland with some grassland and cultivated land.
BPR	BPR (Central Route)	Woodland.
OR	-	Woodland.

Potential Impacts / Implications

- Impacts to agricultural infrastructure and facilities.
- Impacts to game farming (e.g. temporary fragmentation caused by pipeline trenches, clearing within the construction servitude, noise, dust, light pollution).
- During construction land used for agriculture and game farming will be fenced off. There will thus be a temporary loss of land use for this period.
- During the operational phase the landowner will be permitted access and certain use of the servitude area (depending on the limitations specified in the servitude agreement).
- Impacts to agricultural land use downstream of the abstraction point on the Crocodile River, as a result of the water transfer scheme.
- Certain infrastructure (including low-lift rising main, balancing dam, high-lift pump station, transfer system and delivery system) is located within 250m from residential dwellings. Disturbances will be experienced particularly during the construction phase. Possible minor realignments of this route may be considered to minimise these impacts.

Specialist Study Triggered / Additional Investigations

Specialist studies to be conducted in the EIA phase that will consider land use and land cover include the following:

- Agricultural Impact Assessment;
- Terrestrial Ecological Study;

- Visual Impact Assessment (conducted as part of previous EIA for MCWAP-2);
- Socio-economic Impact Assessment;
- Heritage Impact Assessment; and
- Wildlife Impact Assessment.

11.3 Climate

Status Quo

The information to follow was obtained from the South African Weather Service for the weather stations in Thabazimbi and Lephalale.

11.3.1 Temperature

Thabazimbi

Average daily maximum and minimum temperatures for the last ten years measured at the weather station in Thabazimbi are shown in **Tables 19** and **20**, respectively.

Table 19: Average Daily Maximum Temperature (°C) by month– Thabazimbi station

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2006	29.8	29.5	27.2	27	23.2	22.6	24.8	24.7	29.5	32.9	30.8	33.6
2007	33.9	35.5	34.1	29.2	24.4=	23.7	22.9	27	32.2	29.2	31.3	29.6
2008	29.2	31	28.8	27.6	26.2	24.2	23.8	28.2	31.6	34.7	32.1=	33.2=
2009	31.9	30.5=	28.8	29.1	26	23.4	21.6	25.6	31.3	30.8=	31.5	33.3
2010	31.6	32.7	32.6	26.2	25.7	22.6	22.8	27.1	32.6	34.5	32.9	31.9
2011		31.4	31.5	26.4	25.3	23	22	26.5	31	29.6=	33.1=	31.1
2012	32.2	34	31.9	28.4	27.9	23.7	24.7	27.9	29.9	31.9	33.2	31
2013	32.9	34	32.1	28.4	26.4	24.9	23.8	26.6	31.4	31.8	34.4	31
2014	33.3	32.2	28.1	27	26.4	23.8	23.4	26.6	31.5	32.1	31.3	31.9
2015	33	35.3	32.9	29	29.1	23.4	24.4	29.4	31.1	35.3	34.8	37.5

= indicates that the average is unreliable due to missing daily values

Table 20: Average Daily Minimum Temperature (°C) by month– Thabazimbi station

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2006	20.2	19.1	16.8	11.5	4.5	1.6	2.4	6.3	10.3	16.5	17.6	20.1
2007	18.6	18.5	17.9	13.4	2.7=	3.6	1.9	5.4	14	16.1	17.5	18.1
2008	19	18.2	17	9.5	7.4	3.2	2.8	7.1	11.7	18.6	19.9=	21.1=
2009	20.7	19.6=	16.1	11.3	7.8	5.6	1.1	5.2	13.1	16.8=	18.3	19.3
2010	20.6	19.2	18.8	15.4	9.5	2.3	4.9	5.3	11.3	18.1	19.1	19.1
2011		19.1	17.9	14.5	7.8	2	1.3	5.5	13	13.1=	17.5=	20.2
2012	19.8	20.1	16.9	11.5	7	3.5	3.7	7.4	12.3	16.6	18.4	18.5
2013	20.4	20	18	12.5	6	3.2	4.6	6.4	14.1	17.6	19.4	20.2
2014	20.6	20.5	18.8	12.4	6.9	2.8	3.1	8	13.1	17.2	18.9	20.5
2015	20.4	20.2	19.3	14.4	7.8	4.3	5.6	8	15.4	19.6	19.3	21.9

= indicates that the average is unreliable due to missing daily values

Lephalale

Average daily maximum and minimum temperatures for the last ten years measured at the weather station in Lephalale are shown in **Tables 21** and **22**, respectively.

Table 21: Average Daily Maximum Temperature (°C) by month– Lephalale station

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2006	31.1	30.9	27.2	27.6	24.5	23.9	25.3	25.2	29.4	33	31.9	34.1
2007	32.6	35.3	33.2	28.5	26.1	24	23.2	27.3	31.9	28.8	30.3	28.8
2008	29.7	33.4	30.6	29.2	27.4	25.3	24.1	28.4	31.5	33.9	31.5	32.4
2009	31.6	30.8	28.9	29.4	26.5	24.3	22.5	26.3	31.2	31.9	33.3	35.8
2010	35.5	36.6	36.3	29.3	28.5	23.8	24	27.5	32.4	35.1	32.8	33.1
2011	31.2	32.5	34.1	28.2	27.9	24.8	23.7	27	32.6	32.7	33.5	31.2
2012	33.2	35	33.8	29.6	28.9	25.3	25.6	28.3	30.2	31	32.4	31.3
2013	32.1	33.8	31.3	28.8	27	26	24.9	27.1	32.1	32.1	34.8	30.8
2014	32.4	31.9	28.7	27.3	26.7	24.8	24.3	27.4	31.6	32.2	31.4	31.3
2015	33	35.2	33.3	29.8	30.6	25.3	26.2	30.5	31.7	36.3	34.9	36.7

Table 22: Average Daily Minimum Temperature (°C) by month– Lephalale station

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2006	20.3	20	17.2	13.1	6.9	5.4	5.7	7.1	11.5	17.1	18.1	19.8
2007	18.6	19	17.6	13.4	6.1	4.4	2.7	6.4	13.6	15.2	15.8	17.3
2008	19.2	18.7	17.9	11.8	10.4	6.4	5.8	8.9	12	17.6	19.3	19.9
2009	20.5	19.3	17	12.3	9.8	6.8	4.1	6.9	13.9	17.6	19.5	21.9
2010	22.9	23	22.3	19.2	14.2	6.5	7.3	8.4	13.6	18.3	19.8	20.2
2011	20.7	19.6	20.1	16.4	11.3	5.1	4.8	8.1	13.3	17.3	19.7	20.2
2012	20.6	21	18.9	13.9	10.3	7.1	6.6	8.8	14.2	17.5	18.5	19.9
2013	21	20.3	18.2	14.4	9.2	6.4	7.4	8.7	14.8	17	20	20.3
2014	21.1	20.6	19.3	14.7	9.9	6.3	5.9	9.1	14	16.7	18.9	20
2015	20.7	22	20.4	16.7	11.7	8.5	9	11.3	16.3	20.3	20.1	23

11.3.2 Precipitation

The area is classified as semi-arid and precipitation occurs mainly in the summer, with the maximum rainfall experienced during November - March.

Thabazimbi

The monthly daily rainfall for the last ten years for Thabazimbi is shown in **Table 23**.

Table 23: Monthly Daily Rain (mm) by month– Thabazimbi station

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2006	23	239.8	96.2	2	3.6	0.8	0	3.6	0	55.6	71.6	64.8
2007	32.4	11.4	0.4	22.2	0	17.8	4.4	0	58	65.4	42.2	83.2
2008	186.4	6.4=	79.0=	2.4	11.2	2.4	3.6	0	0	0.2	63.6=	24.2=
2009	50.6	0.0=	16.8	0	5.2	41	0	0	0	5.6=	0.4	9.4
2010	1.2	0	26.6	71	39.2	0	0	0	0	0	0	0.0=
2011				0.2	0.2	0.0=	0.0=	0.0=	0	0.0=	0.2=	0
2012	36.8	11	1	0	0	0	0	0	0	24	5.4	19
2013	14.2	12.8	92	22.6	0	0	0	0.6	29.4	41.2	11.8	89.4
2014	36.6	31.2	146.6	12.2	2.2	0	0	0	1.4	15.8	36.4	95.4
2015	75.6	40.6	54.2	37.8	0	0	0.6	0	16.2	12.4	46.4	67.4

= indicates that the average is unreliable due to missing daily values

Lephalale

The monthly daily rainfall for the last ten years for Lephalale is shown in **Table 24**.

Table 24: Monthly Daily Rain (mm) by month– Lephalale station

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2006	143.6	68.8	52.2	12.4	11	0	0	2	1.6	3.2	42	81.4
2007	11.8	24.2	47.4	36.6	0	0.2	1.4	0	30.2	90.2	113.4	74.6
2008	142.4	0	60.8	1.2	11	0	1	0	0	15.2	166.2	80.8
2009	116.8	62	69.8	0.6	4.8	8.4	0.2	0	0	42.6	74.6	85.4
2010	77.8	19.6	18.8	75.2	51	0	0	0	0	36	52.4	61.4
2011	150.4	3.4	3.6	2.4	0	0	0	0	0	73	51.8	82.8
2012	66	52	29.2	0	0	0	0	0	4	93.6	61.4	167.2
2013	118	9.2	21	55	0	0	0	0	0	21.2	19.2	122.8
2014	29.8	20.6	218.8	27.4	0.4	0.2	0	0	0	23.4	24.6	162.4
2015	24.6	48	29.4	21.6	0	1.6	2.2	0	12.2	29.8	57.6	63.8

Potential Impacts / Implications

As is common accepted practice, the potential impact of climate change to river flows has been considered in the hydrological modelling, where a margin for error in the future predictions has been considered. This is based on historical data of wet and dry periods for the area, as well as all known water use that affects river runoff.

Due to the small surface area of the inundation area behind the abstraction weir, in terms of global climate change factors, no noticeable impact on the climate of the region is anticipated.

Specialist Study Triggered / Additional Investigations

The Water Resources Planning Model analyses are conducted for 1000 plausible streamflow and rainfall stochastic sequences. These sequences cater for a range of extremes, where the wettest sequence is wetter than the wettest period experienced historically and the driest sequence drier than the worst drought experienced historically. The variability of the stochastic analysis is thus catered to a certain degree for potential changes within these extremes.

Studies conducted where various global climate models were used to estimate the likely implication on water availability (yield) of system showed widely varying results and found that either increases or decreases will occur in water availability as a result of Climate Change. Due to these observations it has been acknowledged that Climate Change adds another layer of uncertainty to water resource assessment and planning. Considering the recent advances made in developing methods of assessing uncertainty in water resource analysis there are proposals under consideration by DWS and other funding organisations to expand the uncertainty assessment methodology by also incorporating the effects of Climate Change. The key in achieving this is by integrating available research products of Climate Change and uncertainty. This will require developing procedures (including software systems) and establishing analytical techniques that can be used in studies such as this. The water resource analysis that was carried

out for this study should be reviewed once the proposed analytical techniques and procedures have been developed to account for Climate Change as an uncertainty.

11.4 Geology

Status Quo

11.4.1 General Geological Setting

Refer to the simplified geological map in **Figure 68** for the discussion to follow. A variation in the geology generally occurs from the south to the north. The geology in the southern regions consists predominantly of dolomites and granites, changing to predominantly Waterberg quartzite, dolomite and granite in the central regions with Khalahari sands and Waterberg quartzite becoming more prominent towards the north and west.

The information to follow was primarily sourced from the Feasibility Study Geotechnical Investigations (DWA, 2008).

Lithology and Stratigraphy

The large geographical area of the scheme, which extends from the proposed Vlieëpoort weir site in the south, to the delivery area near Steenbokpan in the north, also has, as a further consequence, an extensive geological coverage. The oldest lithologies are found in the southern portion of the study area, becoming progressively younger towards the north. The oldest lithologies encountered belong to the late Archaean to early Protozeroic (i.e. approximately 2 650 to 2 050 million years) Transvaal Supergroup, and comprise the dolomitic rocks and ironstone formations of the Chuniespoort Group, and the slightly younger shales, quartzites and lavas of the Pretoria Group.

The central portion of the study area is underlain by the sandstones of the Waterberg Group which are considered to be between 1 700 and 2 000 million years in age. The northern portion of the study area is underlain by rocks of the Karoo Supergroup which comprises a succession of sandstone, siltstone, shale and mudstone and are approximately 150 to 270 million years in age. Extensive diabase intrusions are particularly prevalent with the central portion of the study area where they are seen to have intruded the sandstones of the Waterberg Group. Extensive areas, particularly in the north, are covered by Quaternary Age sands which are younger than 1.8 million years.

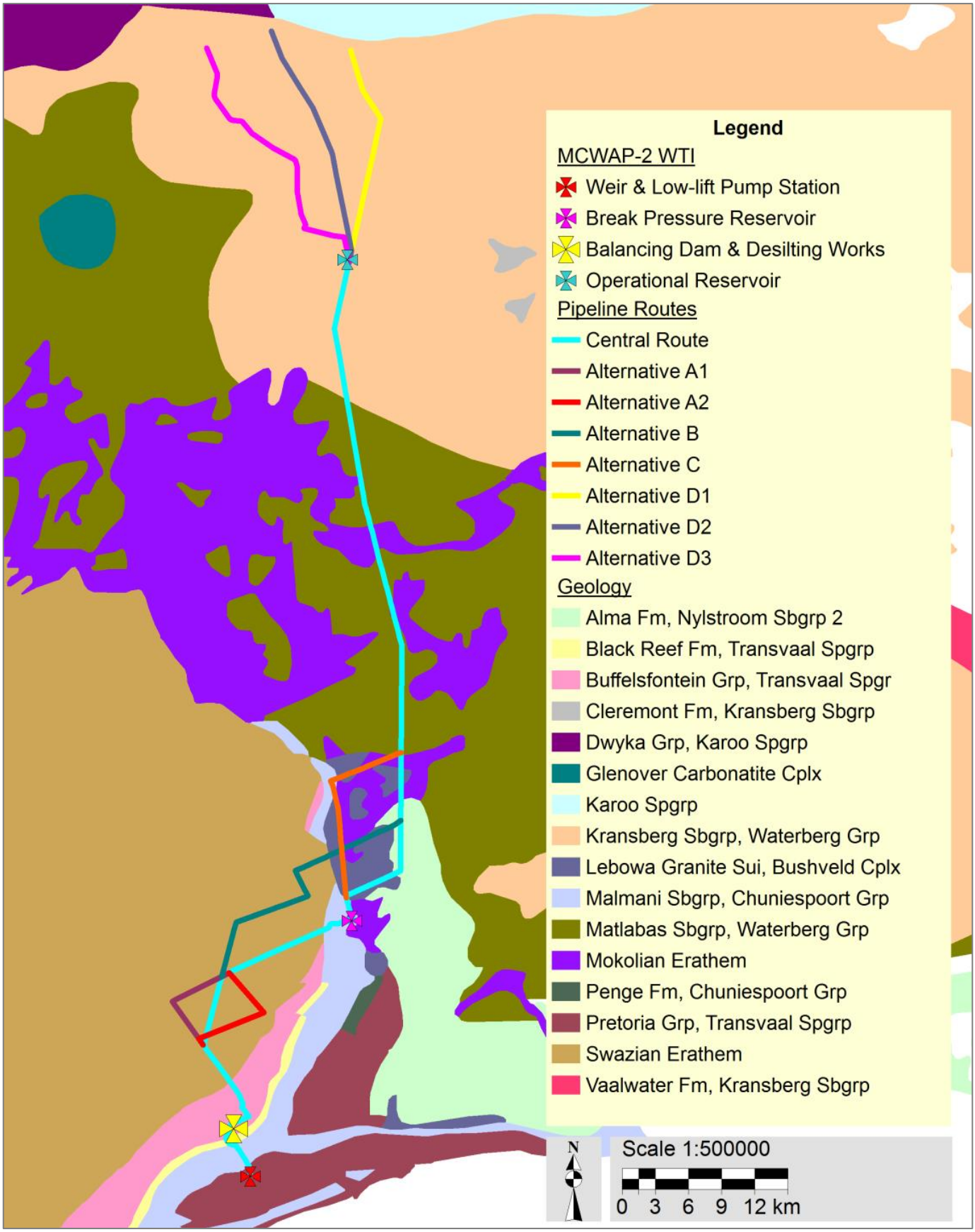


Figure 68: Simplified geology

(Note: Pipeline Route Alternative B was discarded; gauging weirs not shown)

Structural Geology

The structural geology of the study area is similarly highly complex and a single paragraph cannot do these complexities justice. The older, Transvaal Supergroup rocks in the south of the study area have a moderate to shallow dip of 15° to 30° towards the south-east; reflecting the intrusion of the younger Bushveld Complex, which depressed these underlying strata. These Transvaal Supergroup rocks are extensively faulted. Although faults are generally of limited extent, some major faults, which can be traced for distances in excess of 50 km, can be identified.

In the south, the sandstones of the Waterberg Group dip at shallow angles in a northerly direction, but become almost horizontal towards the north. Prominent NE- and NWstriking lineaments are recognized and likely represent intrusive diabase dykes. The Karoo sedimentary strata are essentially sub-horizontally bedded, but are extensively faulted. Some of the faults may be traced for significant distances.

Economic Geology

The envisaged abstraction weir is not intended as a storage facility and the elevated water level will largely be confined within the current river bank. No new inundation of any mineable mineral reserves will therefore occur as a result of impounding. In the north, beyond the Eenzaamheid Fault, coal is extracted on a large scale from the Ecca sediments. The pipeline routes are generally located south of this fault, except for limited transgressions in the vicinity of the Medupi Power Station.

Coal is found in South Africa in 19 coalfields located mainly in the provinces of KwaZulu-Natal, Mpumalanga, Limpopo and the Free State, with lesser amounts in Gauteng, North West and the Eastern Cape. The Waterberg coal reserve is estimated at 75 000 Mt of coal, which is approximately 40 % of South Africa's remaining coal reserves (Ninham Shand, 2008). The coal seams mined at the Grootegeluk Mine form part of the Upper (Volksrust formation) and Middle Ecca (Vryheid formation) with an average coal thickness of 115 meters.

The Thabazimbi area is rich in mineral deposits. A section of the Thabazimbi iron ore mine (undergoing closure at the time of writing this report) is situated upstream of the proposed Vlieëpoort weir site, on the Farm Donkerpoort 344KQ.

Seismic Hazard

Published seismic hazard maps of southern Africa indicate Peak Ground Accelerations (PGAs) in the order of 0.1 g to 0.04 g within the study area, becoming progressively lower towards the north. These accelerations might be considered to represent a moderate to low level of seismic hazard.

Climate and Weathering

The study area straddles the climatic N = 5 line which indicates that neither chemical decomposition nor mechanical disintegration are dominant modes of weathering, and that both modes of weathering are likely to have an influence.

11.4.2 Geophysical Survey

A geophysical survey was carried out at sites earmarked for project infrastructure. The purpose of the survey was to identify any linear features such as faults and to map changes in bedrock depth. Key findings include:

- **Vlieëpoort abstraction weir** –
  - Drilling proved that the site is underlain by banded ironstone that is overlain by up to forty metres of alluvium.
  - According to the Thabazimbi 1:250 000 scale geological map, the local geological strike is SW-NE and the dip is about 25º towards the south east. There are several faults in the area including one with a SW-NE trend that may cross the site.
  - Significant work will be required to prepare the foundation for the abstraction weir. Foundation work must be deep enough to prevent seepage and piping underneath the weir.
- **Low-lift rising main** –
  - The site is underlain by dolomite with rock head typically around twenty-five metres below surface, according to the drilling results.
  - The Thabazimbi 1:250 000 scale geological map indicates that the local geological strike is SW-NE and that the dip is about 25º towards the south east.
- **Balancing dam** –
  - The site is mapped as being underlain by lava and sedimentary rock of the Ventersdorp Group that dips at an angle of 27º towards the south east (2426 Thabazimbi 1:250 000 scale geological map).
  - Post-survey drilling to a depth of about ten metres indicates that beneath a thin cover of transported material, the site is blanketed with agglomerate. Lava was encountered beneath the agglomerate in two holes (BH45 and 65). Given the distance between the two holes and their orientation in respect to each other, the intersections of lava presumably reflect two separate eruptions.
  - Several faults and dykes with east-west and SW-NE trends are recorded in the vicinity but none cross the site.
- **BPR** –
  - According to the Thabazimbi 1:250 000 scale geological map, the area is underlain by dolomite whose geological strike is north-south. In places the dolomite is intruded by diabase and overlain by Waterberg Group arenaceous rock.

Potential Impacts / Implications

A first order assessment of the anticipated geotechnical conditions along the conveyance routes was done in order to inform the pre-feasibility decision making process (DWAF, 2008d). According to this assessment, no adverse geological conditions are expected that would prohibit the construction of the pipelines along any of the alternative route options investigated.

Construction material will need to be sourced from approximately 30 borrow pits that will be located at 5km intervals along the project footprint. Such extraction could result in a variety of environmental impacts including visual impacts, loss of habitat, noise and dust to local communities and wildlife. As mentioned, a separate application will be submitted to DMR to seek approval for the borrow pits.

Other important considerations from a geological perspective for the EIA phase include *inter alia* blasting and spoil material that will need to be disposed of during the installation of the pipeline through filling of borrow pits or other suitable environmental practices.

Specialist Study Triggered / Additional Investigations

- Geotechnical Study undertaken as part of the Feasibility Study. Additional findings will be included in the EIA Report, as necessary.
- Further geotechnical investigations will be undertaken during the design phase. This investigation would result in more information to evaluate the geological conditions.
- Dolomite stability investigations are required at the site for the balancing dam, desilting works and high-lift pump station (DWA, 2008). Depending on the level of inherent risk it may be possible to construct the reservoir at this site, provided appropriate designs are adopted and strict water precautionary measures are adopted. Should limited areas of high risk for sinkhole and doline development be identified, then it might further be possible to optimise the site layout in order to minimise exposure to this risk.

11.5 Soils

Status Quo

The soil classes encountered in the project area are shown in **Figure 69**. The majority of the project infrastructure falls within areas characterised by freely drained, structureless soils. Sections of the pipeline route options traverse areas with red or yellow structureless soils and a section of the Central Route crosses and area consisting of lithosols.

Potential Impacts / Implications

During the construction phase large areas will be cleared of vegetation, which may lead to soil erosion. Soils with a high agricultural potential could also be disturbed. Soil could also be contaminated through inadequate storage and handling of hazardous materials, spillages from equipment and plant and poor management of waste and wastewater.

Where construction activities will take place in terrain that is characterised by steeper gradient as well as at instream works, erosion could take place in the absence of suitable stormwater management and stabilisation of the cut and fill areas.

Specialist Study Triggered / Additional Investigations

- Details on soil types and soil potential will be provided in the Agricultural Impact Assessment.
- Geotechnical investigations were carried out as part of the Technical Feasibility Study. Additional findings will be included in the EIA Report, as necessary.
- The EMPr will contain measures to mitigate against impacts to soil, for example the management of topsoil, preventing soil contamination during construction, erosion protections, stormwater management, etc.

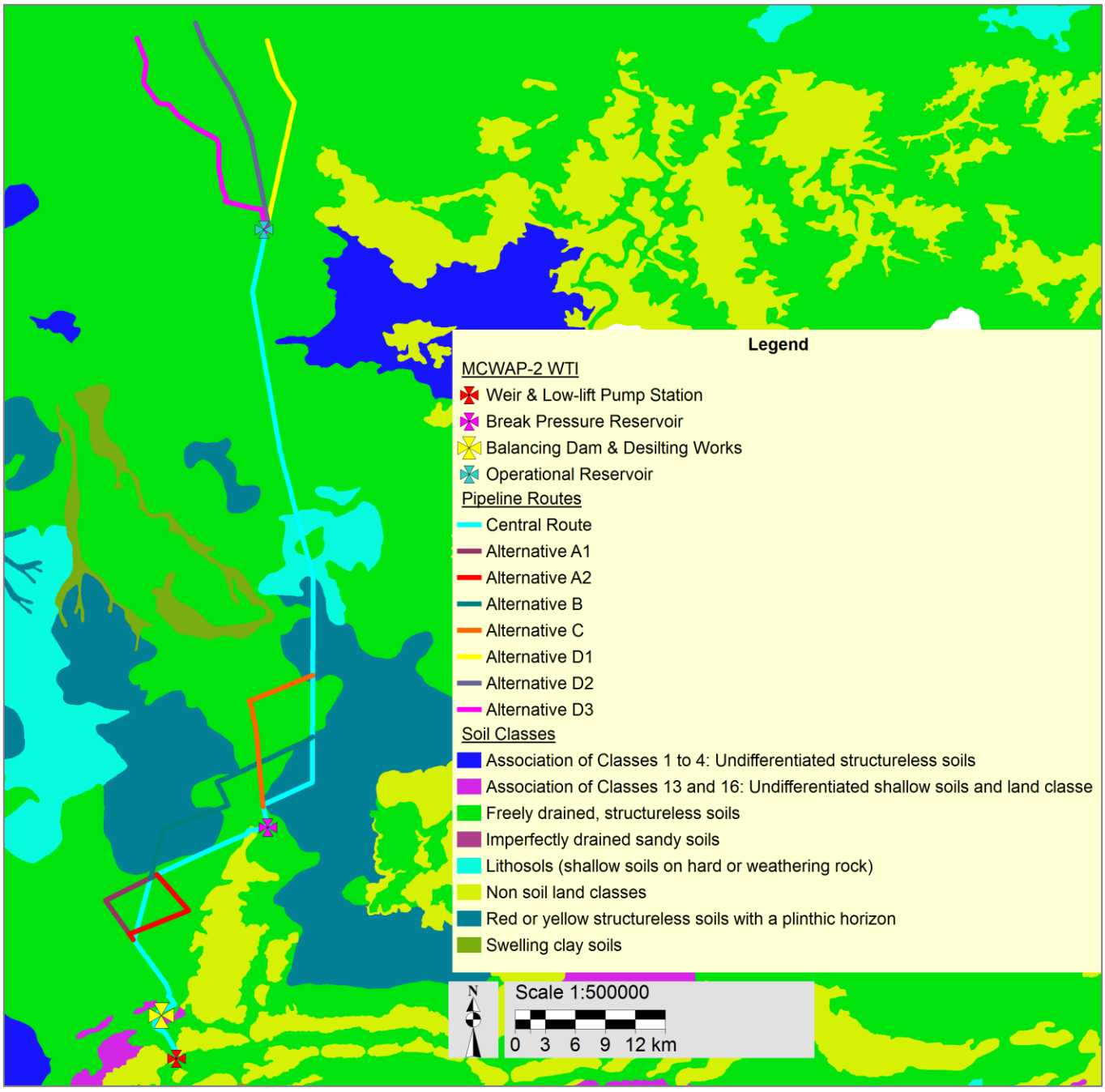


Figure 69: Soil classes

(Note: Pipeline Route Alternative B was discarded; gauging weirs not shown)

11.6 Geohydrology

Status Quo

11.6.1 General

Groundwater forms an important feature with regard to water resources in the Crocodile River (West) Catchment. An intergranular (alluvial) aquifer occurs along the Crocodile River (West), downstream of the Roodekopjes and Vaalkop Dams. A distinguishing feature of this aquifer is its hydraulic connection with the Crocodile River (West). The alluvial aquifer in the Crocodile River (West) sustains the current downstream irrigation use (Makoppa farmers), and is thus an important source. The aquifer is recharged from rainfall as well as river flow (DWA, 2004).

Groundwater pollution in the catchment is caused by poor effluent disposal and waste management practices by municipalities, agricultural activities and mining. Of these, nitrates (from fertilizers and sewage) and acid mine drainage pose the biggest water quality threats (DWAF, 2006).

According to the Crocodile (West) River Reconciliation Strategy (DWS, 2015), a separate report on groundwater assessment was compiled as part of the Crocodile (West) Modelling Study. Water availability from groundwater was determined on a quaternary basis. No further groundwater sources were included as additional water availability in the Crocodile River catchment. Groundwater supply is considered in-directly in the water balance by reducing the volume of water required to be supplied by surface water resources.

Based on the initial geophysical and geotechnical studies the presence of a fault zone was identified at the Vlieëpoort weir site. Monitoring boreholes were drilled (see **Figure 70**) and a two year monitoring programme was initiated to conduct water level monitoring, which started in July 2011 and ended in July 2013. Groundwater levels were measured and samples taken in eight monitoring boreholes drilled at the perimeter of the weir site. Samples were taken in April 2013 for chemical and stable isotope analysis to study the link between the river and monitoring boreholes. Based on the data obtained from water level monitoring and the sampling for chemical and isotope analysis of boreholes, the following conclusions were made (Aurecon, 2013):

- The water levels showed a seasonal trend that could be linked to the annual rainfall, river flow or both.
- The fluctuations in rainfall definitely correlated with the water levels trends with some delay in water level response.
- The river flow which are depending on both rainfall and dam releases correlated well with both the rainfall and water levels trends.
- All the borehole samples show similarity to the surface water indicating a possible link between river and groundwater.

- The stable isotope analysis showed the extent of evaporation between samples and all the samples fall on the same evaporation line that could indicate a possible link between surface and groundwater.
- It is concluded that a link between surface and groundwater exists and once the weir is constructed monitoring of water levels and chemistry will confirm this.

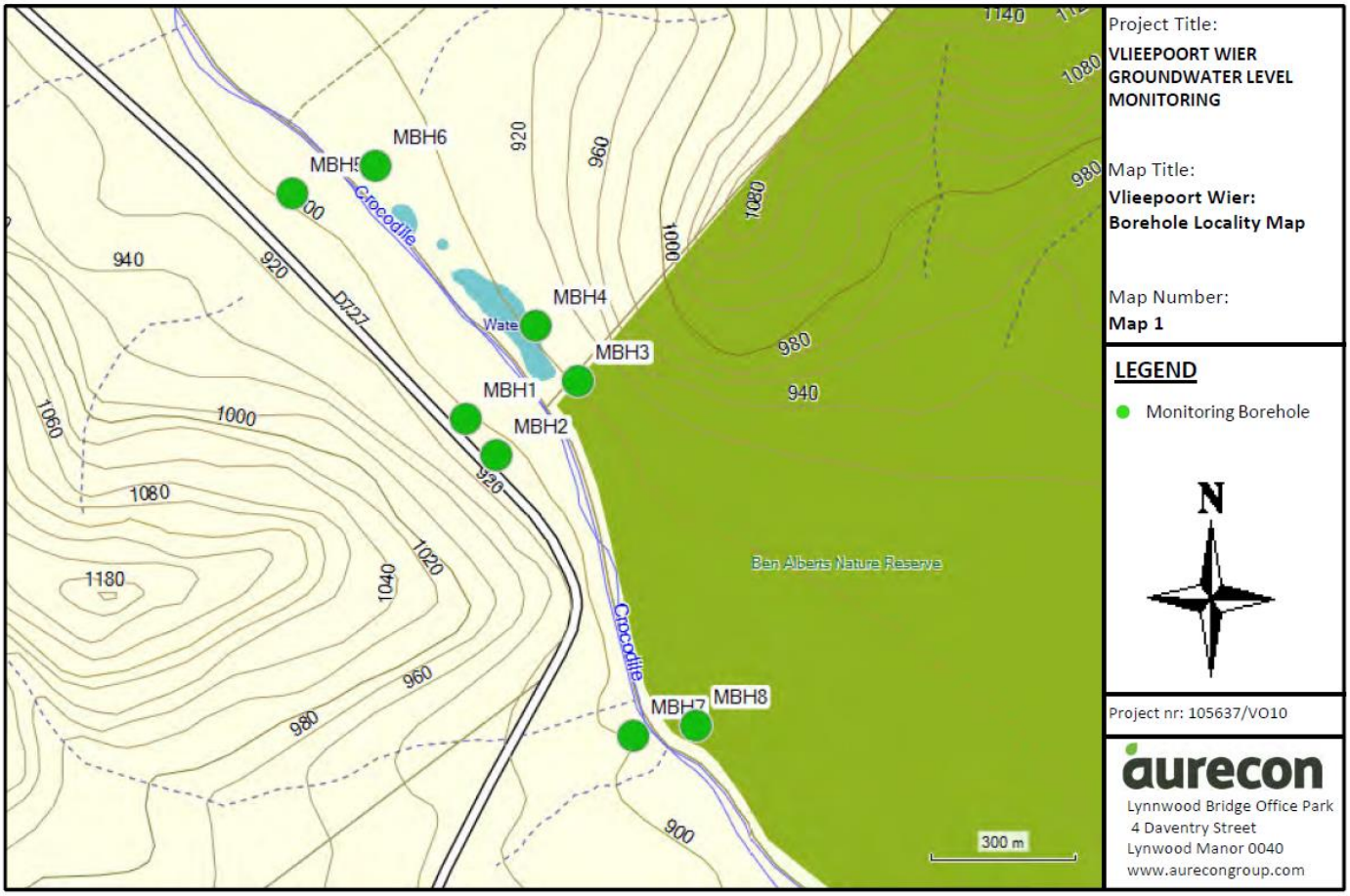


Figure 70: Borehole Locality Map (Aurecon, 2013)

The following recommendations are made as part of the above study (Aurecon, 2013):

- Once the weir is constructed monitoring of the ground-, and surface water levels as well as chemistry should be done to confirm the link between surface and groundwater.
- Digital real-time water level loggers should be installed in the boreholes to ensure accurate water level data.
- A digital rain gauge should be installed at the weir site or site specific rainfall data should be obtained.
- Monitoring boreholes must be properly demarcated to avoid damage from heavy machinery/vehicles during construction and to increase visibility.

11.6.2 Geotechnical Investigations

Some pertinent findings form the Feasibility Study Geotechnical Investigations (DWA, 2008) with regards to groundwater include:

- No water tables were recorded in any of the four boreholes drilled on the footprint of the balancing dam, desilting works and high-lift pump station and it may be assumed that the water table occurs at depths greater than 10 m.
- No seepage was encountered in any of the test pits dug along the pipeline route and it appears that this is unlikely, except in the vicinity of streams (and particularly on the south bank of the Matlabas River).

Potential Impacts / Implications

- Potential disturbance of the aquifer from blasting.
- Potential contamination of groundwater during the construction stage.
- Possible contamination of the primary aquifer with water of poorer water quality from the secondary aquifer as a result of blasting during construction.
- Possible influence to groundwater flow as a result of trenching during construction.
- Possible pollution of the aquifer with water during the maintenance of the infrastructure.
- Impacts to the recharge of the alluvial aquifer downstream of the abstraction weir.

Specialist Study Triggered / Additional Investigations

- Surface water and groundwater interactions were taken into account from a regional perspective when determining the hydrology of the river catchment during the Technical Feasibility Study.
- Implement recommendations from the Groundwater Level Monitoring Report (Aurecon, 2013) in terms of monitoring of the ground-, and surface water levels as well as chemistry to confirm the link between surface and groundwater. Borehole water level monitoring to be instituted at Vlieëpoort to compliment surface flow measurements and to ensure that the alluvial aquifer downstream of Vlieëpoort would not be negatively impacted on by the proposed Vlieëpoort abstraction works. Continued borehole water level monitoring would be required after construction of the abstraction works to confirm the adequacy of releases from the abstraction weir to recharge the aquifer downstream of Vlieëpoort.
- Geotechnical Study undertaken as part of the Feasibility Study. Additional findings will be included in the EIA Report, as necessary.
- Further geotechnical investigations will be undertaken during the design phase. This investigation would result in more information to evaluate the geohydrological conditions.
- The EIA phase will investigate potential impacts to groundwater (e.g. pollution during construction, blasting) and suitable mitigation measures will be identified.
- The EIA phase will need to investigate potential disturbance of the aquifer from blasting, and mitigation measures to manage the potential contamination of groundwater during the construction stage. The possible contamination of the primary aquifer with water of poorer water quality from the secondary aquifer will also be investigated during the EIA phase.
- The potential use of groundwater will need consideration during the EIA phase, taking into account the findings from the WRC study.

11.7 Topography

Status Quo

The primary terrain morphological units encountered in the project area are shown in **Figure 71**.

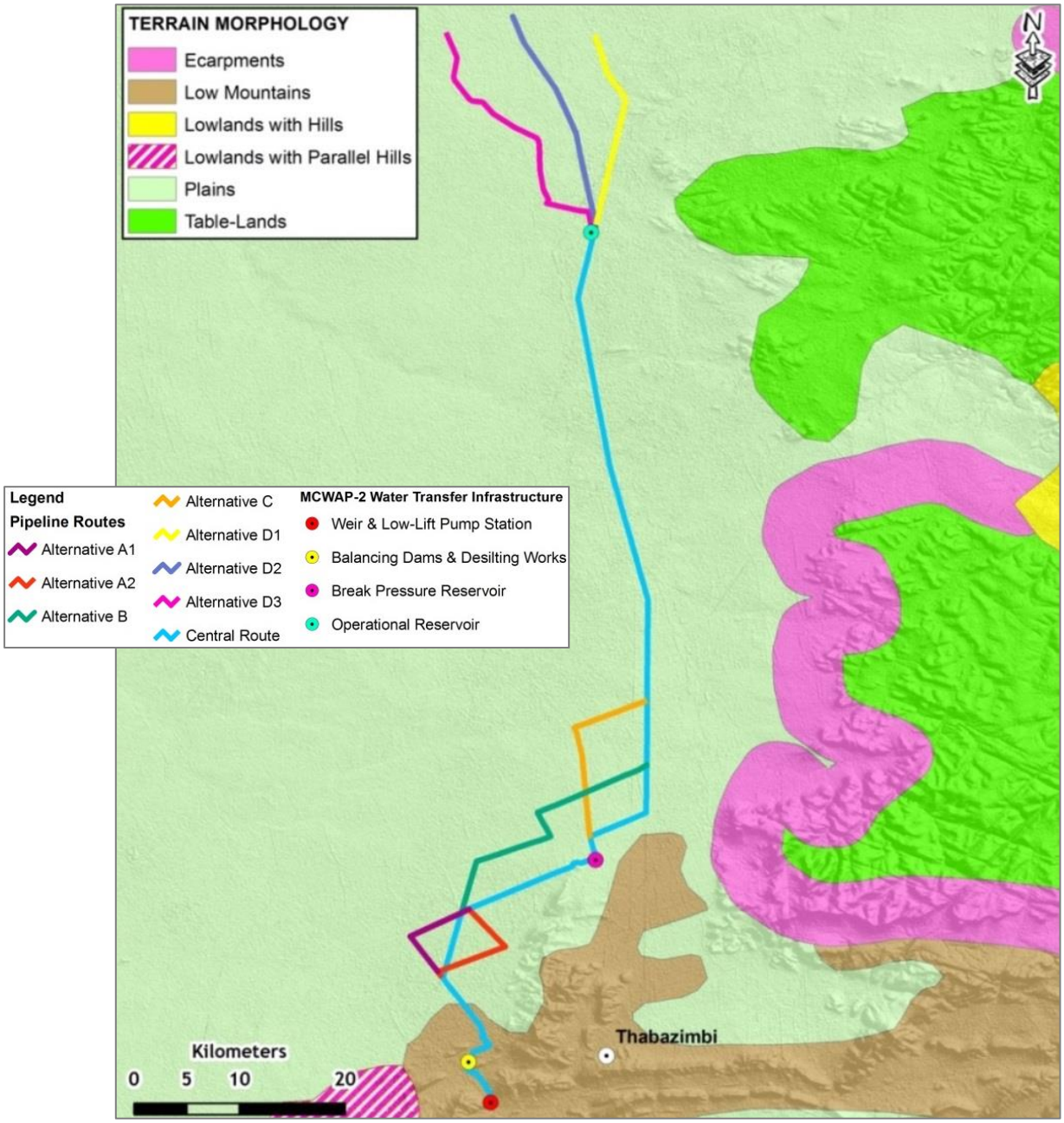


Figure 71: Terrain morphology

(Note: Pipeline Route Alternative B was discarded; gauging weirs not shown)

The terrain in the first section of the project footprint in the Vlieëpoort region (i.e. south-western part of project area) consists of low mountains. From there the terrain transforms to plains for the remainder of the project area, which comprises flat and undulating topography. Refer to **Figure 72** for the contours in the greater area.

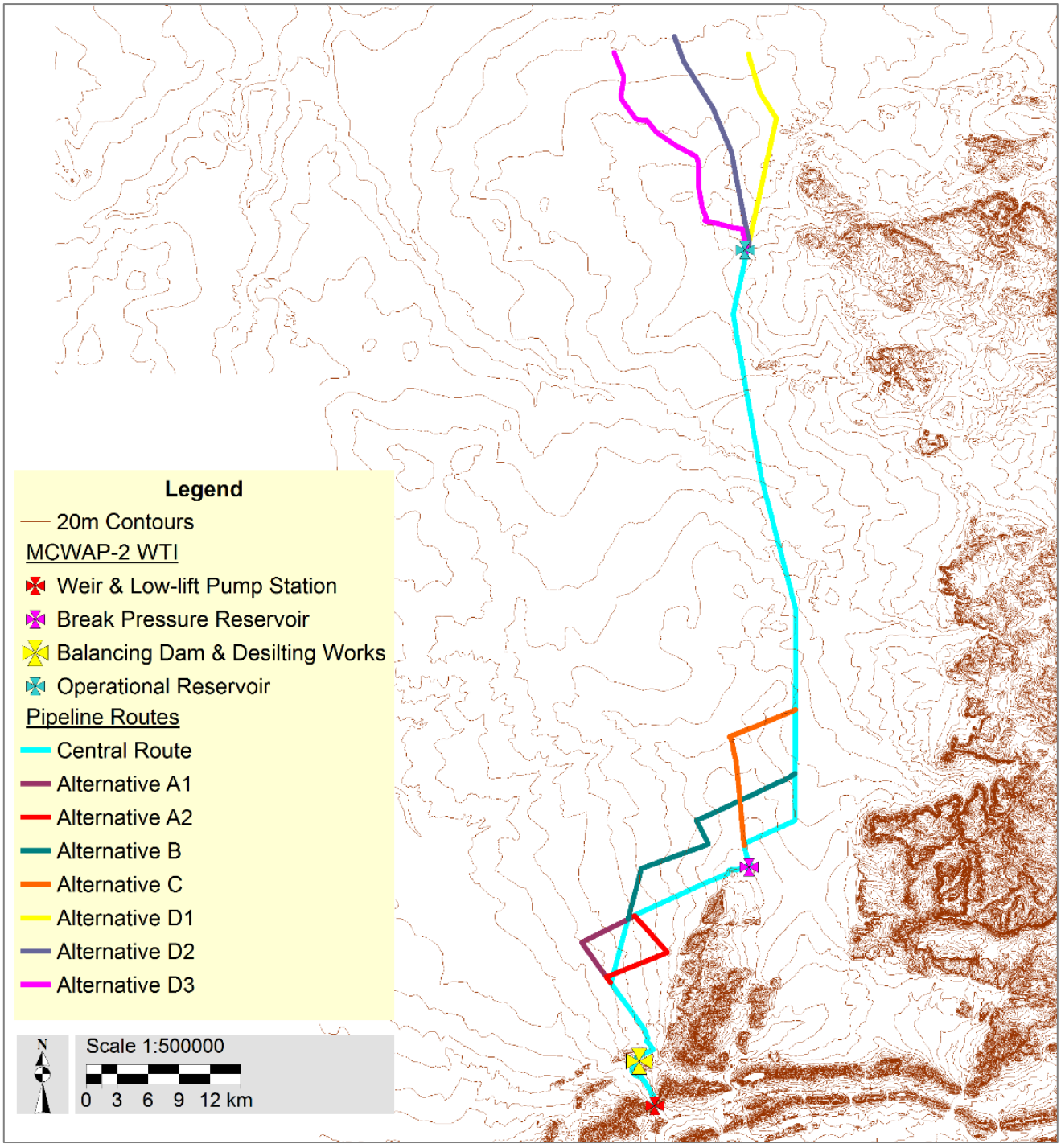


Figure 72: **20m Contours**

(Note: Pipeline Route Alternative B was discarded; gauging weirs not shown)

The site for the abstraction weir is located at a narrowing valley where the Crocodile River cuts through the Vlieëpoort mountains (see **Figure 73**). This mountain rises to elevations in excess of 1400 masl on either side of the river, where the elevation of the river bed is less than 900 masl (DWA, 2008). The site is characterised by a relatively wide river section, estimated in the order of 350m.

A section of the Central Route follows the dirt road and passes a koppie approximately 1 km south-west of the BPR (see **Figure 74**).

Figure 73: **View of the Vlieëpoort abstraction weir site from left flank**

Figure 74: **View along dirt road followed by Central Route with koppie in background**

Potential Impacts / Implications

From a technical perspective, the MCWAP-2A infrastructure purposefully attempts to avoid steep areas for ease of construction and for operational aspects, such as minimising any influence to the hydraulic gradient. Likewise, topographical features like ridges are not preferred for the pipeline route or associated structures to prevent impacts to environmental features such as aesthetics, soil (erosion), and biodiversity (usually high on ridges).

Erosion can occur where construction activities take place in terrain that is characterised by steep gradients, in the absence of suitable stormwater management and stabilisation of the cut and fill areas.

The topography provides a picturesque backdrop to the project area. The project activities associated with the construction phase as well as the permanent infrastructure could impact on the visual quality of the local environment (refer to further discussion on this matter contained in **Section 11.20**).

Specialist Study Triggered / Additional Investigations

- The EMPr will make provision for erosion protections, stormwater management, reinstatement and rehabilitation, etc.
- Visual Impact Assessment conducted as part of previous EIA for MCWAP-2 assessed the impact associated with the building of the infrastructure.

11.8 Surface Water

11.8.1 Hydrology

Status Quo

MCWAP-2A falls within the Limpopo Catchment as well as the Limpopo Water Management Area (WMA). The abstraction works, BPR and the first section of the pipeline in the south are situated in quaternary catchment A24J. The remaining pipeline route options and OR are located in quaternary catchments A41A, A41C, A41D, A41E and A41J. Refer to **Figure 75**. The Bierspruit gauging weir falls in quaternary catchment A24F, the Sand River gauging weir in quaternary catchment A24H and the new Paul Hugo gauging weir in quaternary catchments A24C and A24H.

The Crocodile River, which is a major tributary of the Limpopo River, is primarily fed by the Pienaars, Apies, Moretele, Hennops, Jukskei, Magalies and Elands Rivers. The total area of the Crocodile River Catchment is 29 400 km^2 (DWAF, 2004b). The major watercourses in the region are shown in **Figure 76**.

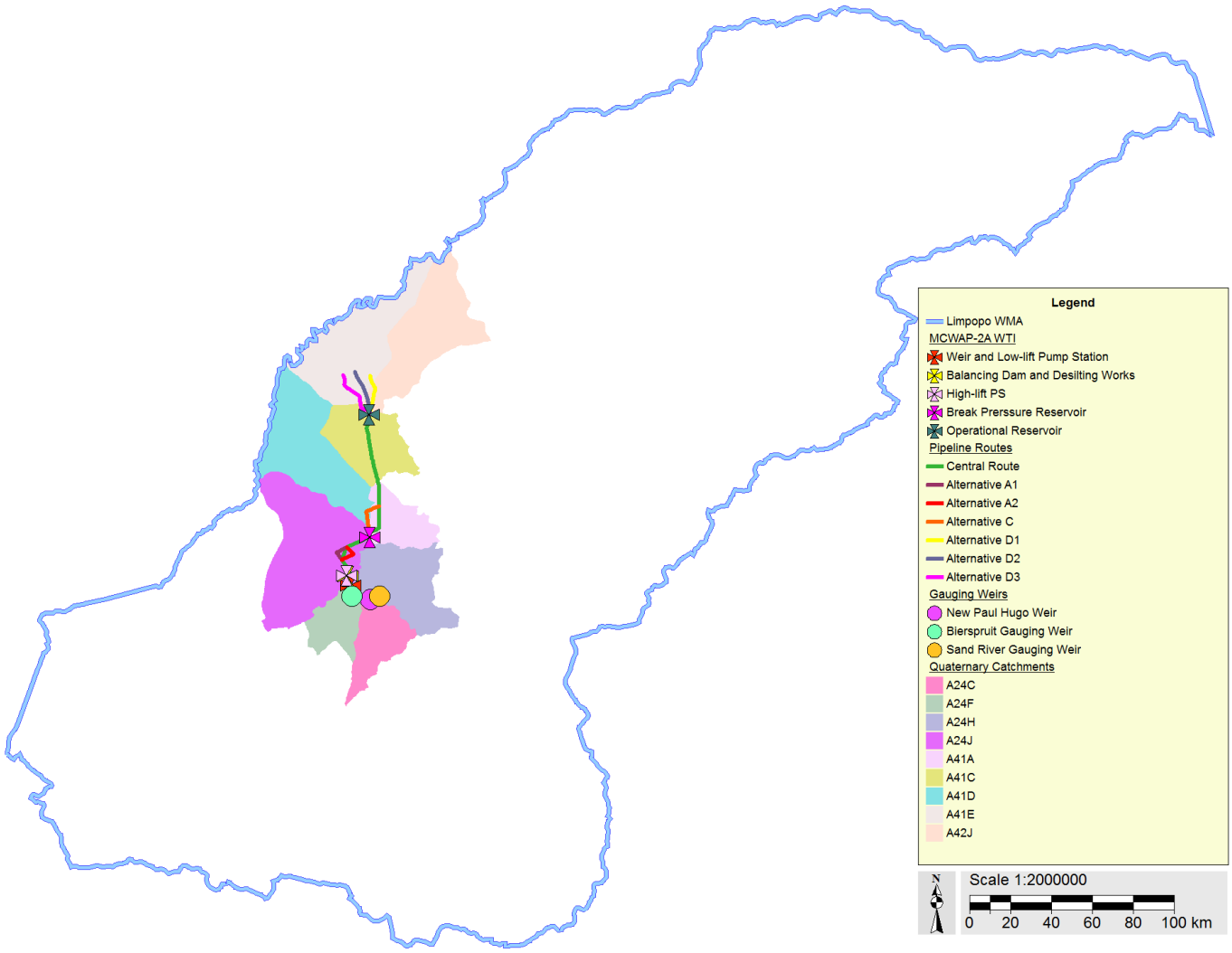


Figure 75: WMAs and quaternary catchments

From the confluence of the Crocodile (West) and Marico rivers, the river is known as the Limpopo River, which forms the northern border of South Africa with Botswana and then with Zimbabwe, before flowing into Mozambique where it discharges into the Indian Ocean. South Africa has international agreements and obligations with each of these countries that need to be adhered to in terms of any new water resource developments within the catchment.

The Crocodile River system is regulated by the following 9 major dams:

- Rietvlei, Hartbeespoort and Roodekopjes Dams in the Crocodile River;
- Roodeplaat and Klipvoor Dams in the Apies/Pienaars River; and
- Olifantsnek, Bospoort, Lindleyspoort and Vaalkop Dams in the Elands River area.

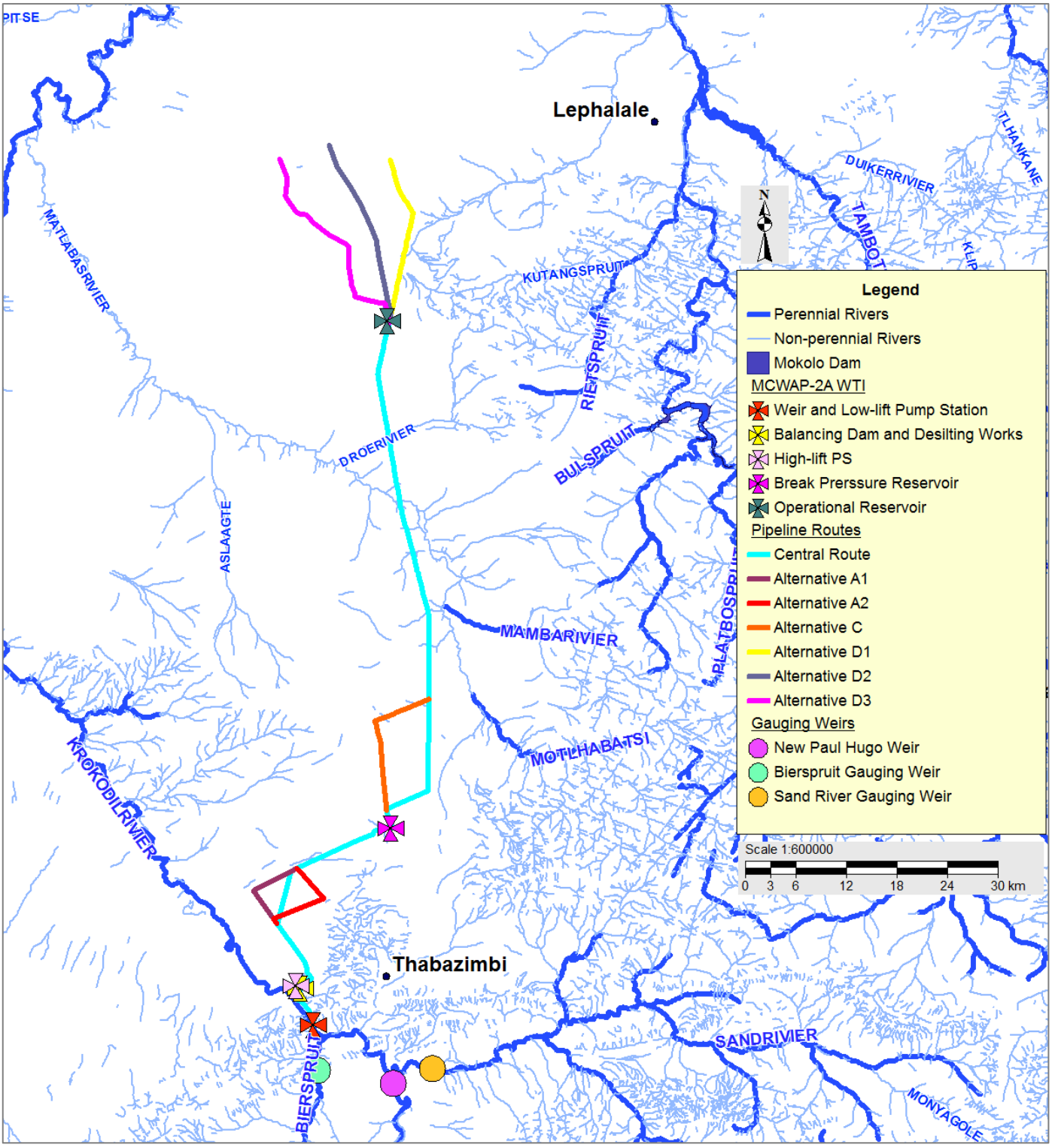


Figure 76: Perennial and non-perennial rivers

The natural Mean Annual Runoff (MAR) of the Limpopo River is 5 067 million m³ per annum, which mainly occurs during large floods. According to the Water Research Commission (WRC) (2004), some key features of the Limpopo River catchment include the following:

- Parts of Johannesburg and Pretoria are situated in the upper reaches of the Crocodile River (in the Crocodile (West) Marico WMA) and are supplied with 650 million m³ per annum of water transferred from Vaal Dam (in Upper Vaal WMA).

- Some 340 million m³ per annum of this imported water is returned to the upper tributaries of the Crocodile River as treated but nutrient rich effluent, which has resulted in eutrophication of dams, whereas the natural runoffs of the Crocodile and Marico Rivers (in the Crocodile West/Marico WMA) together equal only 202 million m³ per annum. Dolomitic aquifers supply 111 million m³ per annum.
- The demand for water in all the South African tributaries of the Limpopo River is dominated by the irrigation requirements, followed by urban usage.

The Reconciliation Strategy for the Crocodile (West) Water Supply system was first developed in 2008, revised in 2012, and continues to be reviewed and updated by the DWS in cooperation with institutions and stakeholders in the water sector. The first Reconciliation Strategy for the Crocodile (West) Water Supply System was developed and published in 2008 by the then Department: Water Affairs (DWA) to ensure sufficient water can be made available to supply the current and future water requirements of the urban, industrial, mining and irrigations users in the system The Strategy primarily focused on the quantitative reconciliation of the water requirements with the available resources and also considered water quality where it impacts on the water balance. The objectives of the Reconciliation Strategy 2015 include (DWS, 2015):

- To maintain a positive water balance in future and reconcile growing water requirements and availability;
- Identify, plan and monitor necessary interventions needed;
- Integrated planning between the different WSAs/ WSPs; and
- In the unique case of the Crocodile (West) River system, to identify the optimal use of the growing water availability due to increasing return flows. This resource is a limited asset to be best used from a regional perspective, i.e. supply within the catchment and transfers to Lephalale and other neighbouring catchments.

Potential Impacts / Implications

A HEC-RAS model of the Crocodile River (West) was set up to determine the flood levels in the Crocodile River. The model was also used to determine and check the impact of the proposed Abstraction Works on flood levels and on infrastructure up- and downstream of the Works. Refer to discussion in **Section 9.3.1**.

The weir is not designed for storage and it is assumed it will silt up. The areas immediately upstream and downstream of the weir will be cleared and suitable erosion protection measures such as grassing and rip-rap will be applied. The existing gravel road (D727) on the left bank will need to be raised locally at the weir.

Mitigate potential impact of the proposed abstraction weir on existing upstream infrastructure, specifically a low level mine haul road and railway bridge crossing the river some 7.5 km upstream of the proposed weir (shown in **Figure 77** and drawing contained in **Appendix H**). The future use of the haul road needs to be considered in light of the closure of the mine.

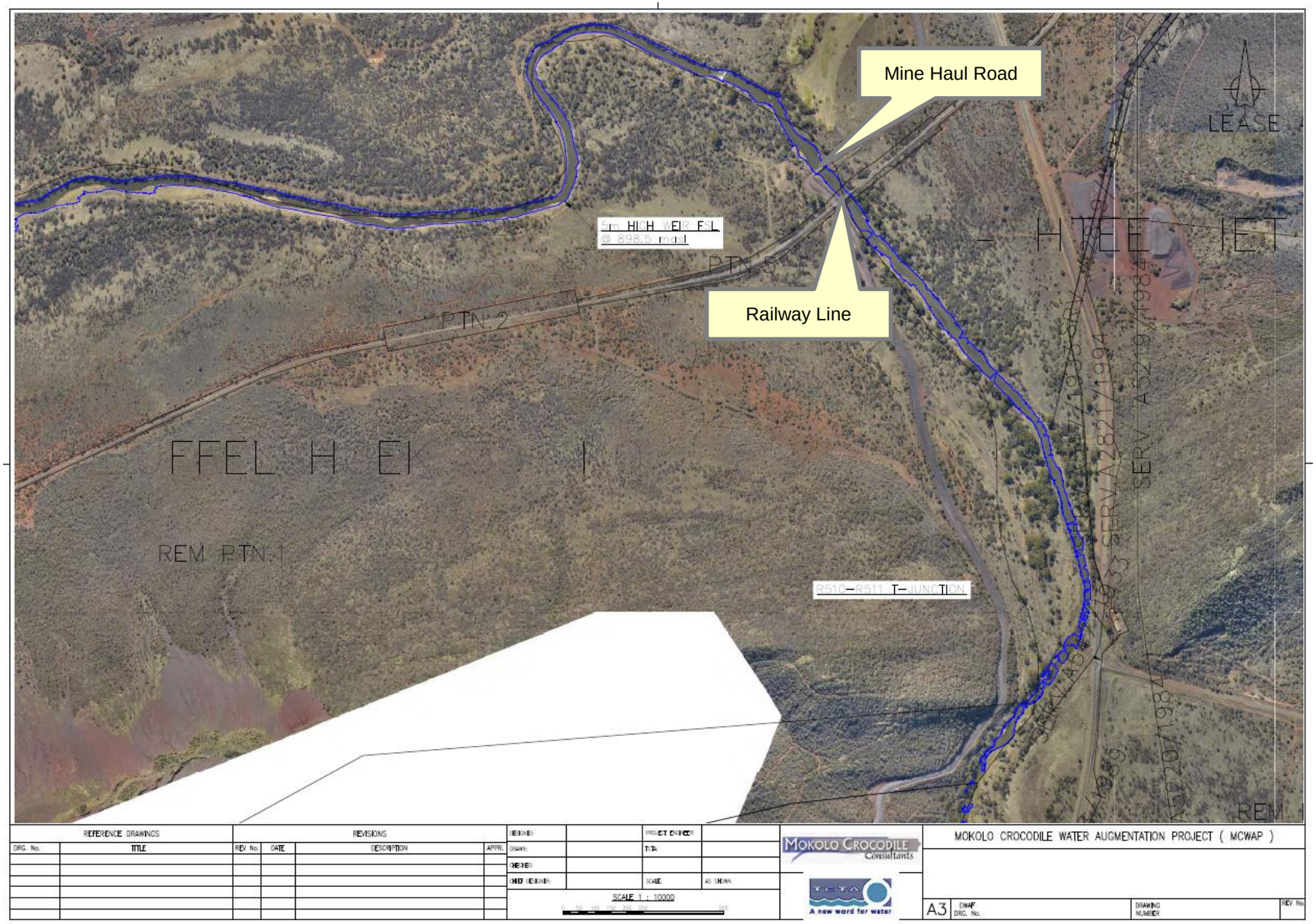


Figure 77: Upstream Structures affected by Vlieëpoort Weir Full Supply Level

The weirs (Crocodile River, Bierspruit and Sand River) and the watercourse crossings (Matlabas River - tributaries and mainstem; Crocodile River – tributaries; Mokolo River - tributaries) may lead to the alteration of the morphology of the watercourse. Any changes to the structure of these watercourses will require adequate rehabilitation and stabilisation measures, which will be addressed through specific mitigation measures during the EIA phase. Alternative crossings-methods, such as pipeline bridges (as opposed to open trenches) will also be considered.

Specialist Study Triggered / Additional Investigations

- A crucial part of the river management functions during the operational stage of MCWAP Phase 2, will be to determine the timing and magnitude of water releases required from the Hartbeespoort and Roodekopjes Dams (and possibly also the Klipvoor and Vaalkop Dams) in order to supply the water allocated to the MCWAP SMA and the other authorised users between these three upstream dams and Vlieëpoort and other authorised users downstream of Vlieëpoort, which includes the Ecological Water Requirements (EWR). In addition to this, factors such as evaporation and evapotranspiration losses, diffuse outflows and inflows, tributary inflows and weather conditions that could affect the flow in the river at Vlieëpoort will also have to be taken into account. These tasks will be performed in support of DWA (and or the Crocodile (West) CMA), who will be responsible for operating the Hartbeespoort, Klipvoor, Roodekopjes and Vaalkop Dams. Refer to further discussion on the proposed River Management System in **Section 9.11**.
- The possible reduction in the average levels of the upstream impoundments during the operational phase will be investigated further during the EIA phase.
- The impacts to the watercourses that are affected by the project infrastructure will be evaluated as part of an Aquatic Ecological Study during the EIA phase.

11.8.2 Affected Rivers and Streams

Status Quo

The following rivers and streams are directly affected by the MCWAP-2A infrastructure (refer to **Figure 76**):

- The Crocodile River (West) will be used for water conveyance for MCWAP-2A;
- Vlieëpoort abstraction weir will be located on the main stem of the Crocodile River (West) (see **Figure 78**) approximately 2km downstream of the confluence of the Bierspruit;
- Gauging weirs will be located on the Bierspruit, Sand River and Crocodile River (West);
- Low-lift rising main crosses non-perennial tributaries of the Crocodile River (West);
- Drainage channel from desilting works crosses a non-perennial tributary of the Crocodile River (West) and will return sediment back to the main stem;
- Central Route crosses non-perennial tributaries of the Crocodile River (West);
- Central Route and Alternative C cross non-perennial tributaries of the Matlabas River;
- Central Route crosses the main stem of the Matlabas River (see **Figure 79**); and
- Alternative D1 crosses non-perennial tributaries of the Mokolo River.

Figure 78: Abstraction weir site on Crocodile River

The Matlabas River originates in the Marakele National Park. The river occupies secondary sub catchment A41 with a gross area of 6 014km^2 and a Gross Mean Annual Runoff (MAR) of 48.7(10^6m^3) (Midgely *et. al*. 1994). The Mamba River is the only significant tributary to the Matlabas. The Matlabas has ephemeral flow, and hence the catchment is largely undeveloped with limited water resources and water use. There are no significant dams in this catchment and a significant portion of the water use is from groundwater due to the low assurance of the run-of-river yields (DWAF, 2004a).

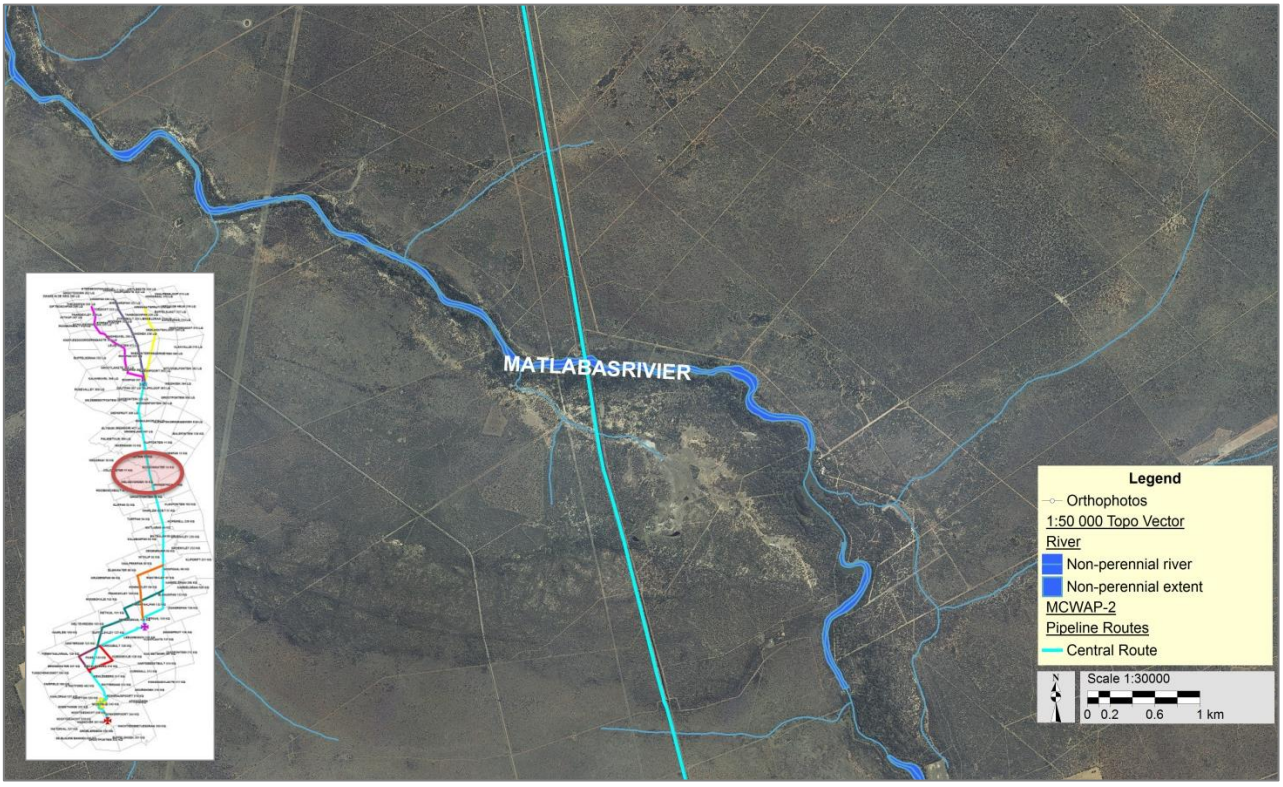


Figure 79: Crossing of Matlabas main stem and tributaries

Potential Impacts / Implications

Activities linked to the construction and operational phases can cause significant adverse impacts to the "resource quality" of the affected watercourses, which is defined by the NWA as the following:

- Quantity, pattern, timing, water level and assurance of in-stream **flow**;
- **Water quality**, including physical, chemical and biological characteristics of the water;
- Character and condition of the in-stream and riparian **habitat**; and
- Characteristics, condition and distribution of the **aquatic biota**.

The weir structure in the Crocodile River and the pipeline crossings at watercourses (Matlabas River - tributaries and mainstem; Crocodile River – tributaries; Sandloop River - tributaries) may lead to the alteration of the morphology of the watercourse. Any changes to the structure of these watercourses will require adequate rehabilitation and stabilisation measures, which will be addressed through specific mitigation measures during the EIA phase. The pipeline will traverse the Matlabas River via a trenchless technique.

Specialist Study Triggered / Additional Investigations

Aquatic Ecological Study to be conducted during the EIA phase to investigate impacts to resource quality of affected watercourses. Best practices to mitigate impacts to be included in EMPr.

11.8.3 Sediment Regime

Status Quo

The sediment regime includes inputs and outputs of mobile sediment from a length of channel and storage of sediment within the channel and floodplain over a specified time interval.

The catchment area between the Klipvoor, Roodekopjes and Vaalkop Dams and Vlieëpoort is in Sediment Yield Region 1 with a medium sediment yield potential (DWA, 2010). As part of the Feasibility Study, an analysis was undertaken to estimate the incremental yield benefit of additional storage at Vlieëpoort (e.g. constructing a dam). Based on the outcomes of the analysis, the following conclusions were drawn:

- Some additional yield from a dam at Vlieëpoort is possible, but the required dam gross storage capacity will have to be well in excess of 100 Million m^3 before any additional exploitable yield could be possible;
- Reduction in gross yield due to the impacts of sedimentation, evaporation and EWR (the main components affecting net incremental yield) will not be easily made up by increasing dam size; and
- The MCWAP water requirements will not be met by a dam at Vlieëpoort alone.

Potential Impacts / Implications

The abstraction weir is required to be located on a bend in the river. This allows the intakes to the Low-lift Pump Station to be placed on the outside of the bend in order to minimise sedimentation at the intakes. The weir is not designed for storage and it is assumed that it will silt up (and, because of its low height, should be scoured clear during most large flood events). The particular design that was adopted will, however, minimise the effects of sedimentation on the operation of the Works.

In order to prevent damage to pumps and pipeline elements, at least part of the suspended sediment will need to be removed from the water. This sediment can be stored temporarily in a suitable storage facility (i.e. sediment reservoir) alongside the pump station for subsequent return to the Crocodile River (West) during periods of high river flows when the impact of the sediment would likely be minimal. However, depending on the period of storage and the character of the sediment removed from the pumped water at the abstraction works, the process of storing the sediments may result in physical and chemical changes to the sediment particles. An analysis was undertaken to establish a quality profile of the silt to be abstracted from the Crocodile River (refer to **Appendix J**). The test results for heavy metals were found to be well within allowable limits of the standards considered. An important factor to bear in mind is that the abstracted suspended sediment is less than 4% of total average annual sediment load in the river and that only up to 2% is planned to be returned. In addition, it is understood that the chemical characteristics of sediment in river are the same as for the sediment to be returned. Refer to discussion in **Section 9.3.4**.

Specialist Study Triggered / Additional Investigations

- Sedimentation analysed as part of the Feasibility Study.
- The final design will minimise the effects of sedimentation on the operation of the abstraction works.
- Management of sediment to be stored and returned to the Crocodile River (West) during operational phase.

11.8.4 Water Use

Status Quo

The main existing water users in the Crocodile River (West) catchment downstream of the Klipvoor, Roodekopjes and Vaalkop Dams comprise the following (DWAF, 2009):

- Irrigators downstream of the three dams (both upstream and downstream of Vlieëpoort) (see **Figure 80**);
- Platinum mines and associated settlements to the west of the Crocodile River (West);
- A number of rural towns and villages north and east of the Pilanesberg and also in the catchment of the Tolwane River (tributary of the lower Pienaars River) between the Klipvoor and Roodekopjes Dams;

- The users supplied from the small Zandriviersdrift and Bierspruit Dams on the Tolwane River and Bierspruit respectively; and
- Thabazimbi Local Municipality.

Figure 80: **Indication of irrigation areas in the Crocodile River (west) (downstream of Hartbeespoort Dam)**

(Note: Pipeline Route Alternative B was discarded)

According to (DWAF, 2009), downstream of the Klipvoor, Roodekopjes and Vaalkop Dams the Crocodile River (West) is characterised by a very flat slope and a number of prominent meanders in flat alluvial plains. Preliminary desktop investigations indicate that these alluvial plains are

underlain by relatively coarse lenticular alluvial deposits that are hydraulically connected to the Crocodile River (West) and that have created sedimentary aquifers that are recharged by rainfall and from the river. These aquifers are a major source of water for the irrigators who have drilled into them and are abstracting water from the boreholes on the basis that it was groundwater, whereas the water is mostly derived from the river (DWAF, 2009).

Hartbeespoort Dam was constructed during the 1920's and completed in 1925. The dam, which lies in a valley to the south of the Magaliesberg mountain range and north of the Witwatersberg mountain range, was mainly built for irrigation purposes. Hartbeespoort Dam is very popular recreational area and also offers various tourism related activities. A number of residential developments occur around the dam.

Potential Impacts / Implications

The need for MCWAP-2A stems from satisfying the water requirements of the following (including strategic water users):

- Power generation in Waterberg;
- Coal for power generation in the Waterberg;
- Coal to support power stations in Mpumalanga;
- Industrial/mining for other purposes; and
- Urban use by Lephalale Municipality.

The impact of the abstraction from the Crocodile River (West) and of the management of the system on the existing agricultural water users is regarded as a key environmental issue associated with the project, and has been raised as a concern by many IAPs during public participation. Existing water use entitlements were accounted for in assessing the availability of water for the transfer scheme.

The operating level of the Hartbeespoort Dam will fluctuate as per seasonal rains, with associated impacts to the surrounding recreational water users (active and passive), such as a reduced waterbody size with access restrictions (e.g. land-locked jetties, enlarged muddy shoreline) and visual impacts.

Specialist Study Triggered / Additional Investigations

As explained in **Section 9.11**, the proposed River Management System will need to establish operating rules for the Lower Crocodile (West) system with MCWAP-2A releases to make provision for (amongst others) multiple users along the river stretch (irrigation, transfer and Ecological Reserve), with varying assurance of supply criteria. Additional information to be provided in the EIA Report.

As part of the future management of the Crocodile (West) system the impact on Hartbeespoort Dam will need to be assessed further. Information to be provided in the EIA Report.

11.8.5 Ecological Status

Status Quo

The Reserve is central to water resource management and enjoys priority of use according to the National Water Act (No. 36 of 1998). The Reserve relates to the quantity and quality of water required to satisfy the following two elements:

- The Basic Human Needs Reserve, which provides for essential needs of individuals; and
- The Ecological Reserve, which relates to the water required to protect the functional integrity of aquatic ecosystems.

As part of a Reserve study, EWR sites are set at specific points on the river which are critical localities within a reach of the river. Factors that guide the selection of EWR sites include:

- The suitability of the site for accurate hydraulic modelling throughout the range of possible flows, especially low flows;
- Accessibility of the sites; and
- An area or site that could be critical for ecosystem functioning.

A comprehensive study was initiated in 2010 and completed in 2012 for the Crocodile (West) Marico WMA (DWA, 2012a). No Reserve study has been undertaken in the Matlabas catchment. **Table 25** shows the results from the Reserve Study in terms of the Present Ecological Status (PES), Ecological Importance and Sensitivity (EIS) and Recommended Ecological Category (REC) associated with each EWR site. The locations of the EWR sites are shown in **Figure 81**. EWR 8 (downstream of the confluence with the Bierspruit in Ben Alberts Nature Reserve) is of particular relevance in terms of the location of the abstraction weir.

Table 25: Summary of PES, EIS and REC per resource unit for the Crocodile (West) (DWA, 2012a)

EWR Site number	EWR site name	River	Resource unit	Quaternary catchment	PES	REC	EIS
EWR 1	Upstream of the Hartbeespoort Dam	Crocodile	MRU Crocodile 3	A21H	**D**	**D**	Moderate
EWR 2	Heron Bridge School	Juskei	MRU Crocodile 1	A21C	**E**	**D**	Moderate
EWR 3	Downstream of Hartbeespoort Dam in Mount Amanzi	Crocodile	MRU Crocodile 5	A21J	**C/D**	**C/D**	High
EWR 4	Downstream of Roodeplaat Dam	Pienaars	MRU Pienaars 5	A23B	**C**	**C**	High
EWR 5	Downstream of the Klipvoor Dam in Borakalalo National Park	Pienaars	MRU Pienaars 8	A23J	**D**	**D**	High
EWR 6	Upstream of Vaalkop Dam	Hex	MRU Hex 5	A22J	**D**	**D**	Moderate
EWR 7	Upstream of the confluence with the Bierspruit	Crocodile	MRU Crocodile 10	A24C	**D**	**D**	Moderate
EWR 8	Downstream of the confluence with the Bierspruit in Ben Alberts Nature Reserve	Crocodile	MRU Crocodile 11	A24H	**C**	**C**	Moderate

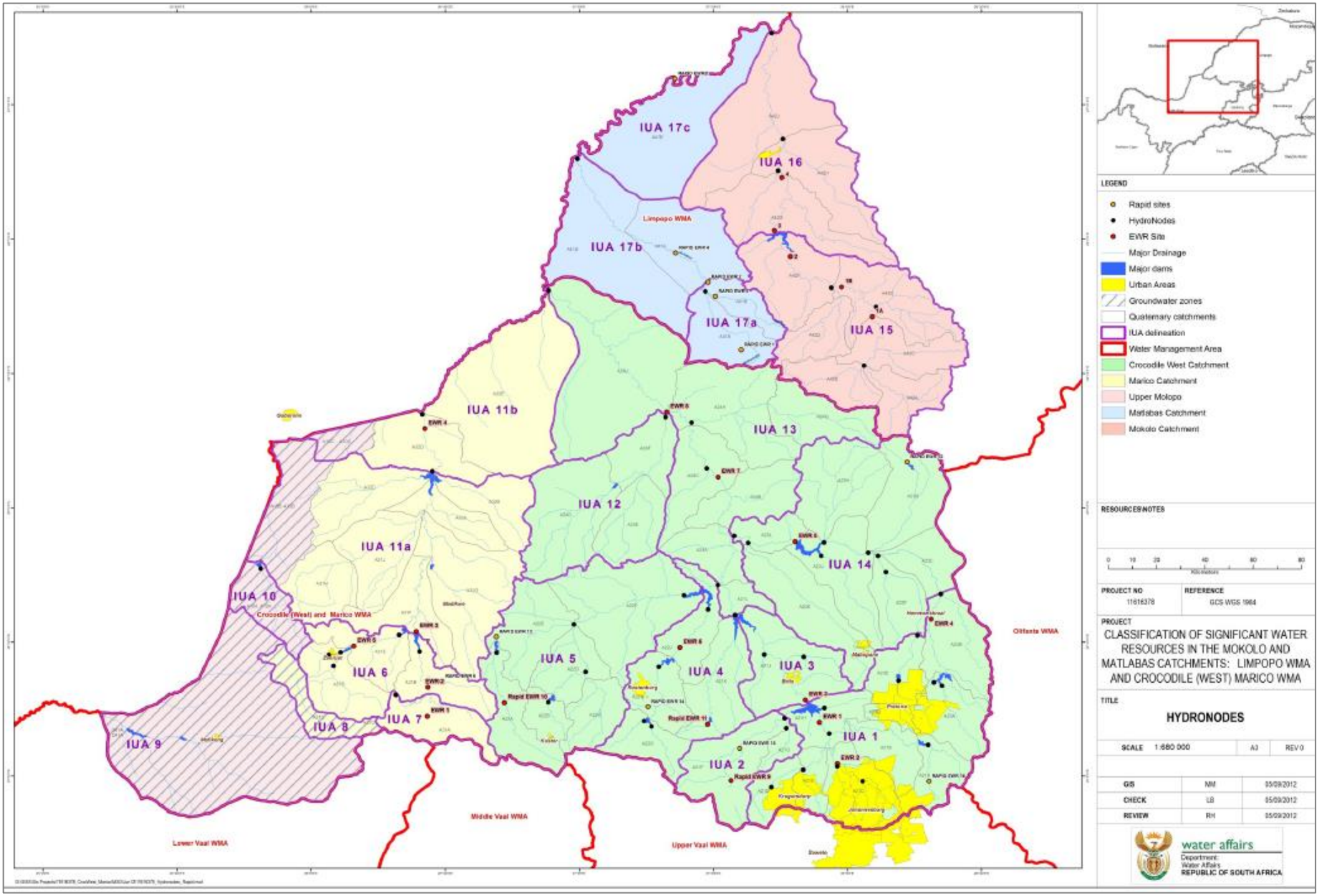


Figure 81: **Crocodile (West) Marico WMA and Mokolo and Matlabas catchments of the Limpopo WMA indicating *inter alia* EWR sites (DWA, 2012a)**

According to the River Health Programme (RHP) (2005), the drivers of change that adversely affect the ecological status of the Crocodile River (West) include:

- Extensive water use for agricultural purposes – abstraction for irrigation impacts on natural flow regime of the river;
- Dams and weirs act as barriers to flow and the migration of fauna; and
- Reduced water quality due to agricultural return flows.

Results from the RHP (2008) indicate that the Matlabas catchment has a fair Ecostatus and moderate Ecological Importance and Sensitivity (EIS), largely due to the fact that a substantial portion of the catchment falls in Marakele National Park, private nature reserves or game farms.

According to the RHP (2005), only hardy fish species are present in the lower Crocodile River, which can be ascribed to the loss of habitat and connectivity of the river. The Fish Assemblage Integrity was thus found to be poor. The Macro-invertebrate Integrity was also categorised as poor, with reduced water quality and diminished flows leading to dry sections and isolated pools. This reduction in suitable habitat has a severe impact on invertebrate diversity. Also the Instream Habitat Integrity was identified as poor due to extensive irrigation and multiple abstraction points along this reach of river which has a severe impact on river functioning. Due to the non-perennial nature of the Matlabas, the RHP (2008) found an absence of flow dependent and migratory fish species and low invertebrate biodiversity. **Table 26** contains a list of all the fish species historically recorded in the Crocodile West and Matlabas catchments.

Table 26: Fish species historically recorded in Crocodile West & Matlabas catchments (RHP, 2008)

Species	English Common Name	Crocodile (West)	Matlabas
Anguilla bengalensis labiata	African mottled eel	✓	
Anguilla mossambica	Longfin eel	✓	
Aplocheilichthys johnstoni	Johnston's topminnow	✓	
Barbus annectens	Broadstriped barb		✓
Barbus bifrenatus	Hyphen barb		✓
Barbus brevipinnis	Shortfin barb	✓	✓
Barbus marequensis	Largescale yellowfish		✓
Barbus mattozi	Papermouth	✓	
Barbus paludinosus	Straightfin barb	✓	✓
Barbus trimaculatus	Threespot barb	✓	✓
Barbus unitaeniatus	Longbeard barb	✓	✓
Barbus viviparus	Bowstripe barb	✓	✓
Chetia flaviventris	Canary Kurper	✓	
Chiloglanis paratus	Sawfin rock catlet	✓	
Chiloglanis pretoriae	Shortspine suckermouth	✓	
Clarias gariepinus	Sharptooth catfish	✓	✓
Labeo cylindricus	Redeye labeo	✓	✓
Labeo molybdinus	Leaden labeo	✓	✓
Labeo rosae	Rednose labeo	✓	✓
Labeo ruddi	Silver labeo		✓
Marcusenius macrolepidotus	Bulldog	✓	✓
Mesobola brevianalis	River sardine	✓	✓
Micralestes acutidens	Silver robber	✓	
Oreochromis mossambicus	Mozambique tilapia	✓	✓

Species	English Common Name	Crocodile (West)	Matlabas
Pseudocrenilabrus philander	Southern mouthbrooder	✓	✓
Schilbe intermedius	Silver catfish	✓	✓
Synodontis zambezensis	Brown squeaker		✓
Tilapia rendalli	Redbreast tilapia	✓	
Tilapia sparrmanii	Banded tilapia	✓	✓

Potential Impacts / Implications

- Most indigenous fish species in this country undertake annual migrations within river systems for a number of reasons, such as feeding, dispersal, refuge areas during unfavourable conditions and reproductive success. The abstraction weir on the Crocodile River (West), as well as the gauging weirs, will act as barriers that will prevent the up- and downstream movement of aquatic biota. The weirs may also lead to the fragmentation of the affected watercourses, where the interconnected relationship of the systems could be adversely influenced.
- During construction, the instream works (i.e. at the abstraction weir and at watercourse crossings) will increase the turbidity in the affected watercourses, which could lead to the clogging of gills of aquatic fauna from increased silt loads and the alteration of micro-habitats.
- The riparian habitat will also be damaged at the construction sites for the abstraction weir and low-lift pump station, gauging weir and at the watercourse crossings. It should be noted that the reaches of the Matlabas (tributaries and mainstem) and Crocodile (tributaries) Rivers that will be affected by pipeline crossings are non-perennial, which will minimise construction-related impacts to this system if the work is undertaken in the dry season.
- The pipeline will traverse the Matlabas River via a trenchless technique.
- The proposed abstraction weir will serve as a morphological modification and the backwater created by the structure will change the affected upstream river reach from a lotic to more of a lentic ecosystem. This will result in changes to the aquatic community structure and remove certain habitats from potential utilisation.
- Potential decrease in flow as a result of the abstraction of water at Vlieëpoort during low flow conditions.
- Potential impacts related to water level fluctuations in the Hartbeespoort Dam may include (amongst others):
  - Impairment of ecosystem functioning due to changes in physicochemical environment;
  - Loss of habitat within beach, littoral and shore zones;
  - Shift in species diversity and loss of biodiversity;
  - Proliferation of nuisance and invasive species;
  - Increased internal nutrient loading;
  - Fluctuations in water level may stimulate germination of water hyacinth seeds in the moist soil at the water's edge.

Specialist Study Triggered / Additional Investigations

- The Reserve will assist DWS to make informed decisions regarding the authorisation of future water use as well as the operation and management of the water resource. The Reserve requirements (EWR) will ultimately feed into the licensing process of DWS and the operation of the system.
- Aquatic Ecological Study to be conducted during the EIA phase. Amongst others, the EWR, National Freshwater Ecosystem Priority Areas (NFEPA) maps, as well as the DWS River Health Programme results, will be further scrutinised by the relevant specialists. In addition, the need for a fish ladder at the weir will be investigated further.
- Suitable mitigation measures will be included in the EMPr, which will form part of the EIA Report, to ensure the safeguarding of the aquatic biota.

11.8.6 Water Quality

Status Quo

DWS conducts an ongoing water quality monitoring programme on the Crocodile River. There are long term monitoring sites for the preliminary resource units and EWR sites identified during the Reserve determination. Some of the relevant monitoring sites are listed in **Table 27**. All the DWS long term monitoring sites include the monitoring of electrical conductivity (EC), pH, the major ions (Mg+, Na+, Ca+, K+, SO4- and Cl-), total alkalinity and nutrients (PO4-P, NH3, NO2, NO3) (DWA, 2012a).

Table 27: DWS water quality sites related to the Crocodile (West) EWR sites (DWA, 2012a)

WATER QUALITY SITE	QUARTENARY CATCHMENT	OTHER INFORMATION
A2H012 – Crocodile River at Kalkheuwel	A21H	Downstream of the confluences of the Jukskei, Hennops and Rietspruit Rivers with the Crocodile River, and upstream of Hartebeespoort Dam.
A2H023 – Jukskei River at Nietgedacht	A21C	Situated at the confluence of the Jukskei River with the Upper Crocodile River, and upstream of Hartebeespoort Dam.
A2H083 – Hartebeespoort Dam: downstream weir	A21J	Crocodile River immediately downstream of Hartebeespoort Dam
A2H006 – Pienaars River at Klipdrift	A23B	Weir is downstream of EWR site
A2H021 – Pienaars River at Buffelspoort	A23L	Weir is 21 km downstream of EWR site
A2H094 – Bospoort Dam: downstream weir	A22J	Weir is situated at Tweedepoort, 4 km downstream of EWR site
A2H060 - Crocodile River at Nooitgedacht	A24C	WQ site is 23 km upstream of the EWR
A2H116 – Paul Hugo Dam: downstream weir	A24F/H/J	Weir is situated at Haakdoorndrift

According to DWA (2012a), the Crocodile River is highly impacted in terms of water quality which is attributed to the following:

- The Lower Crocodile River water quality is deteriorating because of increased salts and nutrients. There are also increased levels of toxicants in the middle reaches of the river.

- Urbanisations, industrial diffuse sources and high agricultural return flows are the major impacting activities.
- Treated wastewater return flows from the Upper Vaal WMA play an important role downstream where the water is used in the Crocodile West catchment area.

Noteworthy point sources of pollution in the Crocodile River, and the watercourses into which they discharge their effluent, include the following:

- Northern Waste Water Treatment Works (WWTW) - Jukskei River;
- Driefontein WWTW - Muldersdrif-se-loop River;
- Sunderland Ridge WWTW - Hennops River;
- Baviaanspoort and Zeekoegat WWTW - Pienaars River;
- Daspoort, Rooiwal, Temba and Babelegie WWTW - Apies River;
- Sandspruit and Klipgat WWTW - Sand Spruit;
- Rietgat WWTW - Soutpan Spruit; and
- Brits WWTW - Crocodile River.

Organic pollution from point and diffuse pollution sources is a significant contributor to the poor water quality in the Crocodile River, which is evident in the highly eutrophic Hartbeespoort Dam.

According to DWAF (2004a), there are no reported water quality problems in the Matlabas Area, either surface or groundwater. Due to the low levels of development in this area, no water quality problems are anticipated.

Potential Impacts / Implications

- During the construction phase, potential contamination of surface water could occur through sedimentation from instream works, silt-laden runoff from disturbed areas, and improper practices (e.g. poor management of waste water and disposal of solid waste).
- During the maintenance of the pipeline and reservoirs the raw water conveyed and stored within this system, which is water of poor quality from the Crocodile River, will be released into the Matlabas River and other watercourses from scour valves. This matter will be investigated further during the EIA stage.
- Refer to discussion in **Section 9.3.4** and **Section 11.8.3** regarding the proposed return of sediment back to the Crocodile River (West) from the desilting works.
- Water level fluctuations in the Hartbeespoort Dam could cause water quality impacts and changes to stratification patterns.

Specialist Study Triggered / Additional Investigations

- Management of sediment to be stored and returned to the Crocodile River (West) during operational phase.
- Manage water quality impacts that may result from the scouring of the pipeline during maintenance.

- Manage water quality impacts during the construction phase by environmental best practises that will be contained in the EMPr.

11.8.7 Habitat

Status Quo

The riparian vegetation at the Vlieëpoort abstraction weir, as well as the three new gauging weir sites, is dominated by Dwaalboom Thornveld. At the Vlieëpoort site the riparian vegetation has retained much of its ecological integrity (see **Figure 82**) and the instream habitat is dominated by slow-flowing medium to deep channel. Prominent sand banks and marginal reedbeds are present. The Matlabas River is dominated by sandy bed, sand banks and reedbeds (see **Figure 83**). The riparian vegetation mostly consists of Mixed Bushveld / Subtropical Alluvial Vegetation.

Figure 82: Riparian vegetation at abstraction point on Crocodile River

Figure 83: Matlabas River

Potential Impacts / Implications

- Inundation of instream habitat as a result of the abstraction weir's backwater effect.
- Damage to habitat due to instream works and pipeline crossings.
- Disturbances of riparian vegetation may lead to erosion encroachment of exotic vegetation.

Specialist Study Triggered / Additional Investigations

- Aquatic Ecological Study to be conducted, which will include an appraisal of the riparian habitat at the various areas affected by the project infrastructure and activities. The riparian habitat of the various watercourses will be delineated as part of the aforementioned study.
- Mitigation measures will be established during the EIA phase to manage the potential impacts to riparian vegetation and to address the overall reinstatement and rehabilitation of these areas.

11.8.8 Pans and Wetlands

Status Quo

In terms of the National Water Act (No. 36 of 21998), a wetland means "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil*".

The wetland systems typically found in the Waterberg (Matlabas and Mokolo Catchments) include hillslope seeps, sheetrock wetlands and channeled and unchanneled valley-bottom systems (DWA, 2012b). The main ecosystem services supplied by these systems include flood attenuation, water quality enhancement, streamflow augmentation and biodiversity maintenance.

According to a preliminary review of the National Wetlands Map II of the South African National Biodiversity Institute (SANBI), which was extracted from the National Land Cover 2000 dataset, no wetlands are directly affected by the project infrastructure. In addition, no NFEPA wetlands are directly affected. However, following preliminary site investigations during the Scoping phase and feedback from IAPs, pans are encountered along the Central Route and Alternatives D1, D2 and D3 (see **Figure 84**). Pans are endorheic wetlands (have no point of outflow and therefore gain water from rainfall and/or seepage and lose water mainly by evaporation), with a closed-drainage system. They are typical of poorly drained, relatively flat and dry regions, and the loss of water through evaporation sometimes results in saline conditions. The water depth within these pans is usually shallow (<3 m) and the pans vary in diameter (Barnes, 1998). Pans are recognized as being important for biodiversity support.

Figure 85 shows the occurrence of wetlands adjacent to the Crocodile River (West) on the Farms Hampton 320 KQ, Stratford 462 KQ and Bridgewater 307 KQ, downstream of the abstraction point.

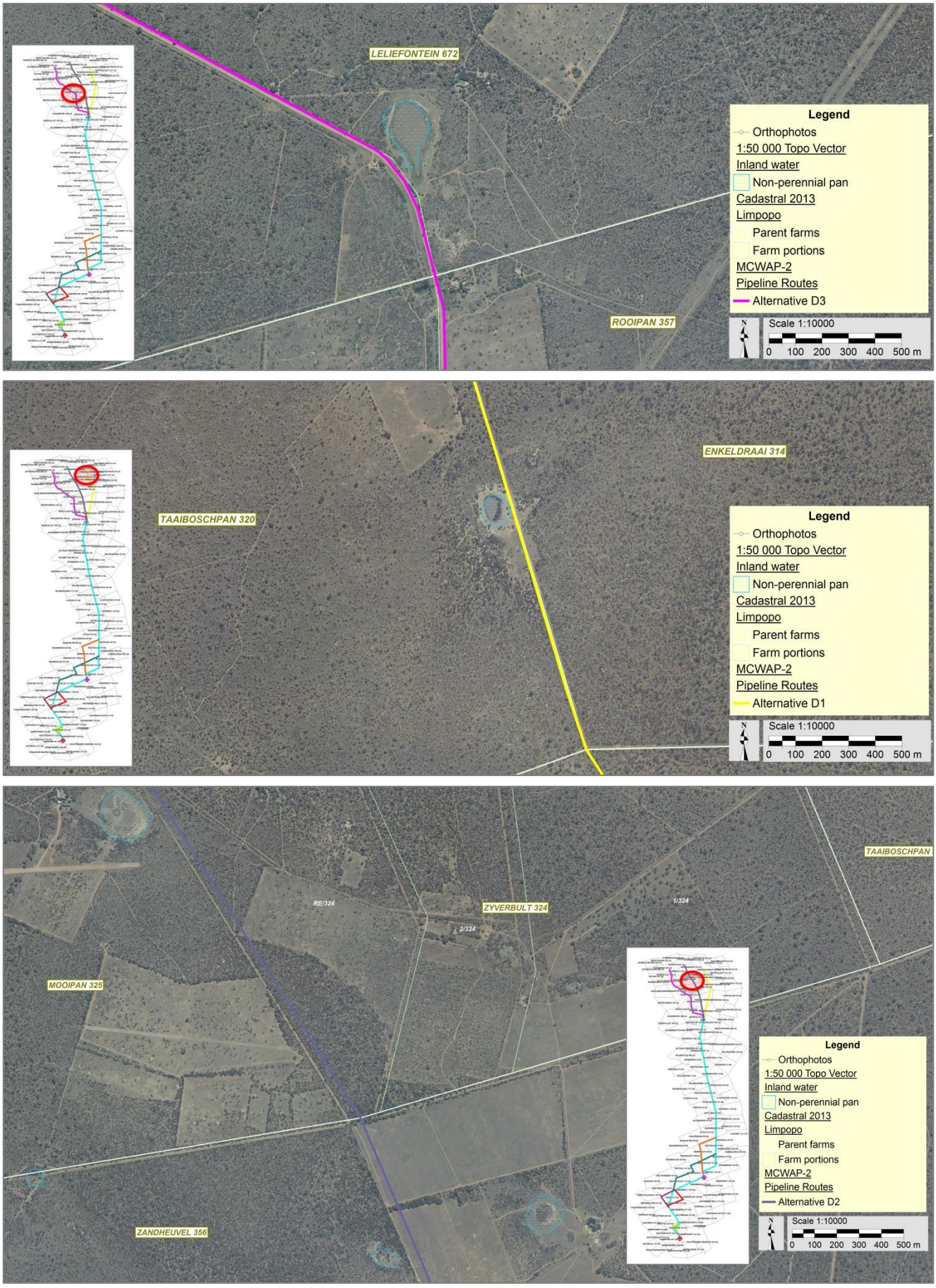


Figure 84: Pans along Alternatives D1, D2 and D3 (not all pans shown)

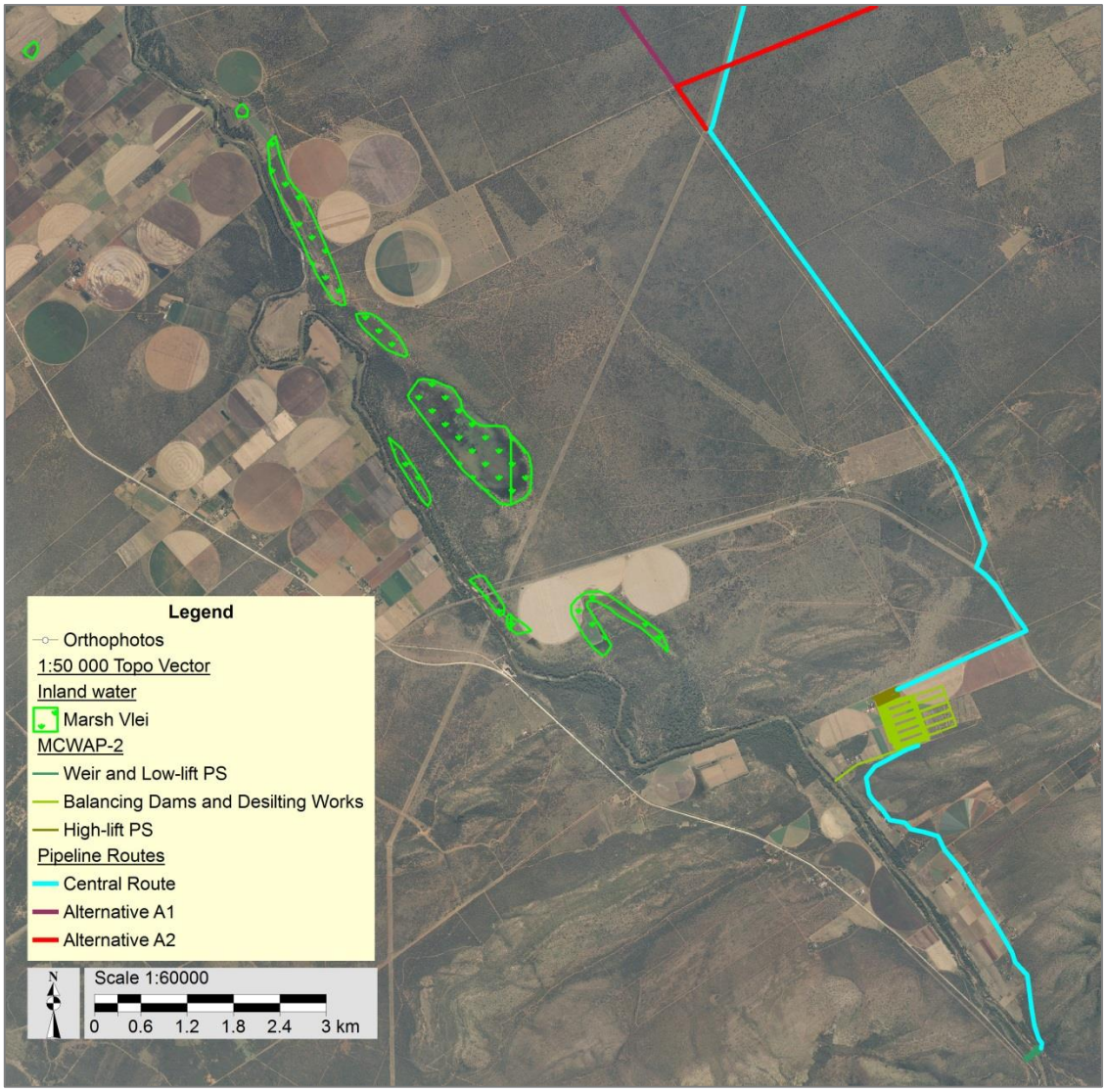


Figure 85: Wetlands adjacent to the Crocodile River (West)

Potential Impacts / Implications

- The Central Route and Alternatives D1, D2 and D3 traverse pans.
- Other wetlands (including pans) may be directly or indirectly affected by the project, including wetlands downstream of the abstraction point.

Specialist Study Triggered / Additional Investigations

- The status of wetlands (including pans) in the project area and the potential impact of the project and concomitant management measures will be considered during a specialist Aquatic Ecological Study (including delineation), earmarked for the EIA phase. Ground-truthing of NFEPA information will be undertaken.
- The avoidance of sensitive pans to be investigated further in EIA phase

11.9 Flora

Status Quo

11.9.1 Regional Vegetation

Mucina and Rutherford (2016) described the study area as falling within the Savanna Biome (**Figure 86**). The Savanna Biome is the largest Biome in southern Africa, occupying 46% of its area, and over one-third the area of South Africa. It is well developed over the lowveld and Kalahari region of South Africa and is also the dominant vegetation in Botswana, Namibia and Zimbabwe. It is characterized by a grassy ground layer and distinct upper layer of woody plants (Low and Rebelo, 1996).

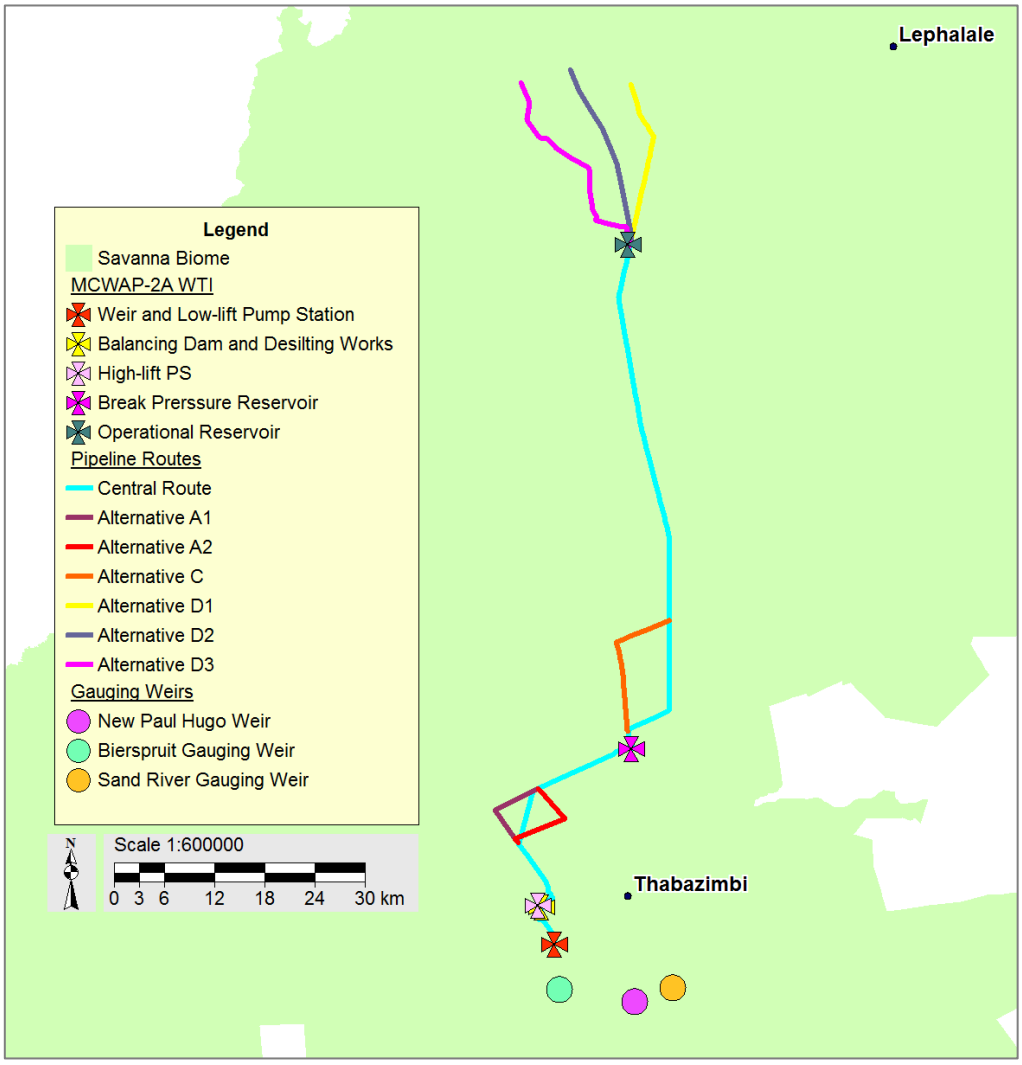


Figure 86: Savanna Biome

The study area traverses five (5) vegetation types-namely Limpopo Sweet Bushveld, Western Sandy Bushveld, Dwaalboom Thornveld, Waterberg Mountain Bushveld and Subtropical Alluvial Vegetation (**Figure 87**). A description of the vegetation types follows.

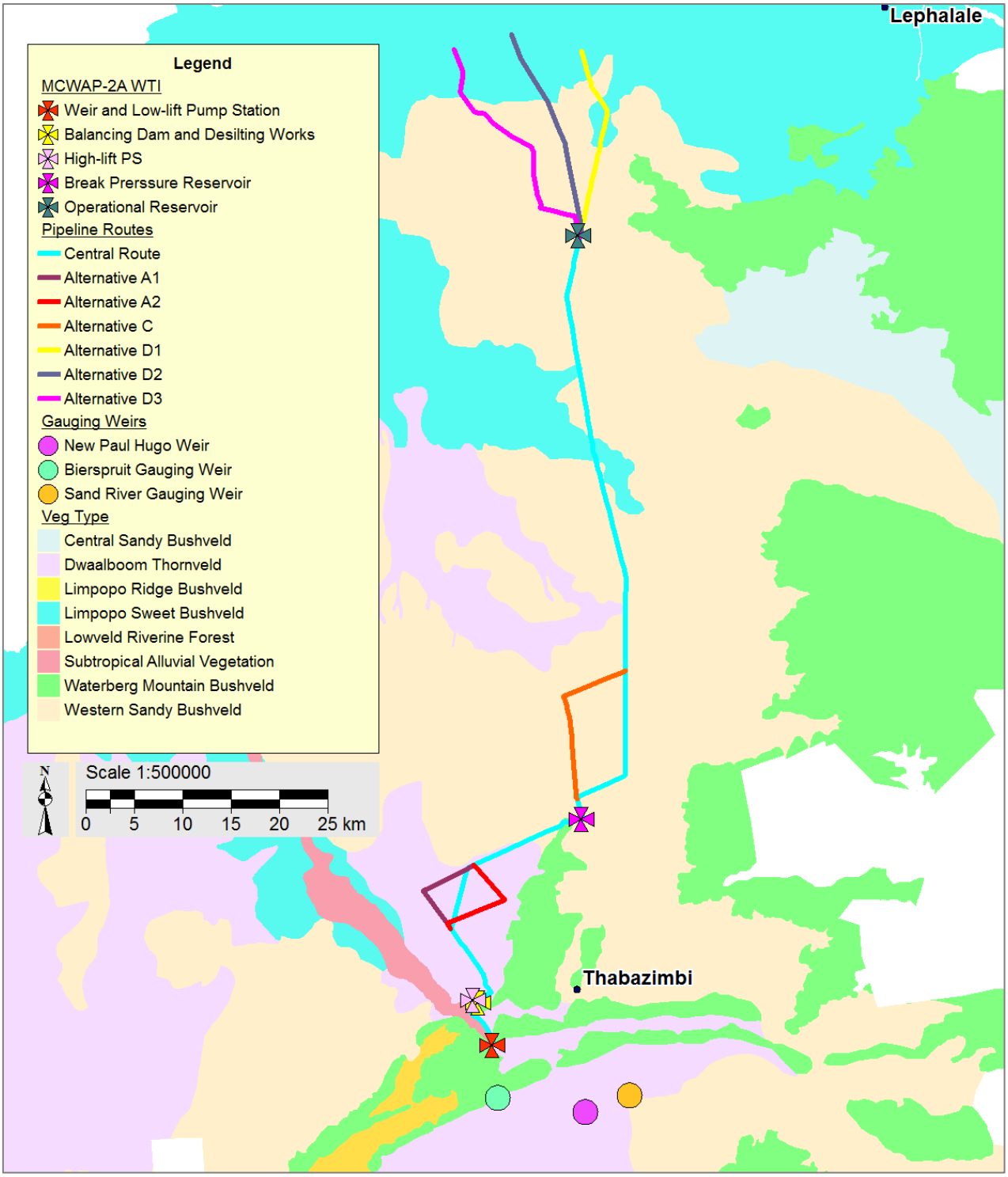


Figure 87: Vegetation types

Limpopo Sweet Bushveld

The Limpopo Sweet Bushveld is found in Limpopo Province. It extends from the lower reaches of the Crocodile and Marico Rivers around Makoppa and Derdepoort, respectively, down the Limpopo River Valley including Lephalale and into the tropics past Tom Burke to the Usutu border post and Taaiboschgroet area in the north. The unit also occurs on the Botswana side of the border (Mucina and Rutherford, 2006).

This vegetation type is listed as **Least threatened** with a national conservation target of 19%. Less than 1% is statutorily conserved and limited to reserves straddling the southeastern limits of the unit, for example the D'Nyala Nature Reserve. Very little of this vegetation type is conserved in other reserves. About 5% is transformed, mainly by cultivation (Mucina and Rutherford, 2006).

Figure 88: Typical vegetation associated with Limpopo Sweet Bushveld

Western Sandy Bushveld

Western Sandy Bushveld vegetation type is found in Limpopo and North-West Provinces. It occurs on flats and undulating plains from Assen northwards past Thabazimbi and remaining west of the Waterberg Mountains towards Steenbokpan in the north. Some patches occur between the Crocodile and Marico Rivers to the west (Mucina and Rutherford, 2006).

This vegetation type is listed as **Least threatened** with a national conservation target of 19%. About 6% is statutorily conserved, just over half of which in the Marakele National Park. About 4% is transformed, mainly by cultivation (Mucina and Rutherford, 2006).

Figure 89: Typical vegetation associated with Western Sandy Bushveld

Dwaalboom Thornveld

Dwaalboom Thornveld vegetation type is found in Limpopo and North-West Provinces. It flats north of the Dwarsberge and associated ridges mainly west of the Crocodile River in the Dwaalboom area but including a patch around Sentrum. South of the ridges, it extends eastwards from the Nietverdiend area, north of the Pilanesberg to the Northam area (Mucina and Rutherford, 2006).

This vegetation type is listed as **Least threatened** with a national conservation target of 19%. Some 6% is statutorily conserved, mostly within the Madikwe Game Reserve in the west. About 14% is transformed mainly by cultivation. Main use is extensive cattle grazing (Mucina and Rutherford, 2006).

Figure 90: Typical vegetation associated with Dwaalboom Thornveld

Waterberg Mountain Bushveld

Waterberg Mountain Bushveld vegetation type is found in Limpopo Province. It occurs in Waterberg Mountains, including the foothills, escarpment and tablelands south of the line between Lephalale and Marken and north of Bela-Bela and west of Mokopane and with outliers in the southwest such as the Boshofsberge and Vlieëpoortberge near Thabazimbi (Mucina and Rutherford, 2006).

This vegetation type is listed as Least threatened with a national conservation target of 24%. About 9% is statutorily conserved mainly in the Marakele National Park and Moepel Nature Reserve. More than 3% is transformed, mainly by cultivation (Mucina and Rutherford, 2006).

Figure 91: Typical vegetation associated with Waterberg Mountain Bushveld on ridge

Subtropical Alluvial Vegetation

Subtropical Alluvial vegetation unit is found in Limpopo, Mpumalanga and KwaZulu-Natal Provinces and in Swaziland. It occurs in broad river alluvia and around some river-fed pans in the subtropical regions of eastern South Africa, in particular in the Lowveld, Central Bushveld and in northern KwaZulu-Natal. The most important alluvia include the Limpopo, Luvubu, Olifants, Sabie, Crocodile, Phongolo, Usutu and Mkuze Rivers. This unit is fully embedded within the Savanna Biome (Mucina and Rutherford, 2006).

The conservation status of is **Least threatened** with a national conservation target of target of 31%. Much of the area has been transformed for cultivation, urban development and road building. Alien woody species commonly occurring in this vegetation type include *Melia azedarach, Chromolaena discolor etc* (Mucina and Rutherford, 2006).

Figure 92: Typical vegetation associated with Subtropical Alluvial Vegetation (along river)

11.9.2 Terrestrial Threatened Ecosystems

According to the data sourced from SANBI, no terrestrial threatened ecosystems were recorded in the project area, with the closest to the site being the Springbokvlakte Thornveld (**Figure 93**).

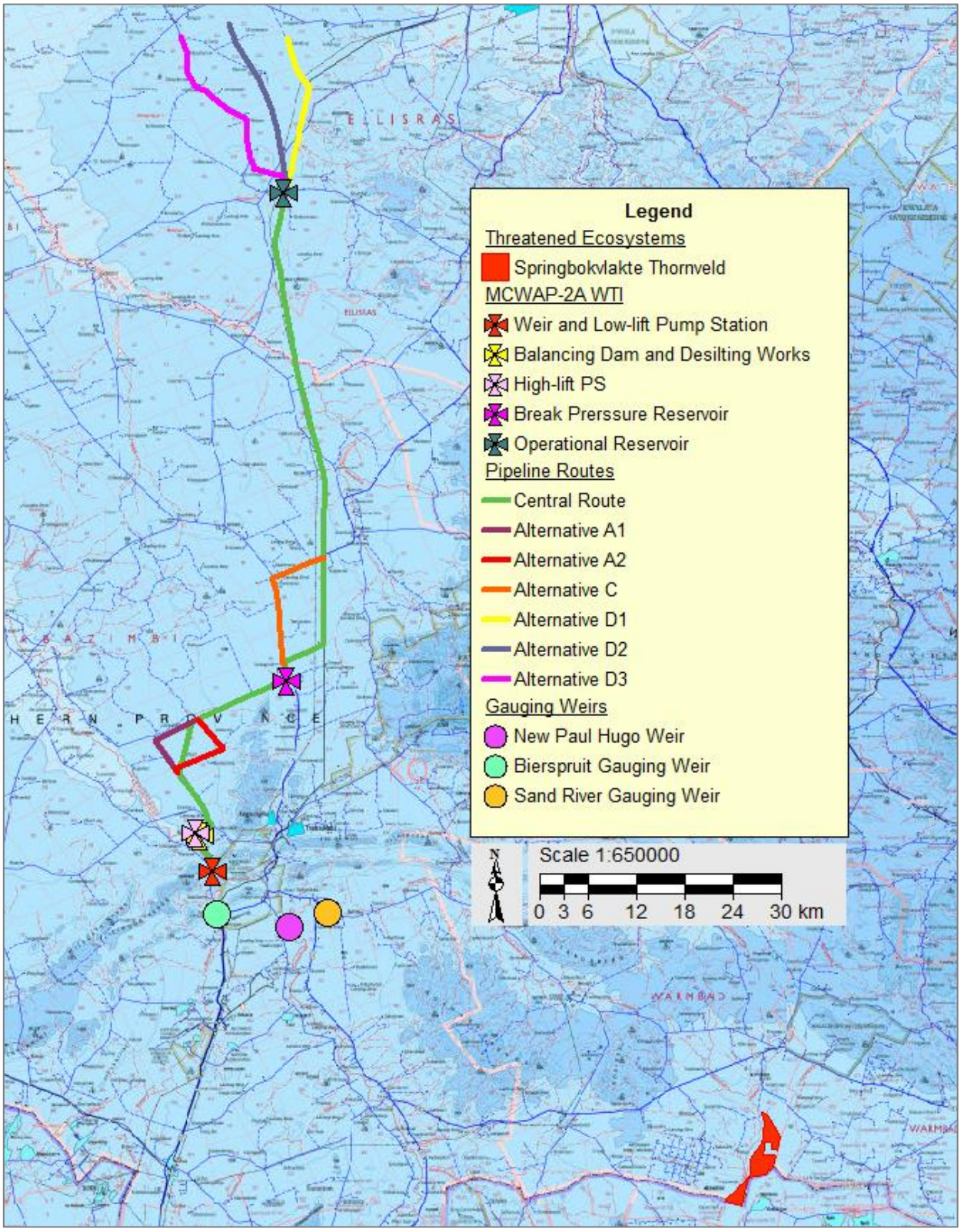


Figure 93: Terrestrial Threatened Ecosystems

11.9.3 Limpopo Conservation Plan

Critical Biodiversity Areas (CBAs) within the bioregion are the portfolio of sites that are required to meet the region's biodiversity targets, and need to be maintained in the appropriate condition for their category (Desmet *et al*, 2013). An objective of the CBA map is to identify a network of areas, which if managed according to the land use guidelines would meet the pattern targets for all important biodiversity features, while at the same time ensuring the areas necessary for supporting necessary ecological processes remain functional.

The systematic conservation planning process resulted in 40% of the Limpopo Province being identified as CBAs (CBA1 22% and CBA2 18%). Ecological Support Areas (ESAs) cover a further 22% of the province, of which 16% are intact natural areas (ESA 1) and 7% are degraded or areas with no natural remaining which are nevertheless required as they potentially retain some value for supporting ecological processes (ESA 2) (Desmet *et al*, 2013).

A map indicating the Limpopo C Plan categories in relation to the project footprint is shown in **Figure 94**. The general description of CBA map categories and associated land management objectives are listed in **Table 28**.

The project footprint in relation to the Limpopo Conservation Plan is as follows:

- CBA 1 - Vlieëpoort abstraction weir, Bierspruit gauging weir, low-lift pump station, OR, sections of low-lift rising main and Central Route, as well as sections of Alternatives A1, B, D2 and D3;
- CBA 2 - balancing dam, desilting works, BPR (Central Route), new Paul Hugo gauging weir, sections of low-lift rising main and Central Route, as well as sections of Alternatives A1, A2, C, D1, D2 and D3;
- ESA 1 - sections of the Central Route and sections of Alternatives B, C and D2, as well as the Sand River gauging weir;
- ESA 2 - balancing dam, sections of low-lift rising main and Central Route, as well as sections of Alternatives C and D3;
- Other Natural Area - sections of all the pipeline route options;
- No Natural Remaining - balancing dam, high-lift pump station, sections of Central Route as well as sections of Alternatives A1, A2, D2 and D3.

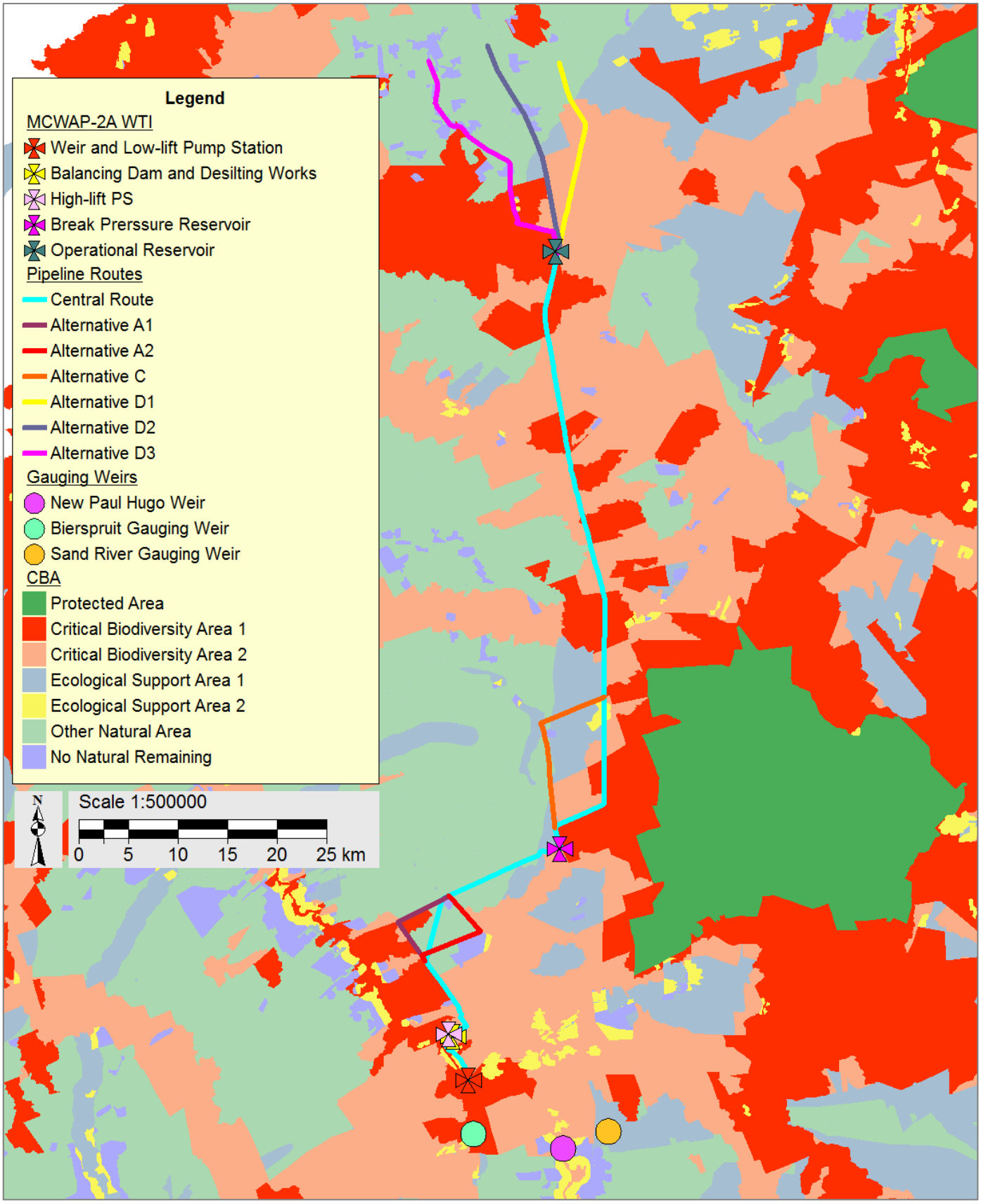


Figure 94: **Limpopo Conservation Plan (CBAs and ESAs)**

Table 28: General description of CBA Map categories and associated land management objectives

CBA Map Category	Description	Land Management Objective	Land Management Recommendations	Compatible Land-Use	Incompatible Land-Use
Protected Areas	Formal Protected Areas and Protected Areas pending declaration under NEMPAA.	Maintain in a natural state with limited or no biodiversity loss. Rehabilitate degraded areas to a natural or near natural state, and manage for no further degradation. Development subject to Protected Area objectives and zoning in a NEMPAA compliant and approved management plan.	Maintain or obtain formal conservation protection.	Conservation and associated activities (e.g. ecotourism operations), and required support infrastructure.	All other land-uses.
Critical Biodiversity Areas (1)	Irreplaceable Sites. Areas required to meet biodiversity pattern and/or ecological processes targets. No alternative sites are available to meet targets.	Maintain in a natural state with limited or no biodiversity loss. Rehabilitate degraded areas to a natural or near natural state, and manage for no further degradation.	Obtain formal conservation protection where possible. Implement appropriate zoning to avoid net loss of intact habitat or intensification of land use.	Conservation and associated activities. Extensive game farming and eco--- tourism operations with strict control on environmental impacts and carrying capacities, where the overall there is a net biodiversity gain. Extensive Livestock Production with strict control on environmental impacts and carrying capacities. Required support infrastructure for the above activities. Urban Open Space Systems	Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, power lines, pipelines). Intensive Animal Production (all types including dairy farming associated with confinement, imported foodstuffs, and improved/irrigated pastures). Arable Agriculture (forestry, dry land & irrigated cropping). Small holdings
Critical Biodiversity Area (2)	Best Design Selected Sites. Areas selected to meet biodiversity pattern and/or ecological process targets. Alternative sites may be available to meet targets.	Maintain in a natural state with limited or no biodiversity loss. Maintain current agricultural activities. Ensure that land use is not intensified and that activities are managed to minimize impact on threatened species.	Avoid conversion of agricultural land to more intensive land uses, which may have a negative impact on threatened species or ecological processes.	Current agricultural practices including arable agriculture, intensive and extensive animal production, as well as game and ecotourism operations, so long as these are managed in a way to ensure populations of threatened species are maintained and the ecological processes which support them are not impacted. Any activities compatible with CBA1.	Urban land-uses including Residential (including golf estates, rural residential, resorts), Business, Mining & Industrial; Infrastructure (roads, power lines, pipelines). More intensive agricultural production than currently undertaken on site. Note: Certain elements of these activities could be allowed subject to detailed impact assessment to ensure that developments were designed to CBA2. Alternative areas may need to be identified to ensure the CBA network still meets the required

CBA Map Category	Description	Land Management Objective	Land Management Recommendations	Compatible Land-Use	Incompatible Land-Use
					targets.
Ecological Support Areas (1)	Natural, near natural and degraded areas supporting CBAs by maintaining ecological processes.	Maintain ecosystem functionality and connectivity allowing for limited loss of biodiversity pattern.	Implement appropriate zoning and land management guidelines to avoid impacting ecological processes. Avoid intensification of land use. Avoid fragmentation of natural landscape.	Conservation and associated activities. Extensive game farming and eco-tourism operations. Extensive Livestock Production. Urban Open Space Systems. Low density rural residential, smallholdings or resorts where development design and overall development densities allow maintenance of ecological functioning.	Urban land-uses including Residential (including golf estates), Business, Mining & Industrial; Infrastructure (roads, power lines, pipelines). Intensive Animal Production (all types including dairy farming associated with confinement, imported foodstuffs, and improved/irrigated pastures). Arable Agriculture (forestry, dry land & irrigated cropping). Note: Certain elements of these activities could be allowed subject to detailed impact assessment to ensure that developments were designed to maintain overall ecological functioning of ESAs.
Ecological Support Areas (2)	Areas with no natural habitat that is important for supporting ecological processes.	Avoid additional/ new impacts on ecological processes.	Maintain current land-use. Avoid intensification of land use, which may result in additional impact on ecological processes.	Existing activities (e.g. arable agriculture) should be maintained, but where possible a transition to less intensive land uses or ecological restoration should be favoured.	Any land use or activity that results in additional impacts on ecological functioning mostly associated with the intensification of land use in these areas (e.g. Change of floodplain from arable agriculture to an urban land use or from recreational fields and parks to urban).
Other Natural Areas	Natural and intact but not required to meet targets, or identified as CBA or ESA	No management objectives, land management recommendations or land-use guidelines are prescribed. These areas are nevertheless subject to all applicable town and regional planning guidelines and policy. Where possible existing Not Natural areas should be favoured for development before "Other natural areas" as before "Other natural areas" may later be required either due to the identification of previously unknown important biodiversity features on these sites, or alternatively where the loss of CBA has resulted in the need to identify alternative sites.			
No natural habitat remaining	Areas with no significant direct biodiversity value. Not Natural or degraded natural areas that are not required as ESA, including intensive agriculture, urban, industry; and human infrastructure.				

11.9.4 Protected Areas

The nearest protected areas, with a formal status in terms of the National Environmental Management Protected Areas Act (Act No. 57 of 2003), to the project footprint include the following (see **Figure 95**):

- Marakele National Park – located approximately 3.5 km to the east of the Central Route;
- Atherstone Nature Reserve – located approximately 40 km to the west of Alternative A1;
- Hans Strijdom Nature Reserve – located approximately 30 km to the east of the Central Route; and
- D'nyala Nature Reserve – located approximately 31 km to the east of Alternative D1.

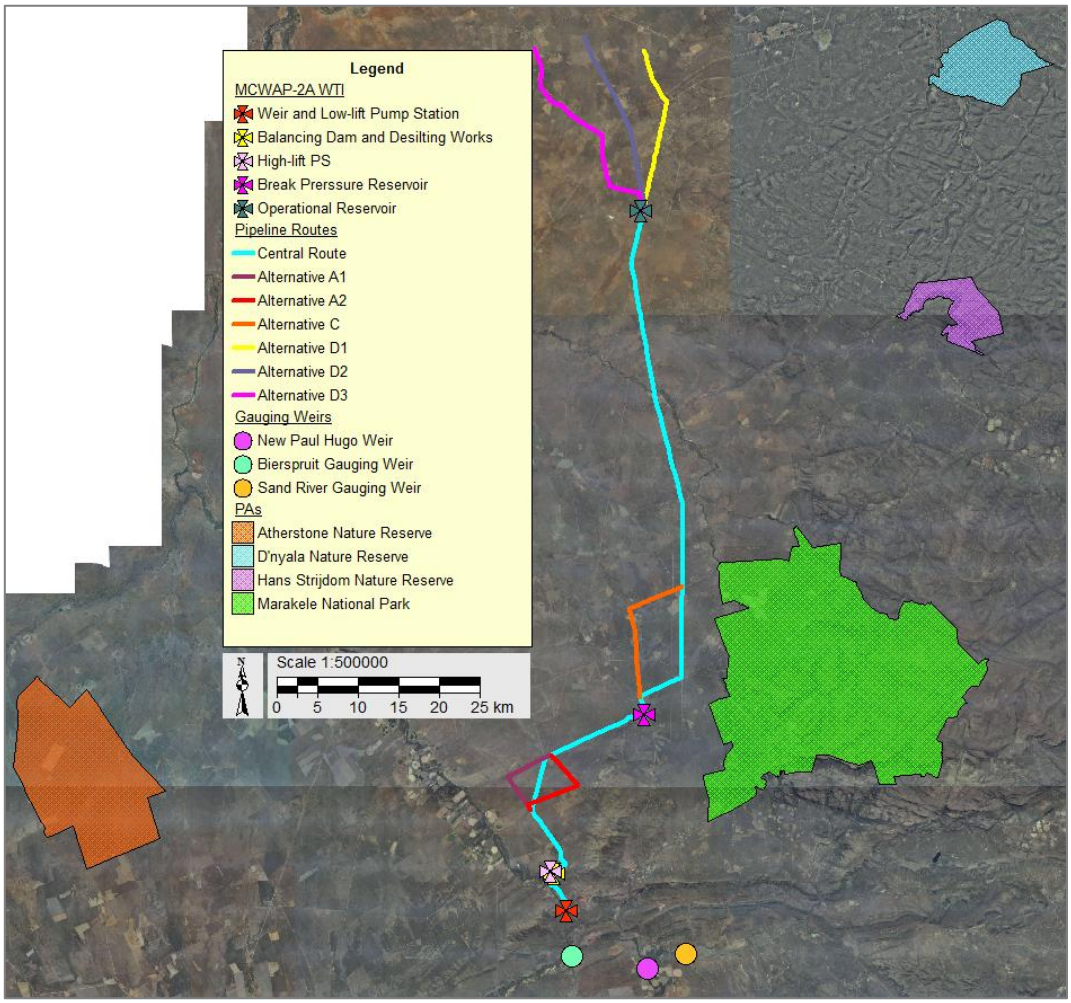


Figure 95: Protected areas

The Waterberg Biosphere, which is located to the east of the project area (see **Figure 96**), represents a considerable area of savanna biome and contains a high level of biological diversity. It stretches from Marakele National Park in the south-west to Wonderkop Nature Reserve in the north-east with Vaalwater as the gateway town. According to UNESCO (2009), Biosphere reserves are areas of terrestrial and coastal marine ecosystems which are internationally recognized under UNESCO's Man and the Biosphere (MAB) Programme. Biosphere Reserves are protected areas and they promote and demonstrate a balanced relationship between people

and nature. Sections of the Central Route as well as Alternatives B and C encroach into the transition zone of the biosphere, which is a flexible area of co-operation, which may contain a variety of agricultural activities, settlements and other uses and in which local communities, management agencies, scientists, non-governmental organizations, cultural groups, economic interests and other stakeholders work together to manage and sustainably develop the area's resources (Waterberg DM, 2013).

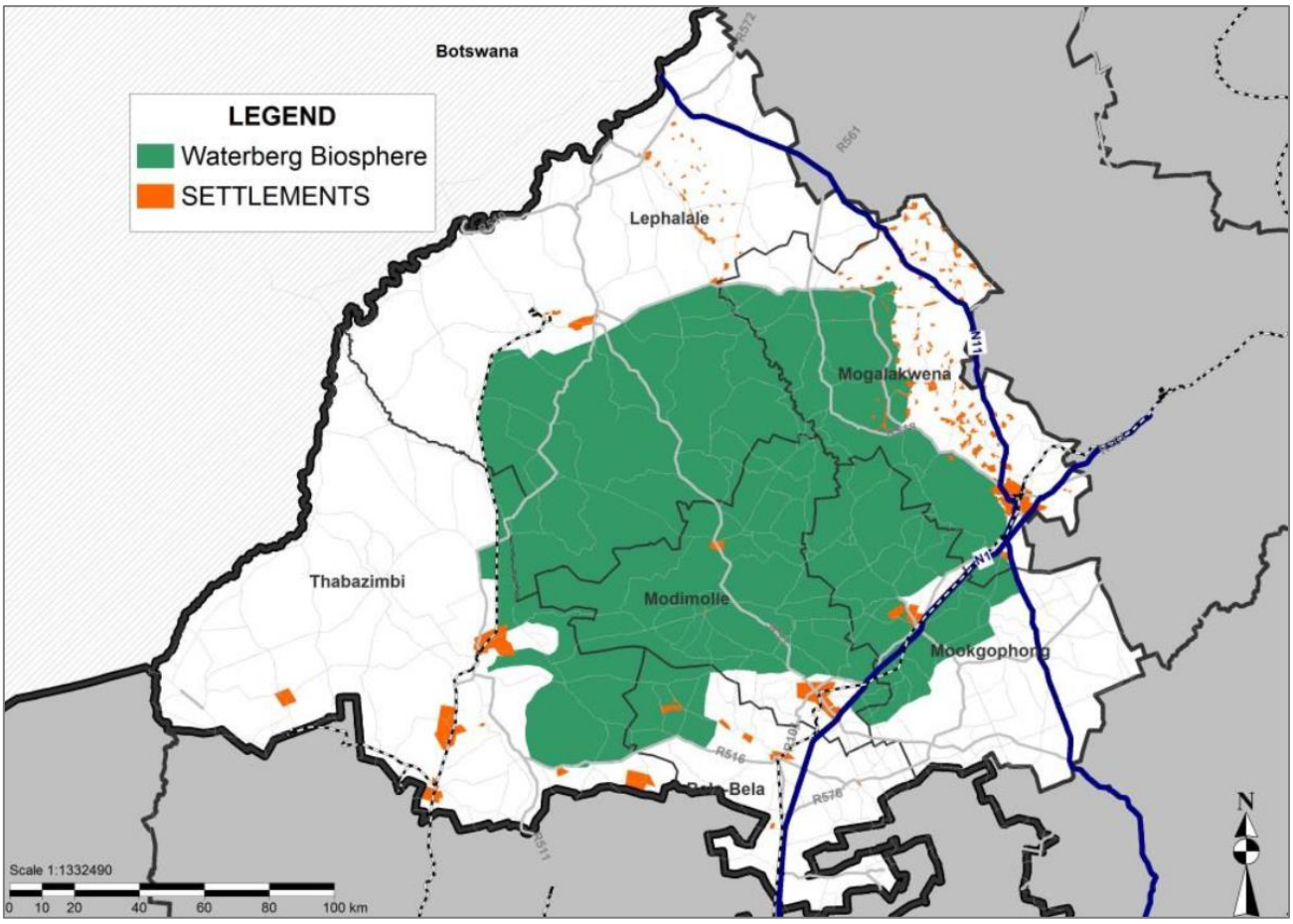


Figure 96: Waterberg Biosphere (Waterberg DM, 213)

The Ben Alberts Nature Reserve lies immediately southeast of the Vlieëpoort weir site. The reserve belongs to Kumba Iron Ore, Thabazimbi mine (currently undergoing closure).

11.9.5 Flora Species

The study area is located within 2327CB, 2327CD, 2427AB, 2427AD and 2427CB quarter degree squares in terms of the 1:50 000 grid of South Africa. SANBI uses this grid system as a point of reference to determine any Red Data plant species or any species of conservation importance occurring in South Africa. **Table 29** provides details on the Red Data plant species which have been recorded in grid cells 2427AD and 2427CB (No Red Data plant species were recorded in grid cells 2327CB and 2327CD). The definitions of the conservation status are provided in **Table 30**.

Table 29: Threatened plant species recorded in grid cells 2427AD and 2427CB

Family	Species	Threat status	Growth forms
Scrophulariaceae	*Freylinia tropica* S.Moore	Rare	Shrub
Scrophulariaceae	*Jamesbrittenia bergae* P.Lemmer	VU	Dwarf shrub
Zamiaceae	*Encephalartos eugene-maraisii* I.Verd.	EN	Shrub, tree

Note: EN=Endangered, VU=Vulnerable

Table 30: Definitions of Red Data status (Raimondo *et. al.* 1999)

Symbol	Status	Description
EN	Endangered	A taxon is Endangered when the best available evidence indicates that it meets any of the five International Union for Conservation of Nature (IUCN) criteria for Endangered, and is therefore facing an extremely high risk of extinction in the wild.
VU	Vulnerable	A taxon is Vulnerable when the best available evidence indicates that it meets any of the five IUCN criteria for Vulnerable and it is therefore considered to be facing a high risk of extinction in the wild.
	Rare	A taxon is rare when it does not meet any of the four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to the five IUCN criteria.

Potential Impacts / Implications

- The project footprint encroaches into CBAs and ESAs, which are important in terms of biodiversity, ecosystem functionality and ecological processes.
- Vegetation will primarily be lost in areas that are to be cleared for the project infrastructure. The potential loss of significant flora species may occur, which needs to be investigated further.
- Clearing of vegetation for construction purposes may result in the proliferation of exotic vegetation, which could spread beyond the construction domain. This potential impact will need to be managed.
- The establishment of trees within the pipeline servitude will not be allowed as roots may compromise the stability of the pipeline.

Specialist Study Triggered / Additional Investigations

- Terrestrial Ecological Assessment to be undertaken. Areas to be affected by project activities and infrastructure will be surveyed to identify sensitive and significant floral species.
- Amongst others, the following information sources will be scrutinised further by the relevant specialists:
  - Limpopo Conservation Plan;
  - SANBI's spatial information, including CBAs; and
  - Waterberg Bioregional Plan.
- Mitigation measures will be established during the EIA phase to manage the potential impacts to vegetation, removal of protected trees and medicinal plants, encroachment by exotic

species and to address the overall reinstatement and rehabilitation of the area affected within the construction domain.

- Permit(s) will be obtained under the National Forests Act (No. 84 of 1998) if protected trees are to be cut, disturbed, damaged, destroyed or removed. The final pipeline route will attempt to avoid protected trees, where possible.

11.10 Fauna

Status Quo

11.10.1 Mammals

The greater area was historically commonly used for cattle grazing. Game farms are now more common, with an associated high faunal biodiversity. Various mammal species (e.g. buffalo) have been introduced through this practice. Numerous farms also keep exotic game species. Proper conservation measures on game farms also afford protection to other species that naturally occur in the area, which include leopard, warthog, baboon and aardvark.

Known mammal distributions correlate well with biomes as defined by Acocks (1953), Low and Rebelo (1998), Knobel and Bredenkamp (2005) as well as Mucina and Rutherford (2006). However, the local occurrences of mammals are more closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (treeliving), rupiculous (rock-dwelling) and wetland-associated vegetation cover. The riverine areas and ridges in the area are regarded as significant in terms of the habitat that they provide to fauna. Riparian zones also serve as important corridors to allow for animal migration.

The Red Data mammal species that could potentially naturally occur in the project area are those which have been recorded in the grid cells 2327CB, 2327CD, 2427AB, 2427AD and 2427CB (Animal Demography Unit, 2018a) and are listed in **Table 31**.

Table 31: Red data Mammal species recorded in the grid cells 2327CB, 2327CD, 2427AB, 2427AD and 2427CB (Animal Demography Unit, 2018a)

Family	Genus	Species	Subspecies	Common name	Red list category	Atlas region endemic
Bovidae	*Hippotragus*	*equinus*		Roan Antelope	Vulnerable	Yes
Bovidae	*Hippotragus*	*niger*	*niger*	Sable Antelope	Vulnerable	
Felidae	*Acinonyx*	*jubatus*		Cheetah	Vulnerable	Yes
Felidae	*Leptailurus*	*serval*		Serval	Near Threatened	Yes
Hyaenidae	*Hyaena*	*brunnea*		Brown Hyena	Near Threatened	Yes
Felidae	*Acinonyx*	*jubatus*		Cheetah	Vulnerable	Yes
Manidae	*Smutsia*	*temminckii*		Ground Pangolin	Vulnerable	Yes
Mustelidae	*Mellivora*	*capensis*		Honey Badger	Near Threatened	Yes
Vespertilionidae	*Myotis*	*tricolor*		Temminck's Myotis	Near Threatened	Yes

Previous studies found a bat cave that is situated in the Mooivallei area. The bats recorded from the cave are reported to be *Rhinolophus darlingi* and *Miniopterus schreibersii*, and are both ranked as 'Least Concern'.

11.10.2 Avifauna

The banks of the Crocodile River where the weir will be constructed are steep with reeds that grow in most areas followed by riparian vegetation that varies in density from place to place. The Matlabas River is a smaller river system with more or less the same vegetation that grows on its banks. These rivers are sensitive for bird species that depend on them for food, water and breeding purposes. Bird species such as herons, crakes, moorhens, bishops, weavers, cisticolas and warblers will breed in the reeds growing on the banks of the river systems and will also feed on insects that live within the reeds and semi-aquatic vegetation. Fish living in the water of these rivers will also attract birds such as kingfishers, cormorants and darters. Frogs and crabs also occur and will attract bird species that feed on them such as Hadeda, herons, hamerkop and kingfishers.

The vegetation within the riparian zone consists of large Acacia and broadleafed trees, which are taller than those trees further away from the river due to the availability of water. This riparian vegetation will favour species typically associated with a bushveld habitat. These birds include a great variety of arboreal passerines such as drongos, warblers, flycatchers, shrikes, sunbirds, waxbills and weavers as well as arboreal nonpasserines such as doves, cuckoos and woodpeckers. Many of these species make use of the thorny nature of these trees to build their nests. Acacia trees generally attract many insects and in turn attract a good diversity of typical "Bushveld" bird species.

The bird species within the woodland habitat include a great variety of arboreal passerines such as drongos, warblers, flycatchers, shrikes, sunbirds, waxbills and weavers as well as arboreal non-passerines such as doves, cuckoos and woodpeckers. Many of these species make use of the thorny nature of these trees to build their nests. Acacia trees generally attract many insects and in turn attract a good diversity of typical Acacia savanna bird species. The ground cover between the trees consists of mainly short to long grass interspersed with shrubs.

Several, mainly seasonal, pans are found in the region. Not only are these pans important for Red Data species but also for many Palaearctic waders which visit southern Africa during the summer months. The pans will attract several water bird species such as lapwings, ducks, herons and egrets for foraging, breeding and roosting purposes. They will feed on prey species such as frogs and their tadpoles and fish that aestivate and hibernate in the mud during times when the pans are dry as well as aquatic insects and plants. The pans are also an important source of water for many woodland bird species such as waxbills, buntings, sparrows, weavers and doves especially during hot and dry periods.

Bird distribution data of the Southern African Bird Atlas Project (SABAP1 – Harrison *et al.*, 1997) obtained from the Avian Demography Unit of the University of Cape Town was used in order to ascertain which Red Data bird species occur in the study area (see **Table 32**). The more recent SABAP2 data was also consulted online (http://sabap2.adu.org.za/coverage.php).

Table 32: Red data bird species recorded in the grid cells 2327CB, 2327CD, 2427AB, 2427AD and 2427CB (http://sabap2.adu.org.za/coverage.php)

Common Name	Scientific Name	Conservation Status	2327CB	2327CD	2427AB	2427AD	2427CB
Kori Bustard	*Ardeotis kori*	VU	✓		✓	✓	✓
White-bellied Korhaan	*Eupodotis senegalensis*	VU				✓	
Yellow-throated Sandgrouse	*Pterocles gutturalis*	NT			✓		✓
Greater Painted-snipe	*Rostratula benghalensis*	NT					✓
Black-winged Pratincole	*Glareola nordmanni*	NT	✓				✓
White-backed Vulture	*Gyps africanus*	VU	✓	✓	✓		✓
Cape Vulture	*Gyps coprotheres*	VU	✓		✓		✓
Lappet-faced Vulture	*Aegypius tracheliotus*	VU	✓		✓		
Bateleur	*Terathopius ecaudatus*	VU	✓		✓		
African Marsh-Harrier	*Circus ranivorus*	VU					✓
Tawny Eagle	*Aquila rapax*	VU	✓	✓	✓		✓
Martial Eagle	*Polemaetus bellicosus*	VU			✓	✓	✓
Secretarybird	*Sagittarius serpentarius*	NT	✓	✓	✓	✓	✓
Lesser Kestrel	*Falco naumanni*	VU			✓		✓
Lanner Falcon	*Falco biarmicus*	NT					✓
Yellow-billed Stork	*Mycteria ibis*	NT			✓		✓
Black Stork	*Ciconia nigra*	NT			✓		✓
Marabou Stork	*Leptoptilos crumeniferus*	NT			✓		✓
Red-billed Oxpecker	*Buphagus erythrorhynchus*	NT			✓		✓

NOTE: VU = Vulnerable, NT = Near-threatened.

The Important Bird & Biodiversity Area (IBA) programme of southern Africa (Barnes, 1998) identified 124 IBAs in South Africa. IBAs are places of international significance for the conservation of birds and other biodiversity and are sites that together form part of a wider, integrated approach to the conservation and sustainable use of the natural environment. The Waterberg System IBA occurs approximately 3.5 km to the east of the Central Route and the Northern Turf Thornveld IBA is situated approximately 2 km to the south of the abstraction weir (see **Figure 97**). The Paul Hugo and Bierspruit gauging weirs fall within the last mentioned IBA.

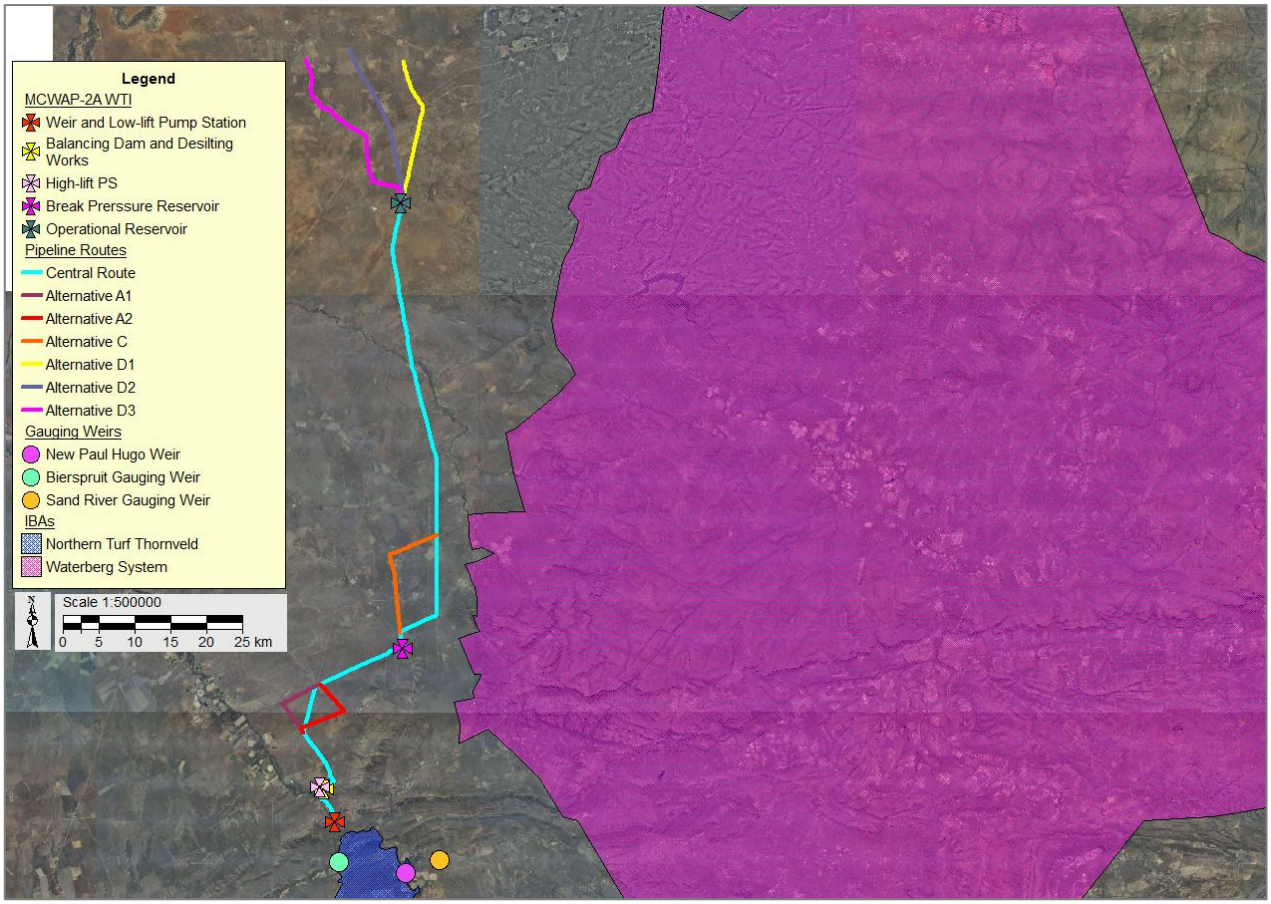


Figure 97: IBAs

11.10.3 Herpetofauna (Reptiles and Amphibians)

In general, the habitat types affected by the project infrastructure are suitable for relatively high species diversity. The herpetofauna mainly consists of widespread, common Bushveld species with slight variation due to the presence of sandy substrate, stony to rocky terrain, water bodies, bush and trees.

Riparian habitats are ordinarily rich in reptile diversity and densities due to the habitat supporting a high abundance of prey species, such as frogs, birds and small mammals (Branch, 2001). Reptilian species are largely dependent on habitat unit structures and prey abundance, which, in turn, also depends on general habitat unit structure and condition. Many reptilian species, together with a large proportion of their prey species, have been shown to be broadly tolerant to a variety of habitat types. Vegetative cover is also greater within this habitat type. Species are also very often “ousted” into wetland and riparian zones due to transformation of lands for urban and agricultural purposes.

Amphibians are an important component of South Africa’s exceptional biodiversity and are such worthy of both research and conservation effort. This is made additionally relevant by international concern over globally declining amphibian populations, a phenomenon currently undergoing intensive investigation but is still poorly understood (Wyman, 1990 & Wake, 1991).

This decline seems to have worsened over the past 25 years and amphibians are now more threatened than either mammals or birds, though comparisons with other taxa are confounded by a shortage of reliable data. Frogs are particularly restricted to aquatic habitats (wetlands and other surface water bodies) and, thus, impacts on these habitats (as a result of the clearing of the vegetation) are likely to negatively impact on amphibian species. Frogs also require terrestrial habitats adjoining aquatic habitats.

Frogs are useful environmental bio-monitors (bio-indicators) and may acts as an early warning system for the quality of the environment. Frogs and tadpoles are good species indicator on water quality, because they have permeable, exposed skins that readily absorb toxic substances. Tadpoles are aquatic and greatly exposed to aquatic pollutants (Blaustein, 2003). The presence of amphibians is also generally regarded as an indication of intact ecological functionality.

Based on Jacobsen (1989), the SARCA Reptile Survey (2006 – 2009) and Minter *et al* (2004), the following list of Red Data herpetofauna species may occur within the project area:

- Giant Bullfrogs (Pyxicephalus adspersus);
- African Bullfrog (Pyxicephalus edulis); and
- Southern African Python (Python natalensis).

Potential Impacts / Implications

- Ecosystem disruption may occur where clearing is undertaken to allow for the construction of the project infrastructure.
- Sections of the alternative pipeline routes traverse or pass in close proximity to enclosures where sensitive game is kept. Provision will need to be made to prevent impacts to sensitive game (e.g. temporary relocation).
- Fauna could be adversely affected through construction-related activities (noise, dust, light pollution, illegal poaching, and habitat loss). This is especially relevant to sensitive game species (including exotic game).
- The construction servitude will minimise animal movement. This is particularly significant on smaller game farms or in instances where access to watering points will be affected.
- Impacts to sensitive fauna species and their habitats to be assessed by relevant specialists and suitable mitigation measures to be identified, where possible.
- Possible disturbance to the bat cave that is situated in the Mooivallei area during construction.

Specialist Study Triggered / Additional Investigations

- The probability of occurrences of conservation-worthy faunal species is based on their respective geographical distributional ranges and the suitability of on-site habitat. A Terrestrial Ecological Assessment will be undertaken and the areas to be affected by project activities and infrastructure will be surveyed to identify sensitive and significant fauna species or occurrence of suitable habitat.

- Amongst others, the following information sources will be scrutinised further by the relevant specialists:
  - Limpopo Conservation Plan;
  - SANBI's spatial information, including CBAs; and
  - Waterberg Bioregional Plan.
- The potential impacts to fauna related to the construction stage, with particular emphasis on the animals on game farms (as also expressed by numerous landowners) and other sensitive species that naturally occur in the area (e.g. bats in Mooivallei area), will be addressed during the EIA phase.
- Wildlife Impact Assessment to be conducted, taking into consideration the types of game kept on the farms and the requisite mitigation measures.

11.11 Socio-Economic Environment

Status Quo

11.11.1 General

Waterberg DM consists mainly of commercial farms, game farming, rural settlements and small towns. The district's economy is characterised by mining, tourism, agriculture and manufacturing. According to the SDF (Waterberg DM, 213), the dominant economic sectors in the district are shown in **Figure 98**.

Figure 98: Dominant economic sectors in Waterberg DM (Waterberg DM, 213)

11.11.2 Local Socio-economic Factors

The project infrastructure is mostly located on privately-owned properties that are primarily used for agriculture, game farming and eco-tourism.

Apart from cultivated land and game farms, some notable socio-economic features in the project area include *inter alia* the following:

- Proximity of farm houses and dwellings of farm labourers to alternative pipeline routes (e.g. Portion 1 of the Farm Mooivalei 342 KQ, Portion 2 and the Remainder of the Farm Schuldpadfontein 328 LQ - **Figure 99**; Farm Honingvley 99 KQ - **Figure 100**);
- A settlement is located to the immediate north of the termination point for Alternative D3, on Portion 2 of the Farm Theunispan 293 LQ in Steenbokpan;
- The Matshaneng Primary School is situated along the Steenbokpan Road (on the Remainder of the Farm Doornlaagte 353 LQ - see **Figure 99**), alongside the Alternative D3. Other schools may also be affected;
- Churches are located alongside Alternative C (Portion 1 of the Farm Tarantaalpan 132 KQ) and Alternative D3 (Portion 10 of the Farm Theunispan 293 LQ);
- Smaller / narrower farms will be affected by project infrastructure, which may influence future agricultural and game farming practices;
- Some properties that may be traversed by the pipeline are already affected by other linear infrastructure (e.g. power lines, roads, railway line); and
- Farm stalls occur along the main roads followed by the pipeline routes.

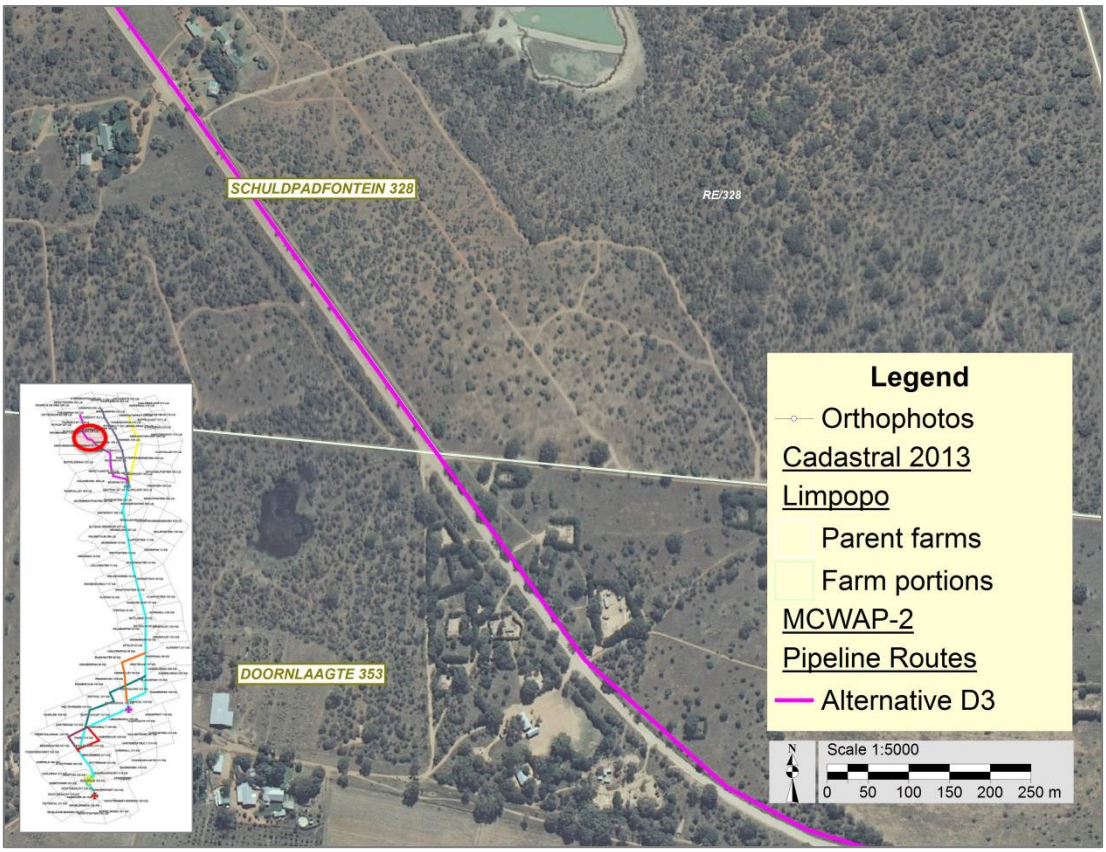


Figure 99: Structures alongside Alternative D3

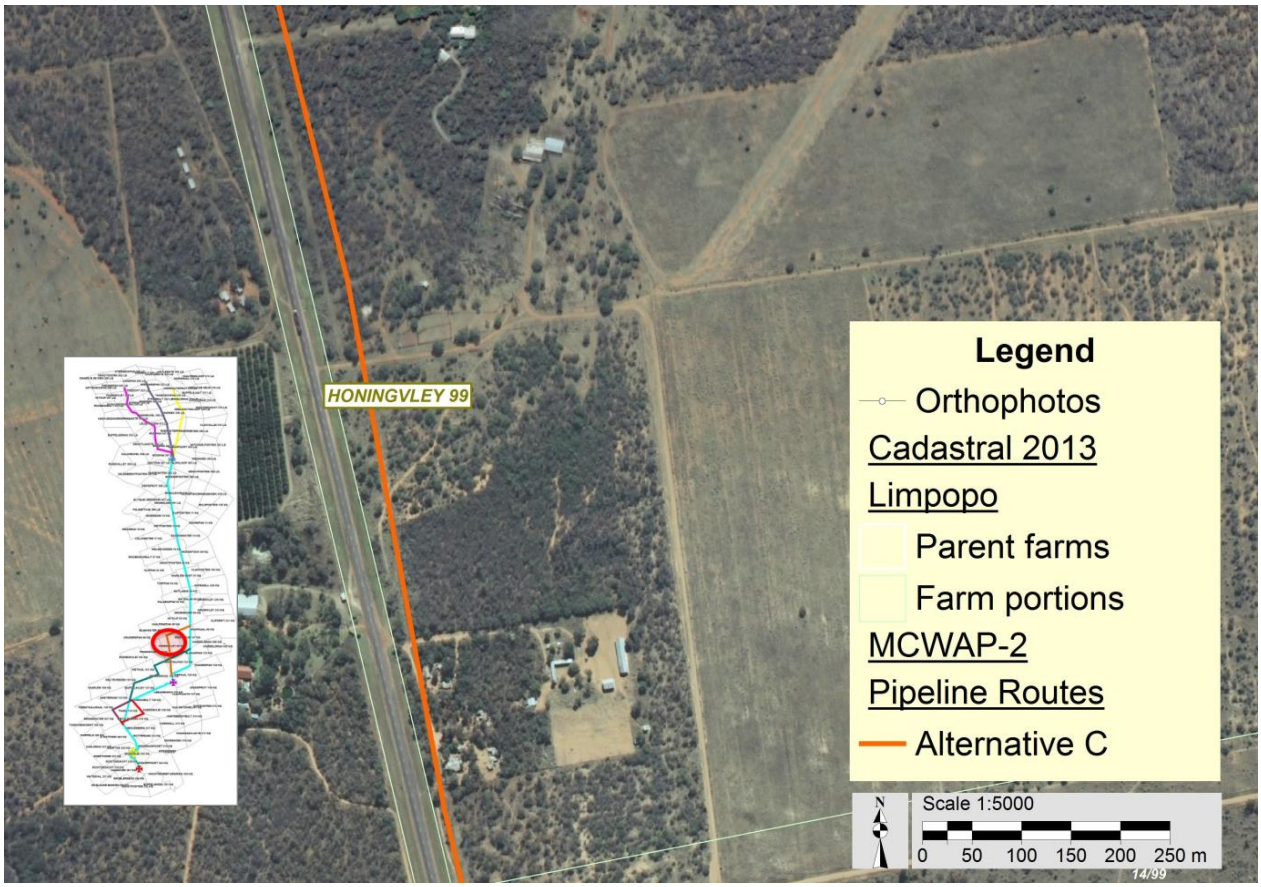


Figure 100: Structures alongside Alternative C

11.11.3 Socio-Economic Baseline

Data pertaining to the socio-economic profile of Thabazimbi and Lephalale LMs, based on Census 2011, is presented below.

The majority of the population in Thabazimbi LM reside in urban areas, whereas in Lephalale LM the majority resides in traditional areas (see **Table 33**).

Table 33: Geo type for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
Urban area	70062	46120
Tribal or Traditional area	-	52355
Farm	15172	17291

The majority of residents in the two LMs fall in the Black African category (see **Table 34**).

Table 34: Population group for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
Black African	71845	104964
Coloured	527	1023

	LIM361: Thabazimbi	LIM362: Lephalale
Indian or Asian	205	344
White	12309	9120
Other	347	317

The male population in the two LMs is higher than the female population (see **Table 35**).

Table 35: Gender for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
Male	49877	62819
Female	35357	52948

Setswana is the dominant language in Thabazimbi LM, whereas Sepedi is dominant in Lephalale LM (see **Table 36**).

Table 36: Language for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
Afrikaans	12345	8690
English	2808	3338
IsiNdebele	754	1277
IsiXhosa	9679	1044
IsiZulu	1672	1972
Sepedi	6264	55539
Sesotho	3085	1813
Setswana	32407	25944
Sign language	247	195
SiSwati	624	259
Tshivenda	1051	1669
Xitsonga	5812	3218
Other	1829	2565
Not applicable	6657	8245

Education levels are assessed in order to understand the potential grade or level of employment as well as livelihood of the community. Furthermore, it indicates the functional literacy and skill level of a community. **Table 37** shows the highest level of education reached for both LMs falls within the “some secondary” category.

Table 37: Highest educational level (grouped) for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
No schooling	5919	7431
Some primary	15753	24447
Completed primary	4464	5559
Some secondary	24597	33315
Grade 12/Std 10	15069	16707
Higher	4578	7986

	LIM361: Thabazimbi	LIM362: Lephalale
Unspecified	156	204
Not applicable	14700	20121

The majority of people in both LMs are employed (see **Table 38**).

Table 38: Official employment status for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
Employed	32916	35328
Unemployed	8562	10101
Discouraged work-seeker	1236	1563
Other not economically active	22437	33699
Age less than 15 years	-	-
Not applicable	20082	35076

The main type of dwelling encountered in both LMs is a house or brick/concrete block structure on a separate stand or yard or on a farm (see **Table 39**).

Table 39: Type of main dwelling for Household weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
House or brick/concrete block structure on a separate stand or yard or on a farm	15917	22816
Traditional dwelling/hut/structure made of traditional materials	469	408
Flat or apartment in a block of flats	306	849
Cluster house in complex	75	95
Townhouse (semi-detached house in a complex)	209	114
Semi-detached house	190	62
House/flat/room in backyard	905	340
Informal dwelling (shack; in backyard)	2925	2098
Informal dwelling (shack; not in backyard; e.g. in an informal/squatter settlement or on a farm)	3580	2456
Room/flatlet on a property or larger dwelling/servants quarters/granny flat	121	321
Caravan/tent	99	74
Other	282	246
Unspecified	-	-
Not applicable	-	-

The majority of annual household income ranges between R 38 201 - R 76 400 in Thabazimbi LM and R 19 601 - R 38 200 in Lephalale LM (see **Table 40**).

Table 40: Annual household income for Household weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
No income	3518	3745
R 1 - R 4800	686	958
R 4801 - R 9600	1027	1876
R 9601 - R 19 600	3165	4876
R 19 601 - R 38 200	4048	6046
R 38 201 - R 76 400	5021	4608
R 76 401 - R 153 800	3517	3354
R 153 801 - R 307 600	2474	2358
R 307 601 - R 614 400	1160	1417
R 614 001 - R 1 228 800	313	445
R 1 228 801 - R 2 457 600	105	126
R 2 457 601 or more	45	68
Unspecified	2	3

11.11.4 Service Delivery

This section provides a summary of level of services in the two affected LMs.

The majority of people in the Thabazimbi LM have piped (tap) water inside dwelling/institution. In the Lephalale LM more people have piped (tap) water inside yard (marginally higher than the aforementioned) (see **Table 41**).

Table 41: Piped water for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
Piped (tap) water inside dwelling/institution	42360	36501
Piped (tap) water inside yard	18867	37854
Piped (tap) water on community stand: distance less than 200m from dwelling/institution	9921	28176
Piped (tap) water on community stand: distance between 200m and 500m from dwelling/institution	3123	6783
Piped (tap) water on community stand: distance between 500m and 1000m (1km) from dwelling /institution	2343	1875
Piped (tap) water on community stand: distance greater than 1000m (1km) from dwelling/institution	1203	570
No access to piped (tap) water	6852	3366
Unspecified	492	519
Not applicable	75	117

The primary source of water for both LMs is regional / local water scheme (operated by municipality or other water services provider) (see **Table 42**).

Table 42: Source of water for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
Regional/local water scheme (operated by municipality or other water services provider)	54036	83595
Borehole	12885	20685
Spring	141	423
Rain water tank	183	345
Dam/pool/stagnant water	267	2316
River/stream	165	1527
Water vendor	2028	1992
Water tanker	13557	3399
Other	1899	1368
Not applicable	75	120

The majority of people have flush toilets in both LMs (see **Table 43**).

Table 43: Toilet facilities for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
None	5034	4539
Flush toilet (connected to sewerage system)	55176	43803
Flush toilet (with septic tank)	3798	4887
Chemical toilet	1848	870
Pit toilet with ventilation (VIP)	2547	33234
Pit toilet without ventilation	13512	26289
Bucket toilet	522	663
Other	2235	846
Unspecified	492	519
Not applicable	75	120

Electricity is the primary from of energy used for cooking, heating and lighting purposes (see **Tables 44 - 46**).

Table 44: Energy or fuel for cooking for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
Electricity	58416	66270
Gas	4494	2838
Paraffin	10908	5364
Wood	10470	40344
Coal	99	51
Animal dung	18	42
Solar	150	57
Other	27	45
None	90	120
Unspecified	492	519
Not applicable	75	117

Table 45: Energy or fuel for heating for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
Electricity	60201	69231
Gas	1272	999
Paraffin	5121	3852
Wood	9945	28092
Coal	108	84
Animal dung	90	69
Solar	177	888
Other	3	-
None	7746	11910
Unspecified	492	519
Not applicable	75	117

Table 46: Energy or fuel for lighting for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
Electricity	67920	101124
Gas	174	108
Paraffin	4023	459
Candles (not a valid option)	11970	12942
Solar	321	276
None	255	219
Unspecified	492	519
Not applicable	75	120

In Thabazimbi LM most of the refuse is removed by the local authority / private company at least once a week. In Lephalale LM most people make use of own refuse dumps for refuse disposal. Refer to **Table 47**.

Table 47: Refuse disposal for Person weighted (Statistics South Africa, 2013)

	LIM361: Thabazimbi	LIM362: Lephalale
Removed by local authority/private company at least once a week	53046	43482
Removed by local authority/private company less often	1218	924
Communal refuse dump	3699	3777
Own refuse dump	21651	53442
No rubbish disposal	4143	13089
Other	909	414
Unspecified	492	519
Not applicable	75	120

11.11.5 Land Claims

The land claims in the district, based on the SDF (Waterberg DM, 2013) are shown in **Figure 101**. The project area around the Matlabas River seems to be the most affected by land claims.

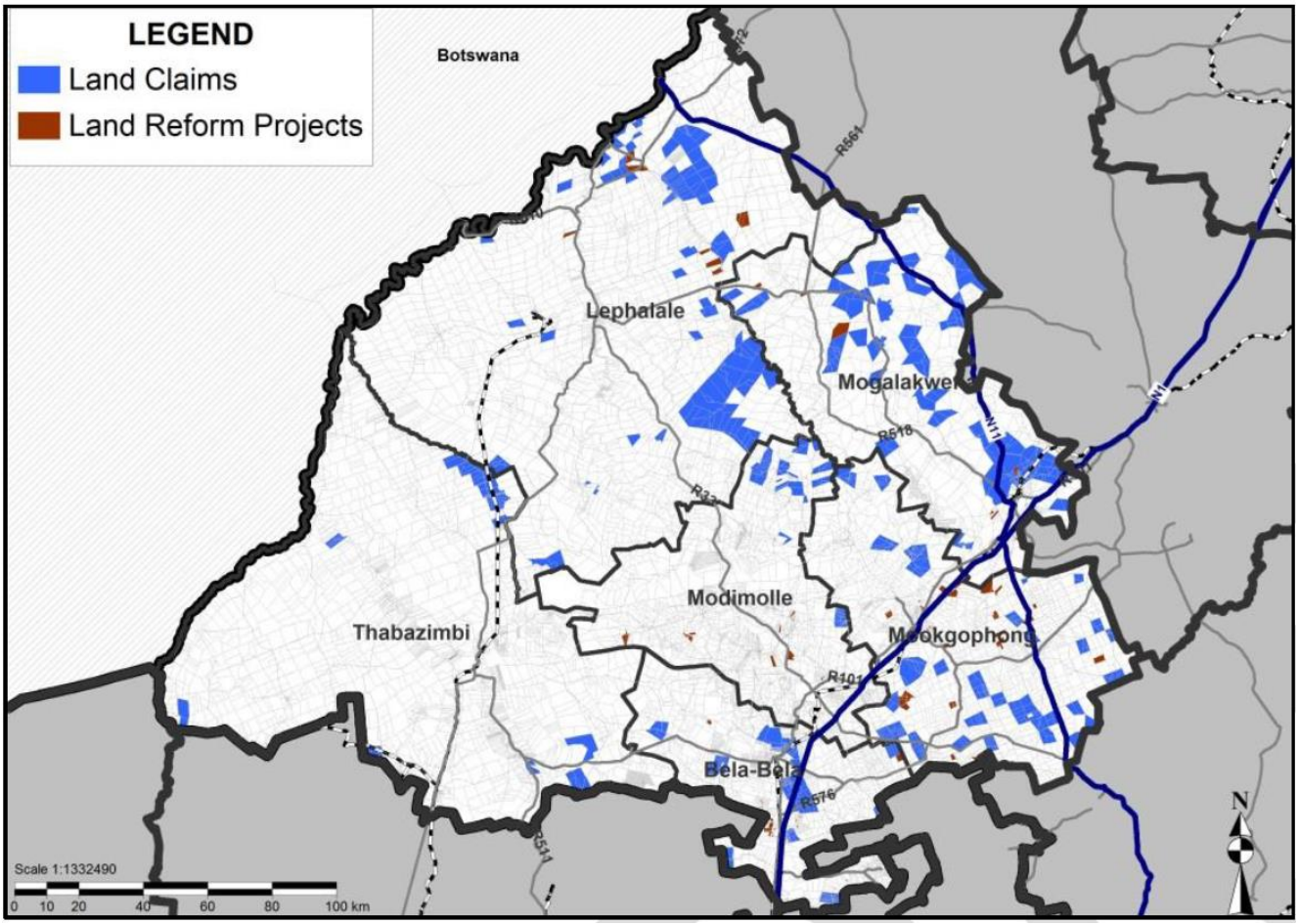


Figure 101: **Land claims in district (Waterberg DM, 2013)**

Potential Impacts / Implications

- Possible adverse impacts to the socio-economic environment include (amongst others):
  - Loss of land (including structures and cultivated areas) through project infrastructure;
  - Loss of agricultural production;
  - Risk to game and livestock as a result of construction related hazards;
  - Loss of income in eco-tourism sector (hunting and game farming);
  - Loss of income along the Crocodile River (West) due to change in operating rules (changes in assurance of supply);
  - Potential damage to property (e.g. gates, fences, structures);
  - Servitude restrictions;
  - Use of local road network;
  - Safety and security;
  - Impact to visual quality and sense of place;
  - Nuisance from dust and noise;
  - Light pollution;
  - Cumulative impacts to properties that are already affected by existing linear infrastructure;

- Impacts to smaller properties, where the servitude may affect the critical mass required to continue with the current land use (e.g. agricultural activities on Portions 1 and 2 of the Farm Mooivalei 342 KQ);
- Influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes, anti-social behaviour, and incidence of HIV/AIDS);
- Reduction in property value;
- If the projected development materialise the population and specifically the urban population of Lephalale will grow substantially;
- The operating level of the Hartbeespoort Dam (see **Figure 102**) will fluctuate as per seasonal rains, with associated impacts to the surrounding recreational water users (active and passive).

Figure 102: Development surrounding Hartbeespoort Dam

- Positive impacts associated with the project include:
  - MCWAP-2A will enable developments associated with the Waterberg coalfields to proceed;
  - Employment opportunities will be created during the construction phase, with accompanying skills transfer;
  - Where possible, goods and services will also be sourced locally during construction.

Specialist Study Triggered / Additional Investigations

- A Socio-economic Impact Assessment will be undertaken as part of the EIA phase, and mitigation measures will need to be identified to manage the impacts to the local social and economic environments.
- Findings from the Economic Impact Assessment (macro-economic analysis), which was undertaken under the Technical Feasibility Study, will be incorporated into the EIA Report.
- The status of land claims needs to be assessed before the project can proceed.
- Compensation to be fair and complaint with the prevailing regulatory framework.

11.12 Agriculture

Status Quo

11.12.1 Irrigation

In general the study area is regarded as arid, and irrigation is hence limited to major watercourses, as is evident immediately downstream of the proposed weir site (shown in **Figure 103**).

Formal agricultural groups in the study area include the following:

- Hartbeespoort Irrigation Board;
- Crocodile-West Irrigation Board;
- Makoppa Farmers;
- Transvaal Agricultural Union; and
- Agri-SA Lephalale.

The location of the Hartbeespoort and Crocodile-West Irrigation Boards is shown in **Figure 80**. The Makoppa Farmers are downstream of the proposed abstraction weir in Vlieëpoort.

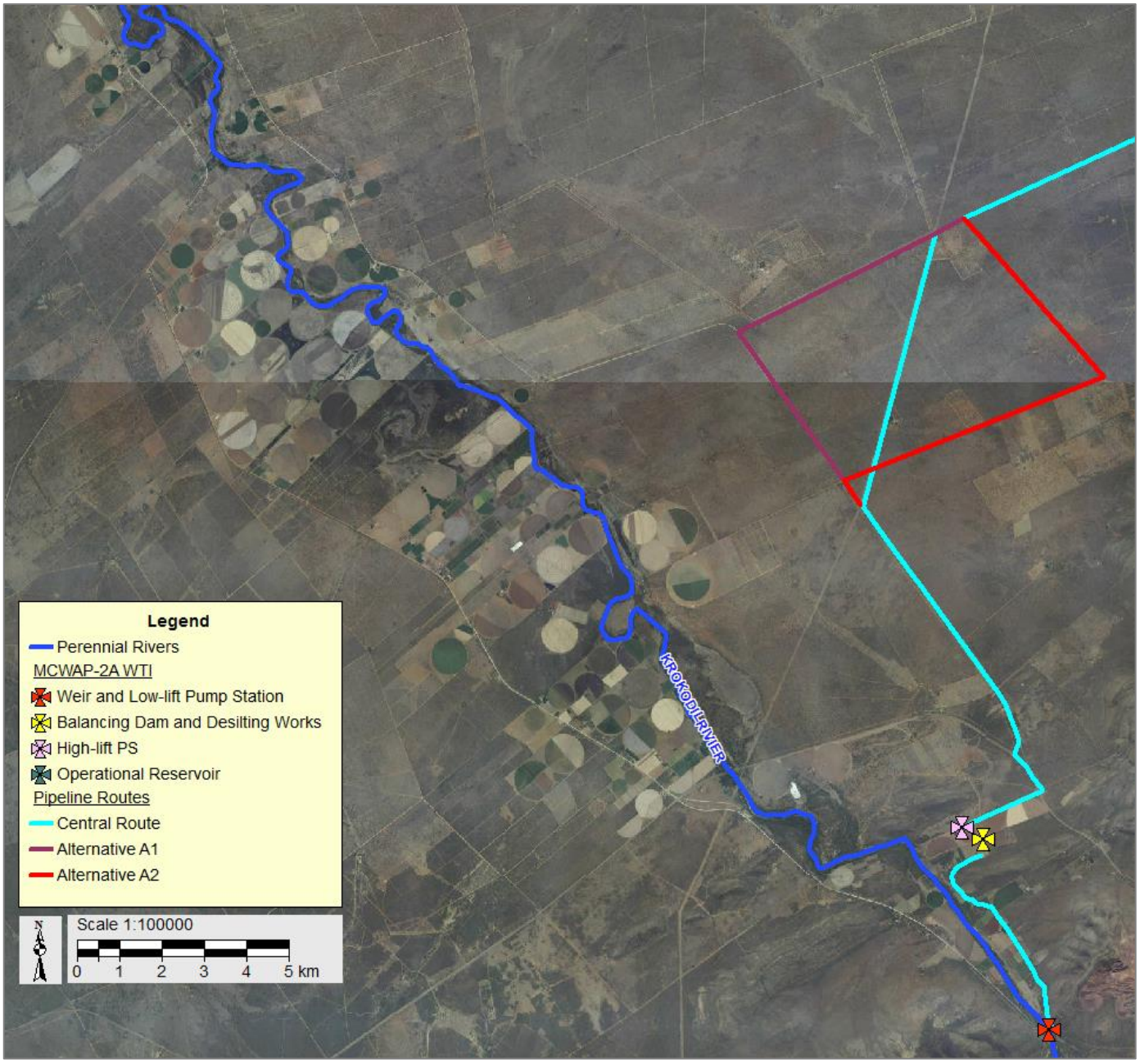


Figure 103: Agricultural practices alongside the Crocodile River, downstream of weir site

11.12.2 Land Capability

The following observations are made with regards to the land capability map in **Figure 104**:

- Moderate potential arable land is affected by the low-lift rising main, balancing dam, high-lift pump station, BPR (Central Route) and sections of the Central Route;
- Marginal potential arable land is affected by the low-lift rising main and sections of the Central Route, as well as sections of Alternatives A1, A2, B, and C; and
- The remainder of the footprint affects non-arable land (grazing, woodland or wildlife).

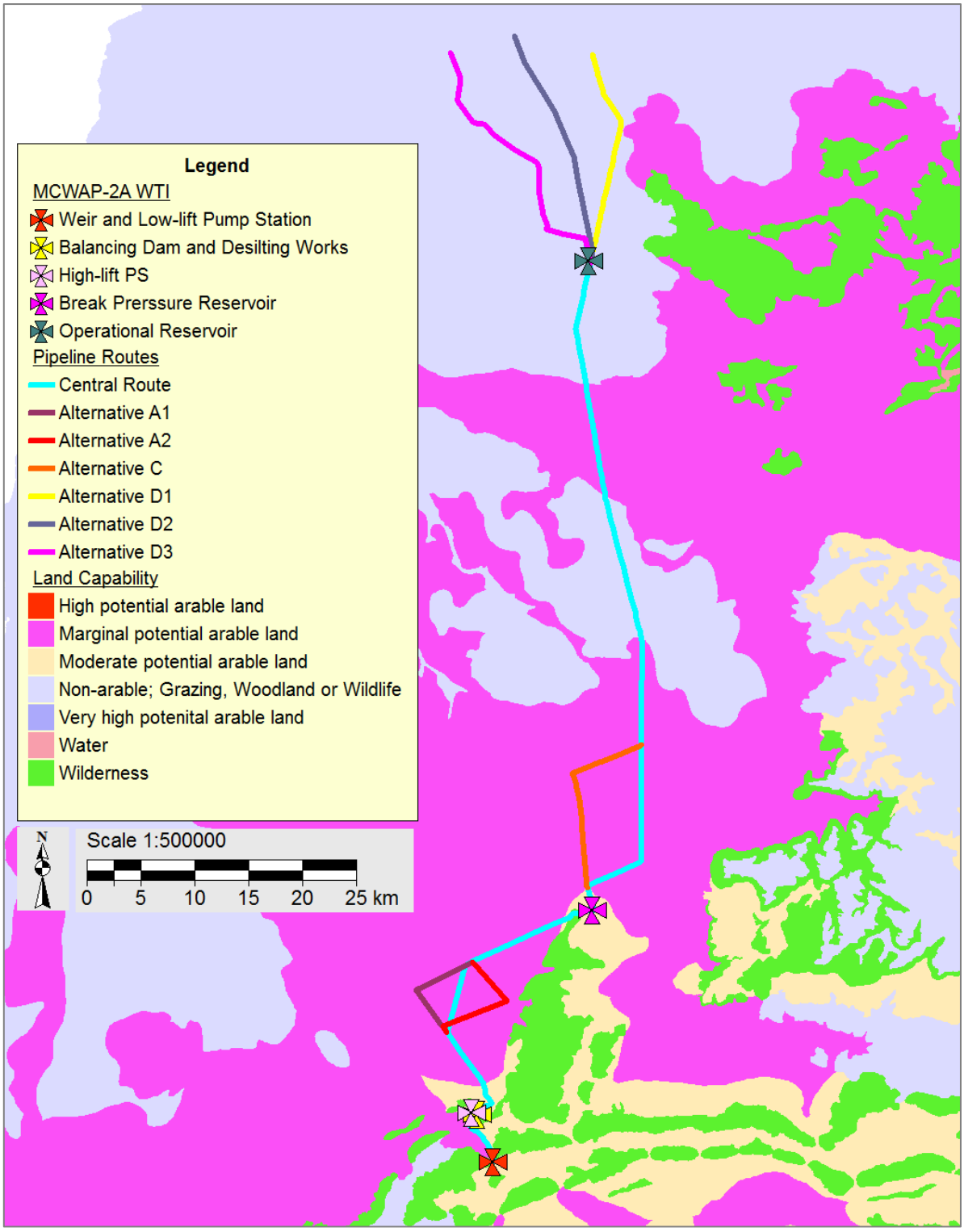


Figure 104: Land capability

11.12.3 Existing Agricultural Activities

According to the Crocodile (West) Marico Internal Strategic Perspective (ISP) (DWAF, 2004b), smallholding and commercial agricultural activities (limited formal irrigation) take place in the area to the north west of Johannesburg (south of the Magaliesberg northern range). The area between Rustenburg and Brits is known for its citrus farming activities, whereas irrigated cash crop farming

takes place below the Hartbeespoort Dam and Brits. Irrigation also occurs along the main stem of the Crocodile River (West), the most significant areas being just south and north of the town of Thabazimbi. The rest of the area is used for dryland farming (limited), cattle grazing and game ranching (DWAF, 2004b). Generally, there has been a movement away from cattle farming towards game farming in the greater area.

The project footprint significantly affects the pivots and fields on Portions 1 and 2 of the Farm Mooivalei 342 KQ, which is earmarked for the proposed balancing dam, desilting works, high-lift pump station and a section of the Central Route (see **Figure 105**). Cultivated areas occur along the south-western part of the low-lift rising main, where the potential impact depends on which side of the dirt road the pipeline will run (see **Figure 105**). Other cultivated areas also occur along other sections of the pipeline routes.

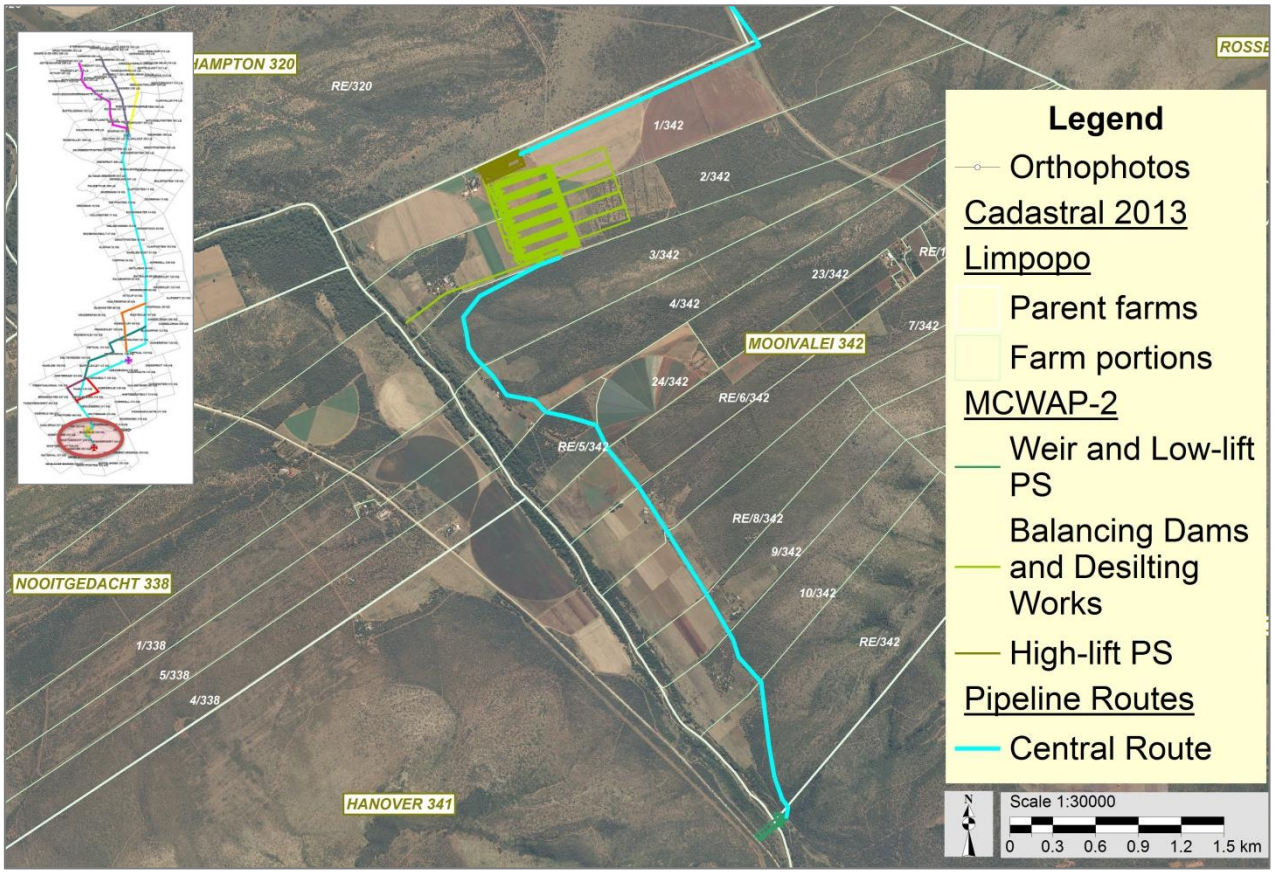


Figure 105: **Agricultural activities affected in Mooivallei area**

Potential Impacts / Implications

- Direct loss of agricultural land in the development footprint and the associated loss of income.
- Concerns regarding the potential impacts to water users (and associated agro-economic impact from reduced crop and food production) downstream of the abstraction works on the Crocodile River is regarded as a key environmental issue associated with the project, and has been raised as a concern by many IAPs during public participation. However, the following must be noted –

- Existing water use entitlements were accounted for in assessing the availability of water for the transfer scheme;
- The surplus water in the system, which is associated with the effluent from various Wastewater Treatment Works, was confirmed as part of the Reconciliation Study through detailed analyses; and
- Vlieëpoort Abstraction Weir will not be a storage facility but simply a diversion structure. High flows will spill over the weir and low flows will be routed through the weir.

Specialist Study Triggered / Additional Investigations

- An Agricultural Impact Assessment will be conducted during the EIA phase. Amongst others, this will quantify the agricultural areas lost as a result of the proposed project and consider possible mitigation measures. It will also identify the preferred project options from an agricultural perspective.
- The loss of cultivated land in the Mooivallei area will need to be considered in terms of the impact to the current agricultural operations.
- Compensation to be fair and complaint with the prevailing regulatory framework.
- The water requirements of the lawful water users are secured through existing entitlements (i.e. Existing Lawful Use – Section 32 of the National Water Act, No. 36 of 1998).
- As explained in **Section 9.11**, the proposed River Management System will need to establish operating rules for the Lower Crocodile (West) system with MCWAP-2A releases to make provision for (amongst others) multiple users along the river stretch (irrigation, transfer and Ecological Reserve), with varying assurance of supply criteria. Additional information to be provided in the EIA Report.
- A broader Public Involvement Programme will be undertaken as part of the River Management System, which extends beyond the scope of the EIA's public participation process. This will entail engaging with the relevant interest groups, which include -
  - Formal agricultural groups (including the Hartbeespoort Irrigation Board, Crocodile-West Irrigation Board, Makoppa Water Users and the Transvaal Agricultural Union); and
  - Hartbeespoort Dam IAPs.

11.13 Air quality

Status Quo

Due to the predominantly rural nature of the study area, the air quality is regarded to be good. Obvious sources of air pollution in the greater region include the following:

- Grootegeluk coal mining operations;
- Dust from areas affected by the previous Thabazimbi iron ore mining operations
- Urban-related emissions from towns (notably Lephalale and Thabazimbi);
- Emissions from Matimba and Medupi power stations (stacks) and its associated ash dump;
- Dust from agricultural lands, bare areas and use of dirt roads;

- Tailpipe emissions from vehicles travelling along the road network;
- Burning of wood for household purposes in areas without electricity;
- Waste treatment and disposal;
- Burning of biomass (veld fires); and
- Veld fires.

Potential Impacts / Implications

- Dust will be generated during the construction period from various sources, including blasting, trenching, activities at the borrow areas, operations at the batching plant(s) and crusher area(s), aggregate stockpiles, use of haul roads and access roads, transportation of spoil material, soil stockpiles and general construction activities on site.
- Sensitive receptors to dust and other air quality impacts in the study area include farm dwellings, human settlements, sensitive game species and eco-tourists.

Specialist Study Triggered / Additional Investigations

No specialist air quality study will be undertaken for the proposed uMWP-1 Raw Water, as it is not deemed necessary for the type of activities associated with this project. Mitigation measures will be included in the EMPr to ensure that the air quality impacts during the construction phase are suitably monitored (dust fallout and particulate matter) and managed and that regulated thresholds are not exceeded.

The EMPr will also include measures to control and minimize greenhouse gas emissions by optimizing the utilisation of construction resources.

11.14 Noise

Status Quo

The rural state of the study area affords it tranquillity. Noise in the region emanates primarily from the following sources:

- Mining operations;
- Human settlements;
- Operations at the Matimba power station and ash dump;
- Farming operations (e.g. use of farming equipment);
- Vehicles on the road network;
- Trains utilising the railway line and
- Occasional overflying aircrafts.

The ridges in the southern part of the route serve as noise attenuation features, although the ambient noise levels are regarded as insignificant.

Potential Impacts / Implications

- During construction, localised increases in noise will be caused by blasting, trenching, activities at the borrow areas, operations at the batching plant(s) and crusher area(s), vehicles on haul roads and access roads, and general construction activities on site. Vibration would be felt close to construction equipment.
- The proposed pump stations will be operating continuously and may cause noise pollution.
- Similar to air quality, the sensitive receptors to noise impacts in the study area include farm dwellings, human settlements, sensitive game species and eco-tourists.
- Refer to **Section 11.17** for further discussions on buildings affected by project infrastructure.

Specialist Study Triggered / Additional Investigations

- Noise that emanates from construction activities will be addressed through targeted best practices for noise management in the EMPr.
- The EIA will further pay special attention to the management of noise from the pump stations, by investigating measures to attenuate noise to remain within regulated standards.

11.15 Historical and Cultural Features

Status Quo

11.15.1 General

The Waterberg is rich in cultural heritage. Bushmen entered Waterberg around two thousand years ago, and they produced rock paintings at Lapalala within the Waterberg. Early Iron Age settlers in Waterberg were Bantu, who had brought cattle to the region. Later people left the first Stone Age artefacts recovered in northern South Africa. Starting about the year 1300 AD, Nguni settlers arrived with new technologies, emanating from the Iron Age.

Some historical information of the district's administrative areas follows (sourced from Waterberg DM, 2013):

- The heritage and sense of place of the Waterberg lies in its cultural diversity, history, and natural environment. The natural environment is of particular importance due to the prominence of its topography, the unique range of habitats, its tourist attractions and its wildlife.
- Lephalale is the youngest town in the district. It was established in 1960 and got municipal status only in 1986. During the first half of the nineteenth century, Lephalale served as a nexus for hunting parties operating from Vaalwater and the Waterberg in the east, Thabazimbi in the south and Botswana in the north-east.
- The Thabazimbi-Rooiberg area is known for the prehistoric mining of tin and evidence for pre-historic iron smelting and habitation has been recorded. Thabazimbi is the Tswana word for 'mountain of iron'. The exceptionally rich iron deposits at the Vlieggepoort defile was re-discovered' by J.H. Williams in 1939. The township of Thabazimbi was mainly established for

the employees of Iscor. It was laid out on the farm Kwaggashoek and officially proclaimed on 4 May 1953.

11.15.2 Local Historical Features

Potential historical features within the study area include the following:

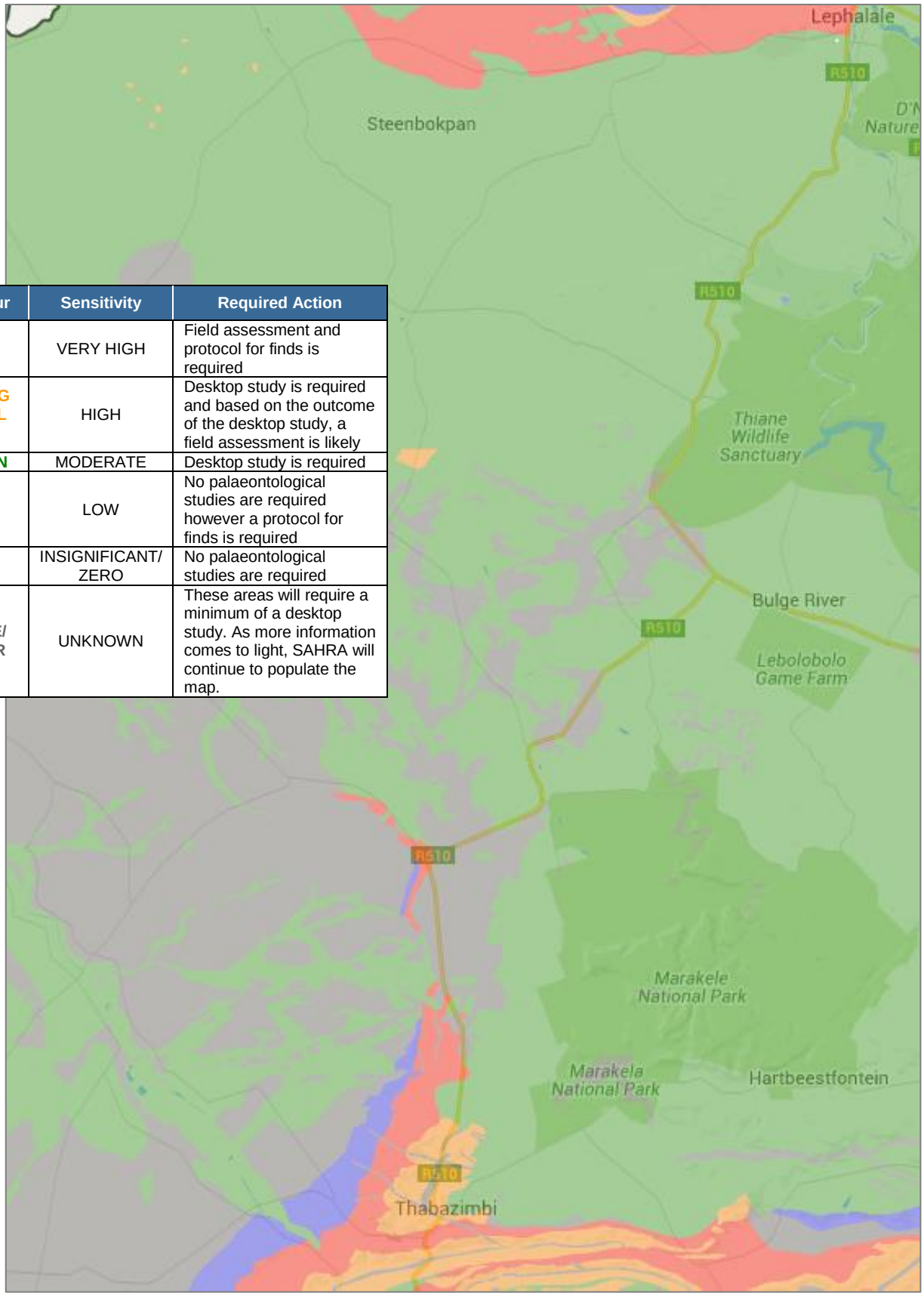
- Archaeological sites (possibly linked to the Stone Age and Iron Age);
- Structures of historical value (e.g. farm houses older than 60 years) (see example in **Figure 106**);
- Grave sites; and
- Intangible historical attributes.

Figure 106: Example of an old structure in the study area

11.15.3 Palaeontology

Based on the Palaeontological (Fossil) Sensitivity Map, sourced from South African Heritage Resources Information System (SAHRIS), (see **Figure 107**), the following is noted in terms of the project footprint in relation to areas of palaeontological sensitivity:

- Very high sensitivity - affected by abstraction weir, low-lift rising main and BPR (Central Route) as well as sections of the Central Route and Alternative C;
- Moderate sensitivity - affected by all the alternative pipeline routes;
- Low sensitivity - affected by balancing dam, desilting works, high-lift pump station and sections of the Central Route; and
- Insignificant / zero sensitivity – remainder of project footprint.



Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ ZERO	No palaeontological studies are required
WHITE/ CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 107: Palaeontological (Fossil) Sensitivity Map (SAHRIS)

Potential Impacts / Implications

- Heritage and cultural resources could be destroyed or damaged through construction activities.
- The chances of encountering heritage and cultural resources are reduced where the proposed footprint follows existing infrastructure and where it is located on cultivated land, due to past disturbances.

Specialist Study Triggered / Additional Investigations

- A Phase 1 Heritage Impact Assessment, in accordance with the National Heritage Resources Act (Act No. 25 of 1999), will be conducted during the EIA phase and will be submitted to LIHRA for review.
- A palaeontological assessment will be undertaken for areas identified by SAHRIS as having very high to moderate sensitivity.
- All the relevant protocols must be abided by and permits will need to be obtained with regard to heritage resources (where necessary).
- All work will cease for chance finds of heritage resources during the construction phase and LIHRA will be notified. Additional mitigation measures will be included in the EMPr.

11.16 Planning

Status Quo

11.16.1 General

Waterberg DM covers an area of approximately 4 951 882 ha. It consists mainly of commercial farms, game farming, rural settlements and small towns. The district is geographically, the largest municipality in the Limpopo Province but has the smallest population compared to the other districts (Waterberg DM, 2015). It is located on the western part of the Province.

Thabazimbi LM is located in the south-western part of the Limpopo Province and Waterberg DM. The total area of the municipality is 10 882 km^2, which constitutes 21.97% of the overall DM. The project footprint is located in Wards 1 and 3 of the Thabazimbi LM (based on 2015 delimitation of wards).

Lephalale LM is located in the western part of the Limpopo Province and north-western part of the Waterberg DM. The total area of the municipality is 14 000 km^2, which constitutes 28.3% of the overall DM. The project footprint is located in Wards 3 and 5 of the Lephalale LM (based on 2015 delimitation of wards).

As mentioned, the project infrastructure is mostly located on privately-owned properties that are primarily used for agriculture, game farming and eco-tourism.

11.16.2 SDF

Limpopo Province SDF

The Limpopo SDF is dated September 2007 and indicates the following elements (Waterberg DM, 213) (see **Figure 108**):

- Infrastructure;
- Nodes;
- Environmentally sensitive areas; and
- Corridors: Four corridors are identified as Strategic Development Initiatives. Two of these impact on the District:, namely the Trans-Limpopo Corridor along the N1 and the east-west Corridor from Polokwane via Lephalale to Botswana.

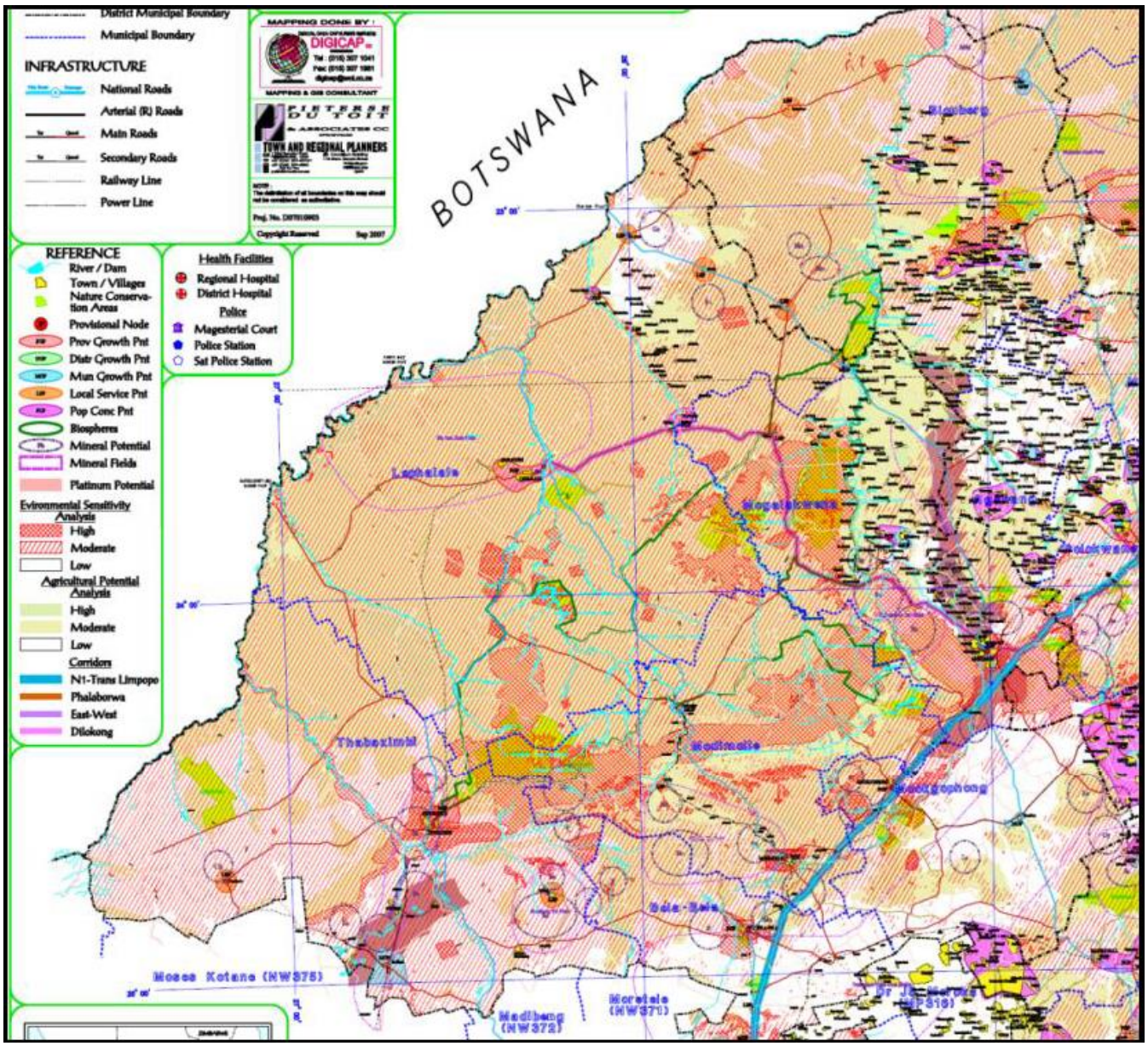


Figure 108 Limpopo Province SDF

Waterberg DM SDF

There is an existing SDF for the Waterberg District, which was approved in 2009, and indicates the following (Waterberg DM, 213) (see **Figure 109**):

- Nodes;
- Networks;
- Conservation and Tourism;
- Mining; and
- Urban and Rural Development.

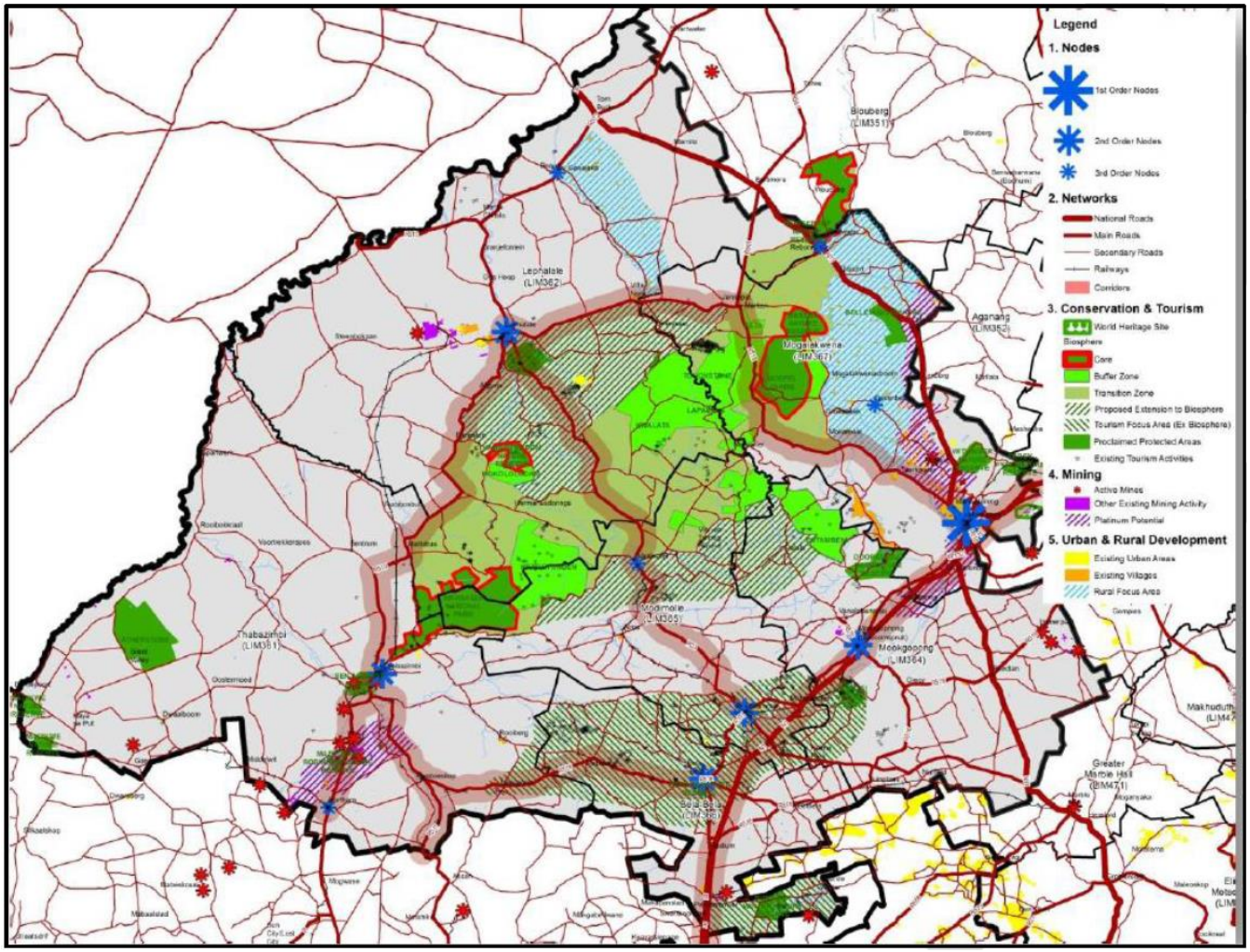


Figure 109: Waterberg DM SDF

Lephalale LM SDF

The Lephalale SDF is dated November 2012 and indicates the following (Waterberg DM, 213) (see **Figure 110**):

- Development corridors and strategic roads;
- Nodal points;
- Human settlement and other zones and
- Long term vision and other features.

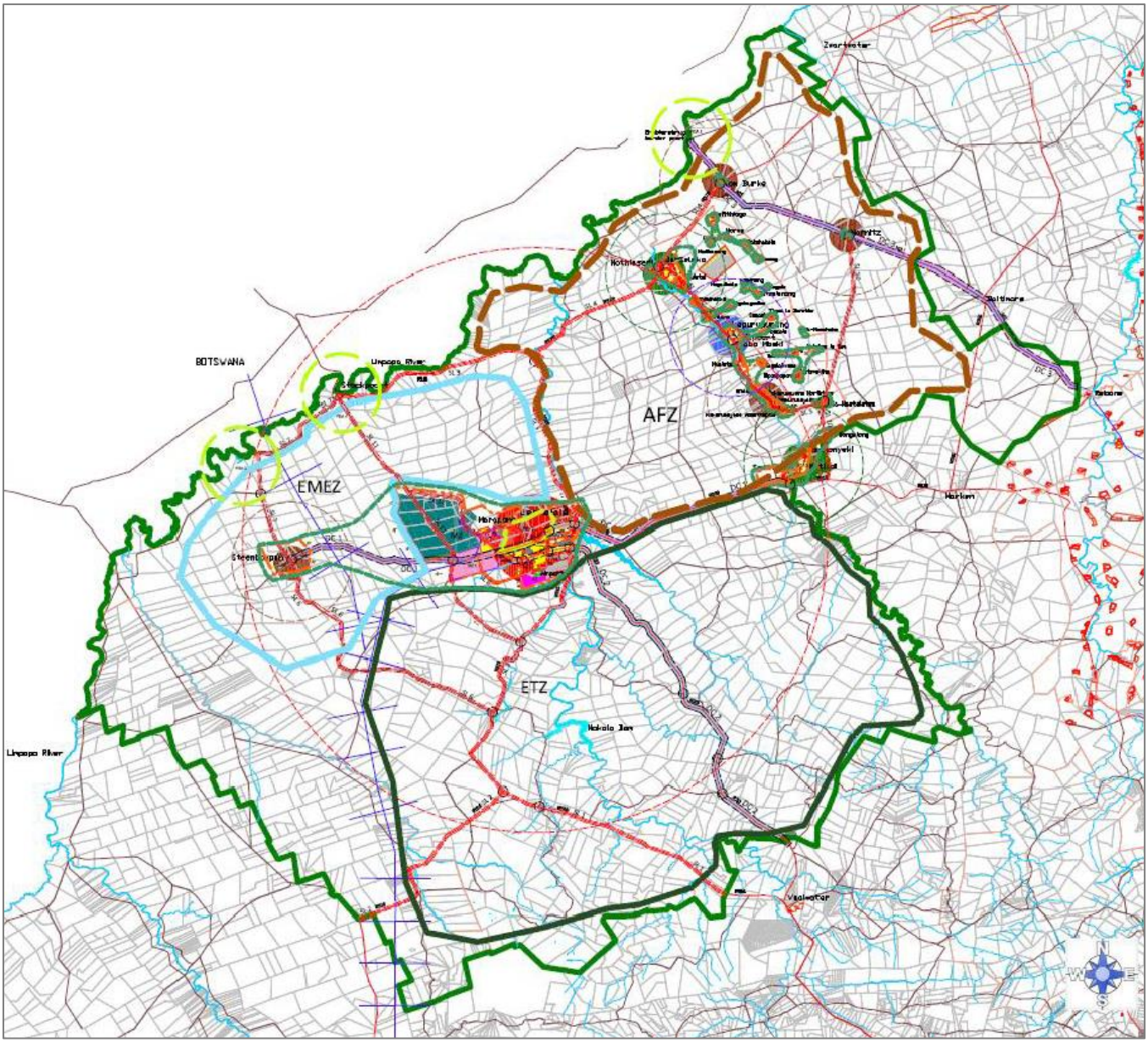


Figure 110: Lephalale LM SDF

Thabazimbi LM SDF

The Thabazimbi SDF is dated June 2008 and indicates the following (Waterberg DM, 213) (see **Figure 111**):

- Growth points;
- Settlements;
- Corridors;
- Nodes;
- Waterberg Biosphere;
- Mines; and
- High-risk river areas.

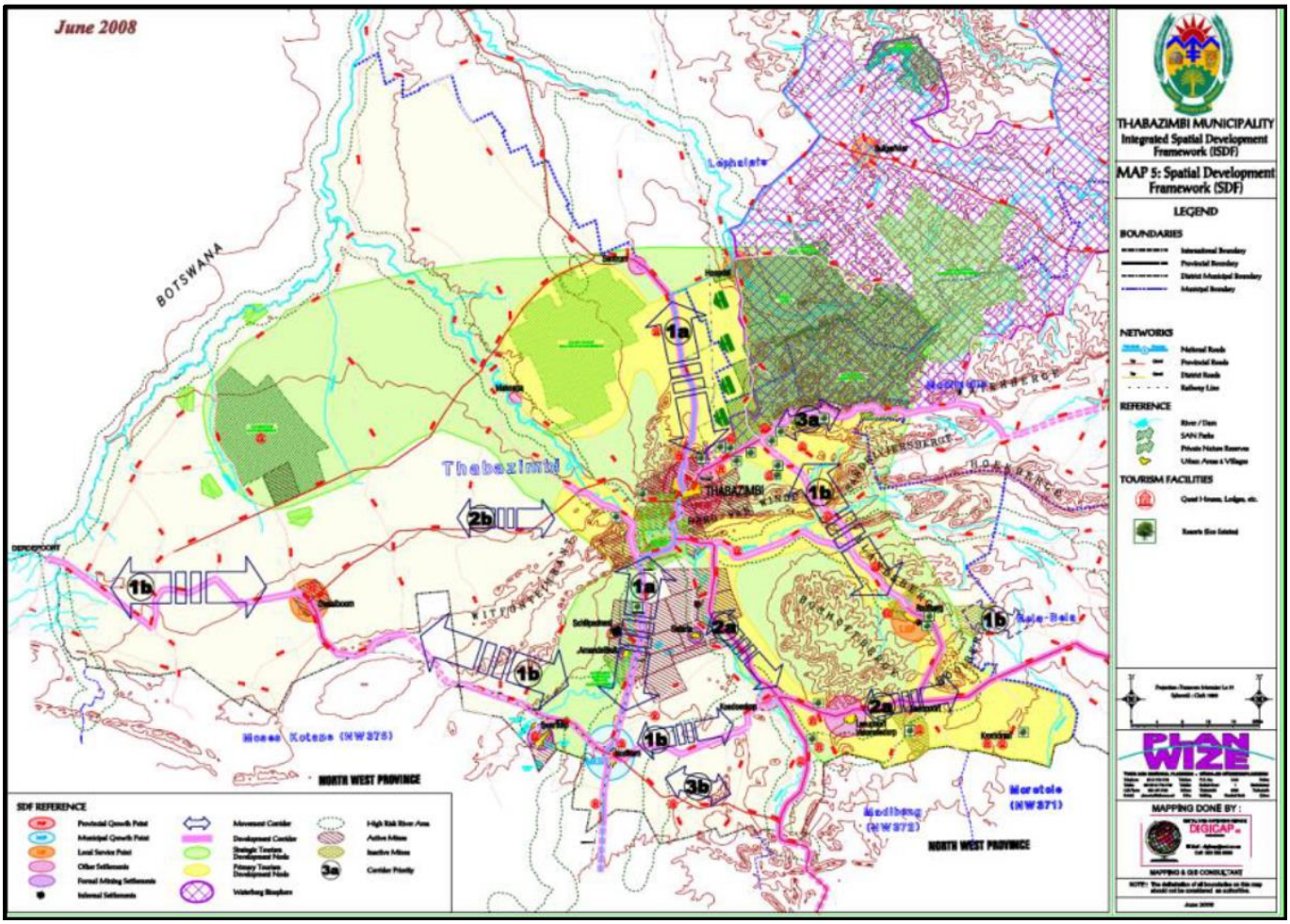


Figure 111: Thabazimbi LM SDF

11.16.3 Environmental Management Framework

An EMF was developed for the Waterberg District with the following objectives (Environomics & NRM Consulting, 2010a):

- Encourage sustainable development;
- Establish development priorities;
- Identify strategic guidance and development management proposals;
- Identify the status quo, development pressures and trends in the area;
- Determine opportunities and constraints;
- Identify geographical areas in terms of NEMA;
- Specify additional activities within identified geographical areas that will require an EIA based on the environmental attributes of such areas;
- Specify currently listed activities that will be excluded from EIA within certain identified geographical areas based on the environmental attributes of such areas; and
- Develop a decision support system for development in the area to ensure that environmental attributes, issues and priorities are taken into account.

In terms of the EMF the project falls within the following Environmental Management Zones (refer to **Figure 112**):

- Zone 4: Game and cattle farming (including hunting) areas with commercial focus;
- Zone 5: Mining and industrial development focus areas;
- Zone 6: Restricted mining focus areas in aesthetic and/or ecological resource areas; and
- Zone 11: Major infrastructure corridors.

It is noted that Zone 11 facilitates the routing of bulk infrastructure, such as the pipeline associated with MCWAP-2A. The EIA will further assess whether MCWAP-2A is incompatible with the desired state established for the remaining zones.

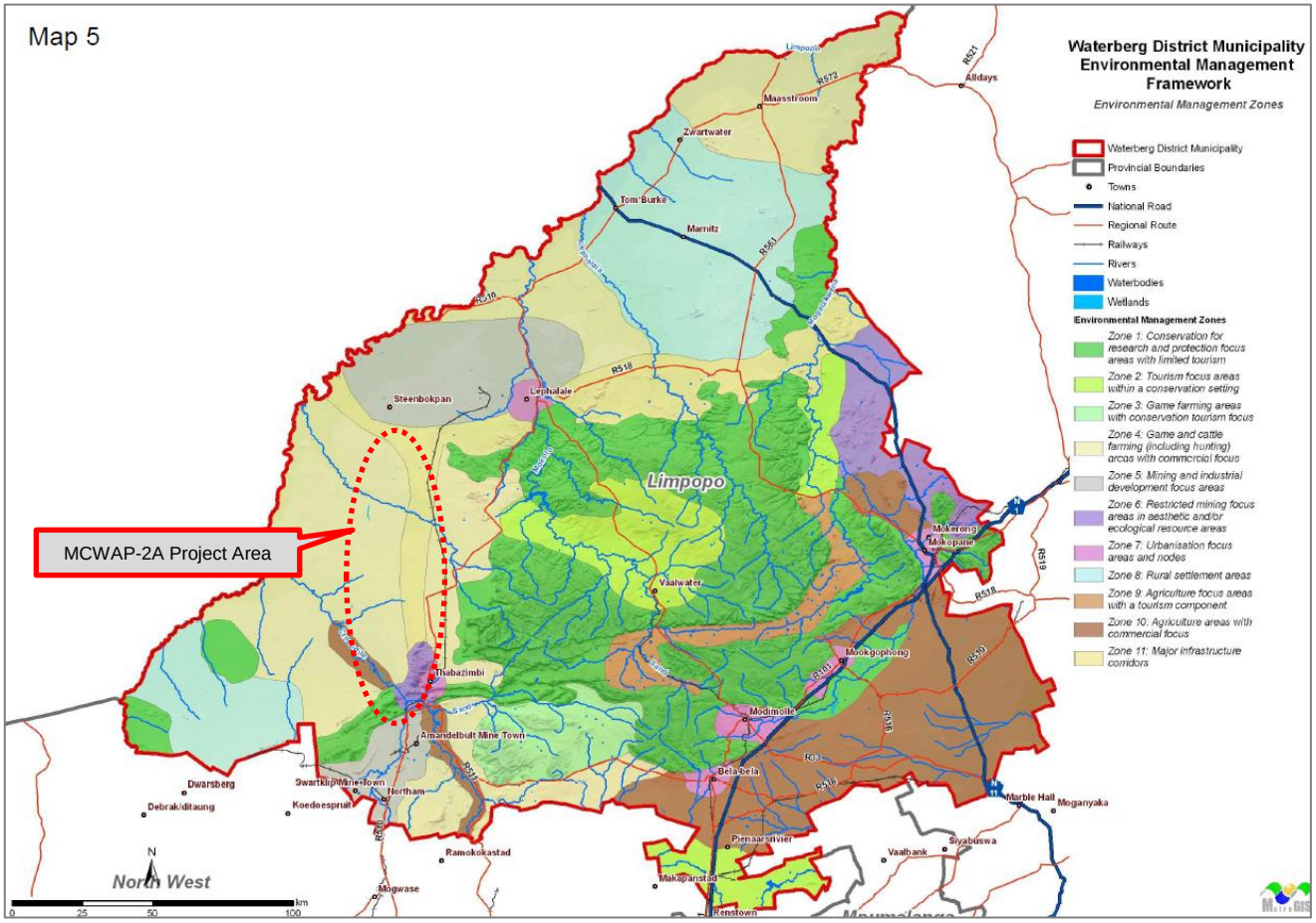


Figure 112: Waterberg DM EMF (Environomics & NRM Consulting, 2010b)

Potential Impacts / Implications

- MCWAP-2A will enable developments associated with the Waterberg coalfields to proceed, with major planning implications for the areas affected. However, the MCWAP-2A infrastructure is not in direct conflict with the planning frameworks of the affected municipalities. MCWAP-2A is further acknowledged in the IDPs for the Thabazimbi LM and Lephalale LM.
- Substantial infrastructure (including the abstraction works, low-lift pump station, balancing dam, desilting works and high-lift pump station) is earmarked for the Mooivallei area. This may

affect the sense of place of the receiving environment. Mitigation measures will be investigated during the ensuing EIA phase.

Specialist Study Triggered / Additional Investigations

- Tourism-related impacts will be assessed in the EIA phase. In this regard, a Visual Impact Assessment was conducted as part of previous EIA for MCWAP-2, which assists in understanding the potential implications to the aesthetic quality of the project area.
- The influence of the proposed MCWAP-2A to matters pertaining to planning and land use will receive further attention in the EIA phase.

11.17 Existing Structures and Infrastructure

Status Quo

The alternative pipeline routes may affect the following physical features located in the project area (amongst others):

- Power lines (transmission, distribution and reticulation);
- Railway line (Central Route) (including bridges);
- Public and private roads (including bridges);
- Telephone lines;
- Access roads to private farms;
- Infrastructure associated with agricultural practices, such as irrigation pipelines, workshops, sheds, livestock enclosures, etc.;
- Private dams and boreholes;
- Fencing erected on the boundaries of private farms;
- Game camps;
- Farm houses and dwellings of farm labourers; and
- Churches and schools.

The balancing dam, desilting works and high-lift pump station affect cultivated land (with associated infrastructure, and are also located near dwellings.

The backwater effect of the proposed abstraction weir will affect existing upstream infrastructure, specifically a low level mine haul road and railway bridge crossing the river some 7.5 km upstream. The future use of the haul road needs to be considered in light of the closure of the mine.

Potential Impacts / Implications

- The infrastructure and structures affected by the proposed development will be relocated, as necessary. Alternatively, compensation will also be considered, where relevant.

- Comply with the specific requirements of the infrastructure custodians when working within servitudes or reserves.
- Disruptions to traffic on local road network during construction. This is associated with road crossings, where the pipeline route follows existing road alignments and as a result of general use of the roads by construction vehicles.
- Disruptions to services.
- Construction-related disturbances (e.g. noise, dust).
- Permanent access along the pipeline servitude will be required after construction.
- Pipeline markers (concrete posts) will be installed at changes in direction and at regular intervals along the pipeline route.
- Following the installation of the pipeline, the servitude can still be utilised by the landowner for certain types of land use, for examples grazing and planting of certain crops. However, the use of the land covering the servitude will be subject to certain restrictions. In this regard, certain activities will not be permitted such as the planting of trees, excavation over the pipeline, building of structures and installation of services.

Specialist Study Triggered / Additional Investigations

- A detailed survey will be conducted to identify all physical features that are located within the final project footprint.
- Optimisation of final pipeline route to be considered in the design phase to avoid existing structures and buildings, as well as other sensitive features (where possible).
- All structures and buildings that will be affected by the project will be identified and suitable compensation measures need to be established.
- Mitigation measures to be identified during the EIA phase to safeguard or relocate existing structures and agricultural infrastructure on private farms or to compensate the owners.

11.18 Transportation

Status Quo

The major transportation network in the region is shown in **Figure 113**.

Lephalale LM

Provincial roads in Lephalale, which serve as links between Thabazimbi, Vaalwater, Ellisras and Mokopane include the following:

- P84/1 (Vaalwater/Ellisras/Botswana);
- P19/2 (Ellisras/Marken) that links with (Mokopane); and
- P198/1 (Vaalwater/Ellisras).

The majority of the movement in the municipality occurs between the Mokerong-area and Lephalale where most of the business facilities are located, and along the road networks to Thabazimbi, Mokopane and Gauteng.

A number of District Roads link with the Main roads, and there are also a number of internal roads, which grant access to farms and settlements.

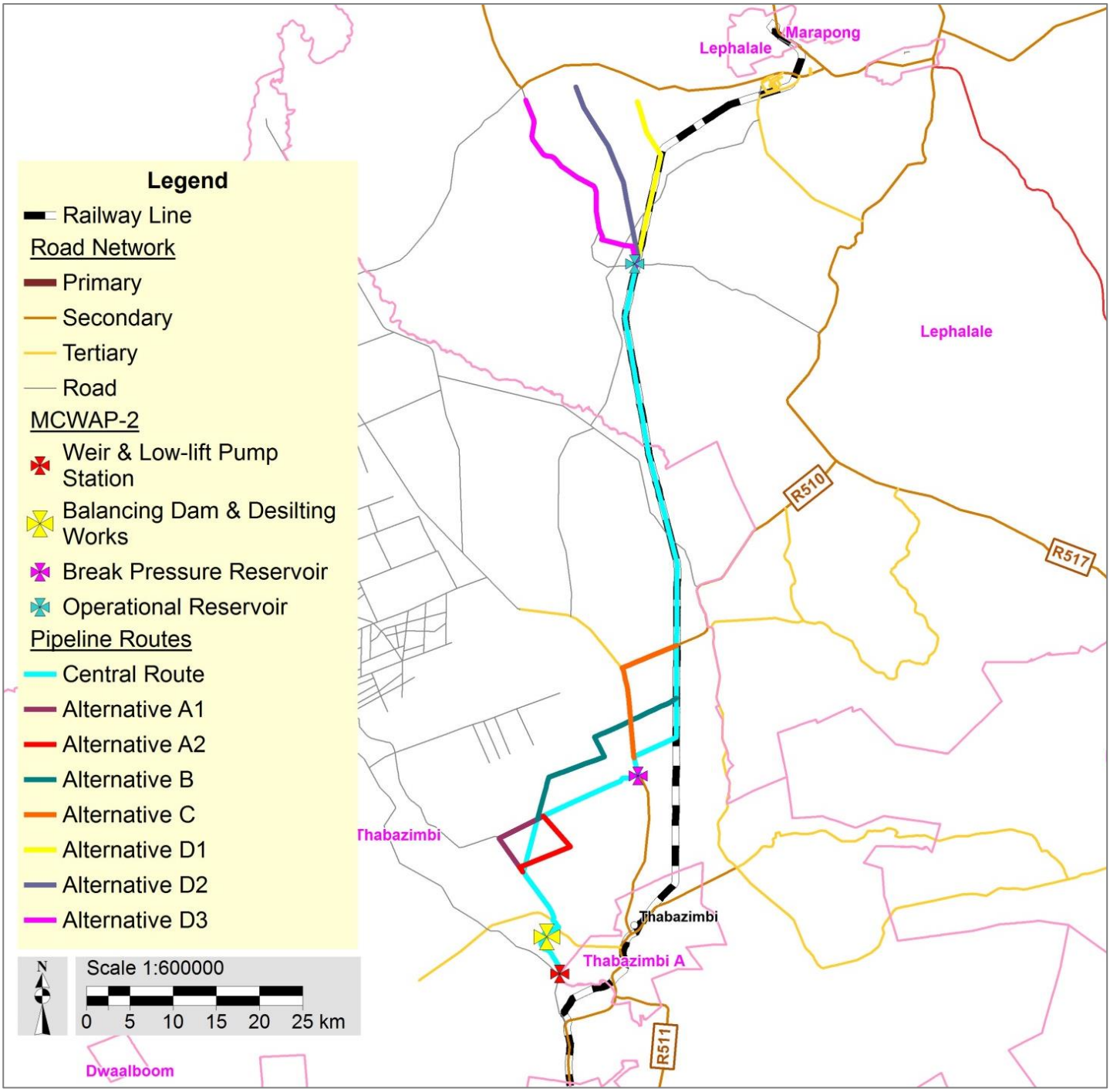


Figure 113: Major Transportation Network in Region
(Note: Pipeline Route Alternative B was discarded)

Lephalale is serviced with a north/south railway line, which transports coal from Grootgeluk Mine. An airfield is also situated in Lephalale.

Thabazimbi Local Municipality

Important routes in Thabazimbi municipal area:

- P16/2 (link with the P84/1 situated in the Lephalale Local Municipality);
- P110/1 (north-south route; access route to the North West Province - Brits/Madibeng);
- P20-1 (east-west route; main access to Bela-Bela);
- P20-2 (east-west route; access to Koedoeskop/Northam);
- D928 (access road to Rooiberg from Thabazimbi); and
- D1649 (access road to Dwaalboom).

Potential Impacts / Implications

- One of the factors considered in determining the alignment of the alternative pipeline route included existing road and rail infrastructure.
- Various public and private roads are affected by the proposed alternative pipeline routes. Some of the major roads that will be followed or crossed by the pipeline alignments include D1649, Rooibokkraal Road (D3677), R510 and the Steenbokpan Road (D175).
- A large section (approximately 56 km) of the Central Route follows the north/south railway line to Lephalale.
- As it is not possible to locate the pipeline within servitudes or reserves of existing infrastructure, it will need to be constructed on the adjoining private properties.
- Permanent access roads will be required for the operational phase, whereas temporary access and haul roads will need to be created for construction purposes. Existing roads will be used, as far as possible.
- During the construction period there will be a significant increase in traffic on the local road networks, due to the delivery of plant and material, transportation of staff and normal construction-related traffic. Haul roads and access roads will also be created on site, within the construction domain.
- As part of the construction phase measures will be implemented for the selective upgrade of the roads (if necessary) and to render these roads safe for other users (amongst others). Dust suppression on the access and hauls roads will also be addressed.

Specialist Study Triggered / Additional Investigations

- Any disruptions to the transportation network must be mitigated, and will be discussed in the EIA Report.
- Traffic management measures will be includes in the EMPr.

11.19 Waste Disposal Facilities

Status Quo

Lephalale LM has one permitted waste disposal facility. The life expectancy of the landfill is 5 years without waste minimization programmes but with such programmes the life expectancy can go as far as more than ten years (Lephalale LM, 2016). The Municipality has appointed a service provider to conduct the feasibility studies for the development of new landfill site.

According to the IDP (Thabazimbi LM, 2017), the waste disposal sites in Donkerpoort (Thabazimbi), Leeuwpoort and Northam have permits.

Potential Impacts / Implications

- The project will directly or incidentally generate various types of solid waste during the construction phase, such as:
  - Waste generated from site preparations (e.g. plant material);
  - Domestic waste;
  - Surplus and used building material; and
  - Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags).
- Wastewater will be produced during construction from the sanitation facilities, washing of plant, operations at the batching plant, etc.
- Excess spoil material (soil and rock) will be generated as part of the bulk earthworks associated with the construction phase of the project. This spoil material will be hauled and dumped at the borrow areas that will be created for the project, as part of rehabilitation.

Specialist Study Triggered / Additional Investigations

- During construction a waste management area will be established at the camps where waste from site will be collected, sorted, weighed and placed in skips and recycling containers for removal to service providers and appropriate registered landfill sites (hazardous and general sites, as required).
- Further provisions for waste and wastewater management will be attended to in the EMPr.

11.20 Aesthetic Qualities

Status Quo

The visual character of the landscape where the MCWAP-2A infrastructure is planned is typical of the bushveld. Private game farms are prevalent in the project area, which afford a high-level of aesthetic appeal to the region. The visual quality of the area is further enhanced by watercourses, undisturbed vegetation and the Vlieëpoort ridge to the south of the pipeline route (see **Figure 114**). The aesthetic quality of certain areas flanking the proposed route is partly degraded due to

the existence of infrastructure such as roads, a railway line (see **Figure 115**) and a transmission line.

Hartbeespoort Dam offers aesthetic value to the surrounding residential and tourism-related developments.

Figure 114: View from Vlieëpoort ridge

Figure 115: View along railway line

Potential Impacts / Implications

Potential visual impacts during the construction phase include:

- Clearing of vegetation;
- Construction-related activities;
- Light pollution;
- Inadequate waste management and housekeeping; and

- Inadequate reinstatement and rehabilitation of construction footprint.

Potential visual impacts during the operational phase include:

- High visibility of permanent infrastructure;
- Loss of “sense of place”;
- Section of cleared vegetation along access road;
- Light pollution;
- Inadequate reinstatement and rehabilitation of construction footprint; and
- Visual impacts of lowered water levels at Hartbeespoort Dam.

Specialist Study Triggered / Additional Investigations

A Visual Impact Assessment was conducted as part of previous EIA for MCWAP-2 and assessed the impacts to the aesthetics as a result of the proposed project infrastructure (especially the abstraction works, balancing dams and reservoirs), and recommended mitigation measures. This assessment also considered the sensitive receptors (e.g. residences) that could potentially be influenced by any visual impacts.

The EMPr will include measures to manage visual impacts and to rehabilitate areas affected by construction activities that fall outside of the development footprint.

11.21 Tourism

Status Quo

Tourism is a key economic sector within the study area. An abundance of tourism activities are available including hunting, game viewing, bird watching, fishing, horse riding, hiking, etc.

There has been a large-scale shift from cattle farming to ecotourism-based land use and hunting in the region, with numerous lodges, chalets and other forms of bush-accommodation also available.

The Waterberg Mountain Range, which stretches from Thabazimbi to Mokopane, is a popular tourist attraction in the region. Thabazimbi is also renowned for the numerous hunting opportunities afforded to tourists. Key tourist attractions in proximity to the MCWAP study area include (amongst others):

- The Marakele National Park lies to the east of the pipeline route (see **Figure 95**);
- Thaba Tholo, which is renowned for breeding threatened and endangered game species like Roan Antelope, Sable Antelope, Tssessbe and disease-free Buffalo, is situated to the west of the pipeline route;
- The Ben Alberts Nature Reserve lies immediately southeast of the Vlieëpoort weir site; and
- Private game reserves are located alongside the pipeline, or are traversed by the pipeline.

Potential Impacts / Implications

Potential impacts to tourism during the construction phase include:

- Visual impacts from construction along the R510 road, which leads to the Marakele National Park;
- Use of surrounding road network by construction and delivery vehicles, which are also used by visitors to the reserves; and
- Impacts to game farming (e.g. temporary fragmentation caused by pipeline trenches, clearing within the construction servitude, noise, dust, light pollution).

The other impacts to tourism are similar to those listed in **Section 11.20** in terms of visual impacts caused during the construction and operational phases of the project.

Specialist Study Triggered / Additional Investigations

A Socio-Economic Impact Assessment earmarked for the EIA phase will need to consider the impacts of the MCWAP-2A on local tourism, and specifically with regards to game farms. Adequate compensation will also be required for the affected parties.

A Wildlife Impact Assessment is to be undertaken as part of the EIA, taking into consideration the types of game kept on the farms and the requisite mitigation measures.

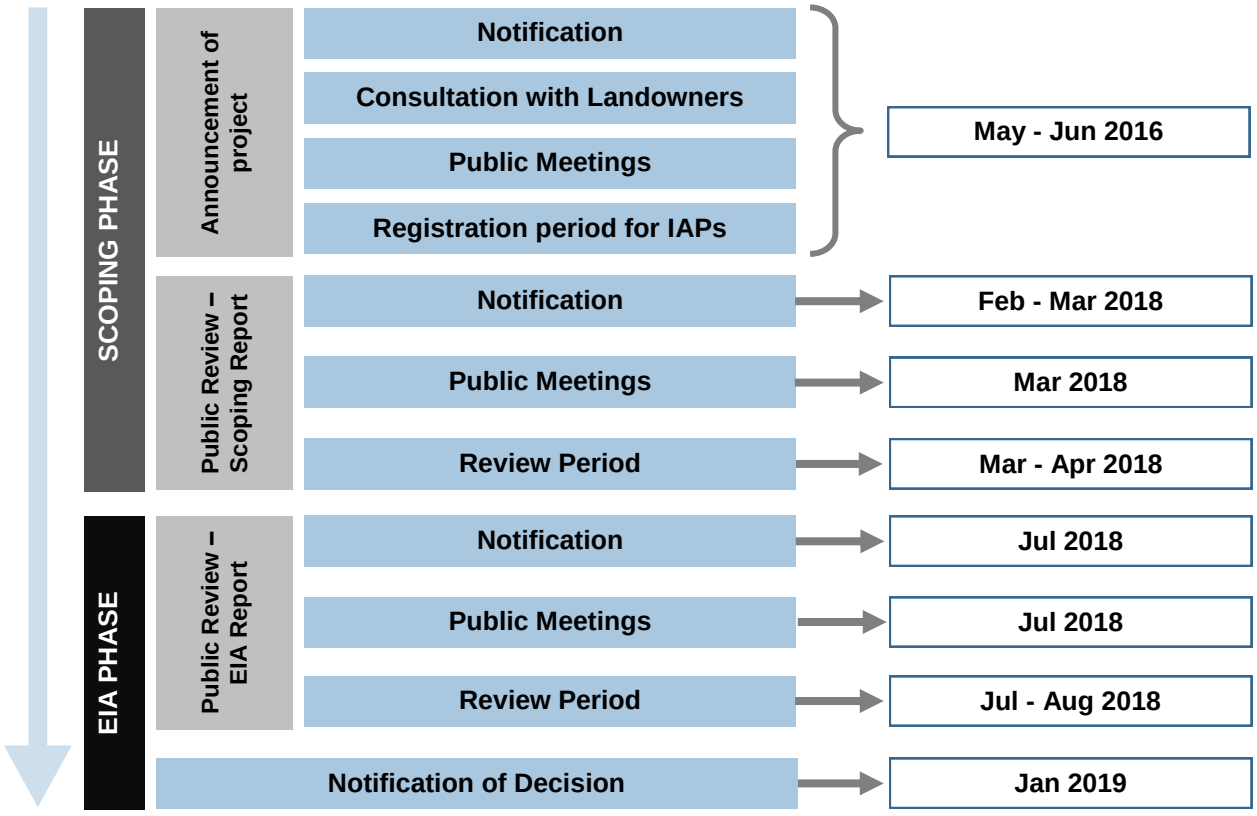
12 PUBLIC PARTICIPATION

12.1 General

The purpose of public participation includes:

1. Providing IAPs with an opportunity to obtain information about the project;
2. Allowing IAPs to express their views, issues and concerns with regard to the project;
3. Granting IAPs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with the project; and
4. Enabling DWS, TCTA and the project team to incorporate the needs, concerns and recommendations of IAPs into the project, where feasible.

The public participation process that was followed for the proposed MCWAP-2A is governed by NEMA and GN No. R 982 of 4 December 2014 (as amended). **Figure 116** outlines the public participation process for the Scoping phase (current) and EIA phase (pending). Note that the dates may change due to the dynamic nature of the EIA process.



Note: *Dates may change during the course of the EIA process*

Figure 116: Outline of Public Participation Process

12.2 Pre-Application Consultation

A Pre-application Consultation Meeting was convened with DEA on 19 August 2015 (refer to **Appendix E** for a copy of the minutes of the meeting). The outcomes of the meeting are discussed in **Section 6.3**.

12.3 Database of IAPs

A database of IAPs, which includes authorities, different spheres of government (national, provincial and local), parastatals, ward councillors, stakeholders, landowners, interest groups and members of the general public, was prepared for the project and is contained in **Appendix I**. This database will be maintained and updated as necessary during the course of the EIA.

12.4 Landowner Notification

Details of the properties that are directly affected by and adjacent to the proposed development (including maps), as well as the landowners, are contained in **Appendix B**. Proof of notification is provided in **Appendix M**.

According to Regulation 39(1) of GN No. R 982 of 4 December 2014 (as amended), if the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land. This requirement does not apply *inter alia* for linear developments (e.g. pipelines, power lines, roads) or if it is a SIP as contemplated in the Infrastructure Development Act, 2014. MCWAP-2A qualifies under SIP 1 and landowner consent is thus not required.

12.5 Project Announcement

The tasks listed in the sub-sections to follow were undertaken during the project announcement phase.

12.5.1 Background Information Document

A Background Information Document (BID) and Reply Form (refer to **Appendix K**) were forwarded to each of the IAPs contained in the database.

The BID provided the following information in a succinct format:

- Project background and overview;
- EIA process; and

- Details of the public participation process and where more information could be obtained.

The BID included a Reply Form, which granted the opportunity to register as an IAP and to raise queries or concerns regarding the project. Copies of the completed Reply Forms and other correspondence received from IAPs are contained in **Appendix R**.

12.5.2 Onsite notices

Onsite notices, which also served to announce the project, were placed at strategic points within the project area (listed in **Table 48**) in May 2017. Onsite notices were primarily placed in proximity to the project components, based on the availability of public access.

Table 48: Locations of onsite notices

No.	Description	Coordinates
1.	Mooivallei Road (D1649)	24°37'18.21"S; 27°18'45.99"E
2.	Mooivallei Road (D1649)	24°35'51.98"S; 27°19'43.04"E
3.	Mooivallei Road (D1649)	24°35'21.32"S; 27°18'59.68"E
4.	Mooivallei Road (D1649)	24°34'39.82"S; 27°18'30.91"E
5.	Paarl (3677)	24°31'38.35"S; 27°16'29.10"E
6.	Leeubosch (R510)	24°25'30.09"S; 27°24'24.21"E
7.	Tarantaalpan (R510)	24°24'24.78"S; 27°24'2.54"E
8.	Tarantaalpan (R510)	24°22'10.78"S; 27°23'48.08"E
9.	Honingvley (R510)	24°18'53.64"S; 27°23'13.76"E
10.	Witklip (R510)	24°17'28.15"S; 27°26'58.49"E
11.	Steenbokpan Road	24°10'50.43"S; 27°26'35.24"E
12.	Steenbokpan Road	24° 5'51.23"S; 27°24'21.01"E
13.	Steenbokpan Road	23°58'26.99"S; 27°23'15.37"E
14.	Steenbokpan Road	23°53'39.09"S; 27°24'13.66"E
15.	Steenbokpan Road	23°52'24.00"S; 27°23'24.82"E
16.	Steenbokpan Road	23°51'31.38"S; 27°23'58.64"E
17.	Steenbokpan Road	23°50'6.65"S; 27°25'4.04"E
18.	Steenbokpan Road	23°48'12.71"S; 27°20'18.09"E
19.	Theunispan	23°43'18.06"S; 27°16'40.88"E
20.	Steenbokpan Winkel	23°42'37.67"S; 27°16'26.06"E
21.	Agri-SA Ellisras	23°40'19.68"S; 27°44'29.83"E
22.	Thabazimbi Library	24°35'49.00"S; 27°24'25.77"E
23.	Thabazimbi Municipal Offices	24°35′20.75” S, 27°24′34.64” E
24.	Koedoeskop Shop & Post office	24°53'0.44"S; 27°31'32.77"E
25.	Sentrum Agricultural Union Auctioning Kraals	24°15'35.65"S; 27°19'37.24"E

Details of the locations of the onsite notices and accompanying photographs are contained in **Appendix L**.

12.5.3 Newspaper Advertisements

Advertisements were placed in the following newspapers in May 2017 as notification of the project (refer to copies of the newspaper advertisements contained in **Appendix N**):

- The Star;
- The Daily Sun;
- Die Kwêvoël;
- Beeld; and
- Mogol Pos.

12.5.4 Comments Received during the Announcement Phase

Copies of the comments received during the EIA announcement phase are included in **Appendix R**.

12.5.5 Public Meetings

The details of the public meetings held during the EIA announcement phase are provided in **Table 49** (see photographs in **Figures 117 - 119**). The minutes of these meetings are contained in **Appendix O**.

Table 49: Details of Public Meetings - EIA Announcement Phase

Date	25 May 2016	26 May 2016	26 May 2016
Area	Thabazimbi	Lephalale	Steenbokpan
Time	09h00 – 13h00	08h30 – 12h30	14h00 - 18h00
Venue	Kumba Bioscope Hall	Mogol Conference Hall	Thusong Community Centre

The purpose of this meeting included the following:

- To introduce the project to the public;
- To provide an overview of the EIA process;
- To provide a platform for project-related discussions; and
- To obtain input into the Scoping Phase.

Figure 117: Picture of public meeting held on 25 May 2016 (Thabazimbi)

Figure 118: Picture of public meeting held on 26 May 2016 (Lephalale)

Figure 119: Pictures of public meeting held on 26 May 2016 (Steenbokpan)

12.5.6 Environmental Authorities' Meeting

Authorities are regarded as government departments with jurisdiction pertaining to the activities associated with the proposed project or the receiving environment. An Environmental Authorities Meeting was held on 25 May 2016 (see photograph in **Figure 120**). The minutes of this meeting are contained in **Appendix P**.

Figure 120: Picture of authorities' meeting held on 25 May 2016 (Thabazimbi)

12.5.7 Focus Group Meetings with Irrigators

The need to convene dedicated focus group meetings with the three affected irrigation groups was identified during the EIA announcement phase. These meetings, which form part of a broader Public Involvement Programme, were held in January 2018 (see details of meetings in **Table 50** and photographs in **Figures 121 - 123**). The minutes of these meetings are contained in **Appendix Q**.

Table 50: Details of Focus Group Meetings with Irrigators

Group	Hartbeespoort Irrigation Board	Crocodile-West Irrigation Board	Makoppa Irrigation Group
Date	24 January 2018	24 January 2018	25 January 2018
Time	09h00 – 12h00	14h00 – 17h00	09h00 – 12h00
Venue	DWS Hartbeespoort Area Office	Koedoeskop Agricultural Union Hall	Kumba Bioscope Hall, Thabazimbi

The primary aims of the focus group meetings included the following:

- To provide an overview of the findings of previous and related studies, including –
  - Crocodile River (West) Reconciliation Strategy; and
  - Validation and verification of water use in the Crocodile (West)-Marico catchment;
- To provide information pertaining to the proposed River Management System; and
- To discuss key agricultural issues related to the proposed project, including –
  - Availability of water in the Crocodile River (West); and
  - Management of impacts regarding Existing Water Uses (Operating Rules).

Figure 121: Focus group meeting with Hartbeespoort Irrigation Board

Figure 122: Focus group meeting with Crocodile-West Irrigation Board

Figure 123: Focus group meeting with Makoppa Irrigation Group

12.6 Review of Draft Scoping Report

12.6.1 Notification of Review of Draft Scoping Report

In accordance with Regulation 43(1) of GN No. R 982 of 4 December 2014 (as amended), registered IAPs are granted an opportunity to review and comment on the Draft Scoping Report.

The following notifications were provided with regards to the review of the Draft Scoping Report:

- Landowners, authorities and registered IAPs were notified via email;
- Notices were placed in the following newspapers (copies of the newspaper advertisements to be contained in the Final Scoping Report) -
  - The Star;
  - The Daily Sun;
  - Die Kwêvoël;
  - Beeld; and
  - Mogol Pos;
- Onsite notices were placed at the same points listed in **Table 48**.

12.6.2 Public Access to the Draft Scoping Report

The review period for the Draft Scoping Report will take place from **06 March until 11 April 2018**. Copies of the document were placed at the locations provided in **Table 51**.

Table 51: Locations for review of Draft Scoping Report

Copy	Location	Address	Tel. No.
1.	Lephalale Public Library	Lephalale Civic Centre, c/o Joe Slovo & Dou Water St, Lephalale	014 762 1453
2.	Thabazimbi Public Library	4th Ave, next to Police station in Thabazimbi	014 777 1525
3.	National Library of South Africa (Pretoria)	c/o Johannes Ramokhoase St and Thabo Sehume St	012 401 9700
4.	Steenbokpan Winkel	Steenbokpan	014 766 0167

The Draft Scoping Report can also be downloaded from the following website - http://www.nemai.co.za/environmental.html.

12.6.3 Copies of Draft Scoping Report to Authorities

Copies of the Draft Scoping Report were provided to the following regulatory and commenting authorities:

- DEA;
- LDEDET;
- DWS Limpopo Regional Office;
- DAFF;

- LIHRA;
- Department of Public Works, Roads and Infrastructure;
- Waterberg DM, Thabazimbi LM and Lephalale LM.

12.6.4 Copies of Draft Scoping Report to Agricultural Groups

Copies of the Draft Scoping Report were also provided to the following agricultural groups:

- Hartbeespoort Irrigation Board;
- Crocodile River (West) Irrigation Board;
- Makoppa Irrigators;
- Sentrum Agricultural Union and Thabazimbi District Agricultural Union;
- Agri Lephalale Office (6A Jacobus Street; Tel. No. 014 763 1888);
- Lephalale District Agricultural Union; and
- Transvaal Agricultural Union South Africa (TAU-SA) (Obaro, Thabazimbi; Tel. No. 014 766 0167).

12.6.5 Public Meetings to Present the Draft Scoping Report

The details of the public meetings scheduled to present the Draft Scoping Report are provided in **Table 52**. The minutes of these meetings will be included in the Final Scoping Report.

Table 52: Details of Public Meetings - Scoping Phase

Date	13 March 2018	14 March 2018	15 March 2018	
Area	Hartbeespoort Dam	Thabazimbi	Lephalale	Steenbokpan
Time	9:00 – 12:00	9:00 – 12:30	9:00 – 12:30	14:00 – 17:00
Venue	Hartbeespoort NG Kerk	Kumba Bioscope Hall, Thabazimbi	Mogol Conference Room	Thusong Community Centre

12.6.6 Comments Received on the Draft Scoping Report

Comments received from authorities and IAPs during the review period for the Draft Scoping Report will be included in the Final Scoping Report. The Comments Sheet provided in **Appendix U** can be used for capturing comments.

12.7 Issues raised by IAPs

The Scoping phase serves to identify and prioritise issues for further assessment during the EIA phase. Accordingly, the comments received from authorities and IAPs during public participation as part of Scoping will be afforded due consideration and further investigation during the pending EIA stage. A Comments and Responses Report will be included in the Final Scoping Report, which will summarise the issues raised and the project team's response to these matters.

13 POTENTIALLY SIGNIFICANT ENVIRONMENTAL ISSUES

In accordance with the purpose of the Scoping exercise as part of the overall environmental assessment, this section aims to identify potentially significant environmental issues for further consideration and prioritisation during the EIA stage. This allows for a more efficient and focused impact assessment in the ensuing EIA phase, where the analysis is largely limited to significant issues and reasonable alternatives.

13.1 Approach

13.1.1 Predicting Significant Environmental Issues

The potential environmental issues associated with the proposed project were identified during the Scoping phase through an appraisal of the following:

- Project-related components and infrastructure;
- Activities associated with the project life-cycle;
- Resources required for construction and operation;
- Nature and profile of the receiving environment and potential sensitive environmental features and attributes (see **Section 10**), which included a desktop evaluation (via literature review, specialist input, GIS, topographical maps and aerial photography) and site investigations;
- Review of technical information, including the Feasibility Study;
- Understanding of direct and indirect effects of the project as a whole;
- Input received during public participation from authorities and IAPs; and
- Legal and policy context (see **Section 5**).

Apart from explaining the receiving environment, **Section 10** succinctly discusses possible impacts during primarily the construction and operational phases of the project. The significant environmental issues were distilled from this information and are summarised in **Section 13.2**. Cumulative impacts are briefly explained in **Section 13.3**.

13.1.2 Mitigation of Impacts

During the EIA stage a detailed assessment will be conducted to evaluate all potential impacts (paying particular attention to the significant issues listed in the Scoping Report), with input from the project team, requisite specialist studies and IAPs and through the application of the impact assessment methodology contained in **Section 13.4**.

Suitable mitigation measures will be identified to manage the environmental impacts according to the following hierarchy:

1. Initial efforts will strive to **prevent** the occurrence of the impact;

2. If this is not possible, mitigation will include measures that reduce or **minimise** the significance of the impact to an acceptable level;
3. **Remediation** and **rehabilitation** will take place if measures cannot suitably prevent or reduce the impacts, or to address the residual impacts; and
4. As a last measure, **compensation** will be employed as a form of mitigating the impacts associated with a project.

The mitigation measures will be incorporated into the EMPr, which will form part of the EIA Report. This deliverable, together with the Environmental Authorisation, can act as a standalone document that can be used to *inter alia* monitor against compliance of the project with its pre-determined objectives, targets and management actions.

13.2 Summary of Potentially Significant Environmental Issues

Pertinent environmental issues, which will receive specific attention during the EIA phase through a detailed quantitative assessment and relevant specialist studies (where deemed necessary), are listed in the tables to follow.

Table 53: Potentially Significant Environmental Issues for prioritisation during the EIA phase

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts	Investigations * / EIA Provisions
Land Use	• Temporary loss of land used for agriculture and game farming within pipeline servitude. • Permanent loss of land at abstraction works, low-lift pump station, balancing dam, desilting works, high-lift pump station, BPR, OR and chambers. • Servitude restrictions. • Disturbances on game farms.	• Permanent loss of land at abstraction works, low-lift pump station, balancing dam, desilting works, high-lift pump station, BPR, OR and chambers. • Servitude restrictions and inspections. • Operation and maintenance functions. • Impacts to land use surrounding Hartbeespoort Dam due to fluctuating water levels.	• Agricultural Impact Assessment; • Terrestrial Ecological Study; • Visual Impact Assessment (previous EIA for MCWAP-2); • Socio-economic Impact Assessment; • Heritage Impact Assessment; and • Wildlife Impact Assessment. • EMPr
Climate	• Emission of greenhouse gases during construction.	• Impacts of climate change on the yield and operation of the scheme.	• Climate change factors considered as part of the Water Resources Planning Model • EMPr
Geology	• Blasting related impacts. • Sourcing of construction aggregate and associated impacts (e.g. borrow pits, haul roads). • Disposal of spoil material. • Unsuitable geological conditions – risks to structural integrity of infrastructure. • Significant work will be required to prepare the foundation for	-	• Geotechnical Study • Dolomite stability investigations • EMPr

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts	Investigations * / EIA Provisions
	the abstraction weir.		
Geohydrology	• Potential disturbance of the aquifer from blasting. • Contamination of groundwater primary aquifer with water from more saline secondary aquifer as a result of blasting. • Potential contamination of groundwater during the construction stage. • Possible influence to groundwater flow as a result of trenching during construction.	• Possible pollution of the aquifer with water during the maintenance of the infrastructure. • Impacts to the recharge of the alluvial aquifer downstream of the abstraction weir, due to surface water and groundwater interactions.	• Monitoring of groundwater levels during construction and operational phases to confirm that (a) the alluvial aquifer downstream of Vlieëpoort is not negatively impacted on by the proposed abstraction works; and (b) the adequacy of releases from the abstraction weir to recharge the aquifer downstream of Vlieëpoort. • EMPr
Soil	• Soil erosion (e.g. steep terrain and instream works). • Soil contamination through poor construction practices and inadequate management of dangerous goods (e.g. fuel).	• Soil erosion (e.g. steep terrain and instream works).	• Agricultural Impact Assessment. • Geotechnical Study • EMPr
Hydrology	• Temporary impacts to flow during the instream works associated with the construction of the weir and pipeline crossings.	• Alteration of flow regime by the weir structure. • Impact of the proposed Abstraction Works on flood levels and on infrastructure up- and downstream of the weir. • Reduction in the average levels of the upstream impoundments during the operation of the scheme.	• Hydrological assessment (Feasibility Study) • Reserve determination (conducted separately from EIA) • River Management System • Aquatic Impact Assessment
Water Quality	• Sedimentation from instream works. • Water quality impacts due to spillages and poor construction practices.	• During the maintenance of the pipeline and reservoirs the raw water conveyed and stored within this system, which is water of poor quality from the Crocodile River, will be released into the Matlabas River and other watercourses from scour valves.	• Water Quality Monitoring Programme • Aquatic Impact Assessment • Solution for releases into the Matlabas River • EMPr
River Morphology	• The weir structure in the Crocodile River and the pipeline crossings at watercourses may lead to the alteration of the morphology of the watercourse (e.g. destabilisation of bed and banks of watercourses).	• Destabilisation of river structure due to inadequate reinstatement and rehabilitation.	• Aquatic Impact Assessment • EMPr
Riparian Habitat	• Encroachment of construction activities into riparian zones / wetlands. • Inundation of instream habitat as a result of the weir's backwater effect. • Loss of riparian and instream vegetation within construction	• Disturbances of riparian vegetation may lead to erosion and encroachment of exotic vegetation.	• Aquatic Impact Assessment • EMPr

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts	Investigations * / EIA Provisions
	domain.		
Wetlands and Pans	• Crossing of wetlands and pans by the pipeline and access roads • Inundation of wetlands as a result of the weir's backwater effect	• Destabilisation of wetlands due to inadequate reinstatement and rehabilitation. • Impacts to wetlands downstream of the abstraction point (surface-groundwater interactions).	• Reserve determination (conducted separately from EIA) • Aquatic Impact Assessment • EMPr
Water Use	• Impacts to existing water users (e.g. sedimentation)	• Impact of the abstraction from the Crocodile River (West) and of the management of the system on the existing agricultural water users. • Water availability in the Crocodile River (West). • Impacts to recreational use at Hartbeespoort Dam due to fluctuating water levels.	• River Management System • Socio-economic Impact Assessment • EMPr
Aquatic Ecology	• Disruptions to aquatic biota community due to water contamination, temporary alteration of flow and disturbance to habitat during construction (instream works).	• The abstraction weir and gauging weirs will act as instream barriers that will prevent the migration of aquatic biota. • The abstraction weir will serve as a morphological modification and the backwater created by the structure will change the affected upstream river reach from a lotic to more of a lentic ecosystem. This will result in changes to the aquatic community structure and remove certain habitats from potential utilisation. • Impairment of ecosystem functioning in Hartbeespoort Dam due to fluctuations in water levels.	• Reserve determination (conducted separately from EIA) • Aquatic Impact Assessment • EMPr
Sediment Regime	• Sedimentation from instream works.	• Management of sediment at abstraction works to be stored and returned to the Crocodile River (West) during operational phase	• Sediment Baseline Study • EMPr
Terrestrial Ecology - Flora	• Encroachment into CBAs and ESAs, which are important in terms of biodiversity, ecosystem functionality and ecological processes. • Vegetation will primarily be lost in areas that are to be cleared for the project infrastructure. The potential loss of significant flora species may occur. • Clearing of vegetation for construction purposes may result in the proliferation of exotic vegetation, which could spread beyond the construction domain.	• The establishment of trees within the pipeline servitude will not be allowed as roots may compromise the stability of the pipeline.	• Terrestrial Ecological Impact Assessment • Search, Rescue and Relocation Management Plan • EMPr

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts	Investigations * / EIA Provisions
Terrestrial Ecology - Fauna	• Ecosystem disruption may occur where clearing is undertaken to allow for the construction of the project infrastructure. • Sections of the alternative pipeline routes traverse or pass in close proximity to enclosures where sensitive game is kept. • Fauna could be adversely affected through construction-related activities (noise, dust, light pollution, illegal poaching, and habitat loss). This is especially relevant to sensitive game species (including exotic game). • The construction servitude will minimise animal movement. This is particularly significant on smaller game farms or in instances where access to watering points will be affected. • Possible disturbance to the bat cave that is situated in the Mooivallei area during construction.	• Disruptions to game farms during operation and maintenance activities.	• Terrestrial Ecological Impact Assessment • Wildlife Impact Assessment • EMPr
Socio-economic Environment	• Loss of land (including structures and cultivated areas) through project infrastructure. • Loss of agricultural production. • Risk to game and livestock as a result of construction related hazards. • Loss of income in eco-tourism sector (hunting and game farming). • Potential damage to property (e.g. gates, fences, structures). • Servitude restrictions; • Use of local road network. • Safety and security. • Impact to visual quality and sense of place. • Nuisance from dust and noise. • Light pollution. • Influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes, anti-social behaviour, and incidence of HIV/AIDS). • Reduction in property value. • If the projected development materialise the population and specifically the urban population of Lephalale will grow substantially.	• Use of local road network for operation and maintenance purposes. • Impact to visual quality and sense of place. • Provision of light at infrastructure may cause light pollution. • Inundation of low level bridges due to the weir's backwater effect. • The pump stations will be operating continuously and may cause noise pollution. • Cumulative impacts to properties that are already affected by existing linear infrastructure. • Impacts to smaller properties, where the servitude may affect the critical mass required to continue with the current land use. • The operating level of the Hartbeespoort Dam will fluctuate as per seasonal rains, with associated impacts to the surrounding recreational water users (active and passive).	• Socio-economic Impact Assessment • EMPr
Agriculture	• Loss of cultivated land within construction domain. • Loss of grazing land within construction domain. • Loss of stock watering points	• Potential impacts to water users (and associated agro-economic impact from reduced crop and food production) downstream of the	• Agricultural Impact Assessment • Socio-economic Impact Assessment • EMPr

Environmental Factor	Construction Phase Potential Issues / Impacts	Operational Phase Potential Issues / Impacts	Investigations * / EIA Provisions
	within construction domain. • Disruptions to farming operations as a result of construction-related use of existing access roads. • Loss of fertile soil through land clearance.	abstraction works on the Crocodile River. • Permanent loss of cultivated land due to physical infrastructure.	
Historical and Cultural Features	• Heritage and cultural resources could be destroyed or damaged through construction activities.	-	• Heritage Impact Assessment • EMPr
Existing Structures & Infrastructure	• Risk of damaging existing services, infrastructure and structures during construction. • Disruptions to traffic on local road network during construction. This is associated with road crossings, where the pipeline route follows existing road alignments and as a result of general use of the roads by construction vehicles.	• Impact of the proposed Abstraction Works on flood levels and on infrastructure up- and downstream of the weir. • Servitude restrictions.	• Socio-economic Impact Assessment • Relocation of affected infrastructure • Satisfy requirements of infrastructure owners • EMPr
Transportation	• Increase in traffic on the local road networks. • Develop temporary access and haul roads. • Risks to road users.	• Permanent access along the pipeline servitude will be required after construction.	• Traffic Impact Assessment • EMPr
Solid Waste	• Waste generated from site preparations (e.g. plant material). • Domestic waste. • Surplus and used building material. • Hazardous waste (e.g. chemicals, oils, soil contaminated by spillages, diesel rags). • Wastewater (sanitation facilities, washing of plant, operations at the batching plant, etc.). • Disposal of excess spoil material (soil and rock) generated as part of the bulk earthworks.	-	• EMPr
Aesthetics	• Visual quality and sense of place to be adversely affected by construction activities.	• High visibility of permanent infrastructure. • Loss of “sense of place”. • Section of cleared vegetation along access road. • Provision of light at infrastructure may cause light pollution. • Inadequate reinstatement and rehabilitation of construction footprint. • Visual impacts of lowered water levels at Hartbeespoort Dam.	• Visual Impact Assessment (previous EIA for MCWAP-2) • EMPr

* *Investigations refer to technical studies that have been completed (further details to be included in the EIA Report, or future studies to be undertaken).*

13.3 Cumulative Impacts

A cumulative impact, in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

Cumulative impacts can be identified by combining the potential environmental implications of MCWAP-2A with the impacts of projects and activities that have occurred in the past, are currently occurring, or are proposed in the future within the project area.

The following potential cumulative impacts will be considered as part of the EIA:

- The propose MCWAP pipeline will cross over properties that are already traversed by existing linear infrastructure. These properties will thus have a network of infrastructure with the associated servitude restrictions.
- Increasing the footprints of existing linear developments (e.g. roads, power lines, railway line). However, the alignment of the proposed MCWAP pipeline along existing linear disturbances may be preferred, as it limits the fragmentation of the affected land.
- The construction period may cause traffic-related impacts in terms of the local road network, which will be associated with heavy vehicle construction traffic for the delivery of material, transportation of construction workers and general construction-related traffic. This may compound traffic impacts if other large scale projects are planned during the same period.
- Land clearing activities and other construction-related disturbances could lead to the cumulative loss of bushveld vegetation as well as the proliferation of exotic vegetation.
- There will be an increase in the dust levels during the construction phase, as a result of earthworks, use of haul roads and other gravel roads, stockpiles, material crushing, etc.
- The Terrestrial Ecological Impact Assessment will need to identify species of conservation significance that could be adversely affected by the project activities. This study will need to consider the existing local impacts to the biodiversity and the incremental loss of conservation-worthy species, within the context of the provincial conservation goals and targets.
- Construction activities on steep slopes that are already disturbed can contribute towards erosion, if proper reinstatement and rehabilitation is not undertaken.
- Changes in demographics in the region due to the influx of employment seekers, particularly in the light of the existing and future development in Lephalale, and the associated problems (e.g. crime, STDs).
- Cumulative impacts to Hartbeespoort Dam as a result of reduced water levels.

The cumulative water user requirements of the Crocodile River (West) have been duly considered in the DWS water resource planning process, including the Reconciliation Study for the Crocodile West Water Supply System (DWS, 2015) and the MCWAP Feasibility Study.

13.4 Methodology to Assess the Identified Impacts

The EIA quantitative impact assessment will further focus on the direct and indirect impacts associated with the project. All impacts will be analysed with regard to their nature, extent, magnitude, duration, probability and significance. The following definitions and criteria apply:

Nature (/Status)
The project could have a positive, negative or neutral impact on the environment.

Extent
- Local - extend to the site and its immediate surroundings.
- Regional - impact on the region but within the province.
- National - impact on an interprovincial scale.
- International - impact outside of South Africa.

Magnitude
Degree to which impact may cause irreplaceable loss of resources.
- Low - natural and social functions and processes are not affected or minimally affected.
- Medium - affected environment is notably altered; natural and social functions and processes continue albeit in a modified way.
- High - natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.

Duration
- Short term - 0-5 years.
- Medium term - 5-11 years.
- Long term - impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention.
- Permanent - mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Probability
- Almost certain - the event is expected to occur in most circumstances.
- Likely - the event will probably occur in most circumstances.
- Moderate - the event should occur at some time.
- Unlikely - the event could occur at some time.
- Rare/Remote - the event may occur only in exceptional circumstances.

Significance
Provides an overall impression of an impact's importance, and the degree to which it can be mitigated. The range for significance ratings is as follows-
0 – Impact will not affect the environment. No mitigation necessary.
1 – No impact after mitigation.
2 – Residual impact after mitigation.
3 – Impact cannot be mitigated.

14 PLAN OF STUDY FOR EIA

14.1 General

This Plan of Study, which explains the approach to be adopted to conduct the EIA for the proposed MCWAP-2A, was prepared in accordance with Appendix 2 of GN No. R 982 of 4 December 2014 (as amended).

14.2 Potentially Significant Environmental Issues identified during Scoping Phase

The Scoping exercise aimed to identify and qualitatively predict potentially significant environmental issues for further consideration and prioritisation. During the EIA stage a detailed quantitative impact assessment will be conducted via contributions from the project team and requisite specialist studies, and through the application of the impact assessment methodology contained in **Section 13.4**. Suitable mitigation measures will be identified to manage (i.e. prevent, reduce, rehabilitate and/or compensate) the environmental impacts, and will be incorporated into an EMPr.

Pertinent environmental issues identified during Scoping, which will receive specific attention during the EIA phase are listed in **Table 53** (construction and operational phases).

14.3 Feasible Alternatives to be assessed during EIA Phase

The EIA phase will include a detailed comparative analysis of the project's feasible alternatives that emanate from the Scoping exercise, which will include environmental (with specialist input) and technical evaluations. This will ultimately result in the selection of a BPEO. The feasible alternatives to be assessed in the EIA phase include the various pipeline alignments.

14.4 Specialist Studies

14.4.1 Overview

According to Münster (2005), a 'trigger' is "*a particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an issue and/or potentially significant impact associated with that proposed development that may require specialist input*". The requisite specialist studies 'triggered' by the findings of the Scoping process, aimed at addressing the key issues and compliance with legal obligations, include:

1. Aquatic Impact Assessment;
2. Terrestrial Ecological Impact Assessment;
3. Heritage Impact Assessment;

4. Agricultural Impact Assessment;
5. Social Impact Assessment;
6. Socio-Economic Impact Assessment; and
7. Wildlife Impact Assessment.

In addition, the findings from the following specialist studies that were undertaken as part of the previous EIA for MCWAP-2 will also be considered as part of the above studies and included in the EIA Report (as relevant):

- Ecological Study – Terrestrial;
- Ecological Study – Aquatic;
- Traffic Impact Assessment;
- Heritage Impact Assessment;
- Socio-Economic Study;
- Visual Impact Assessment;
- Social Impact Assessment; and
- Noise Study.

The Terms of Reference (ToR), both general and specific, for the abovementioned specialist studies follow in the sub-sections below. Amongst others, the *Guideline for determining the scope of specialist involvement in EIA processes* (Münster, 2005) was used in compiling the general Terms of Reference for the specialist studies. The following guidelines were also employed to prepare the specific ToR for the respective specialists (where appropriate):

- Guideline for involving biodiversity specialists in EIA processes (Brownlie, 2005);
- Guideline for involving heritage specialists in EIA processes (Winter & Baumann, 2005); and
- Guideline for involving social assessment specialists in EIA processes (Barbour, 2007).

In addition to the above guidelines, the relevant specialists need to satisfy specific requirements stipulated by the following mandated environmental authorities (amongst others):

- DEA;
- LDEDET;
- DWS;
- DAFF; and
- LIHRA.

For the inclusion of the findings of the specialist studies into the EIA report, the following guideline will be used: *Guideline for the review of specialist input in EIA processes* (Keatimilwe & Ashton, 2005). Key considerations will include:

- Ensuring that the specialists have adequately addressed IAPs' issues and specific requirements prescribed by environmental authorities;
- Ensuring that the specialists' input is relevant, appropriate and unambiguous; and

- Verifying that information regarding the receiving ecological, social and economic environment has been accurately reflected and considered.

14.4.2 Terms of Reference – General

The following general ToR apply to all the EIA specialist studies to be undertaken for the proposed project:

1. Address all triggers for the specialist studies contained in the subsequent specific ToR.
2. Consider the findings of all specialist studies undertaken as part of the previous EIA for MCWAP-2, where relevant.
3. Address issues raised by IAPs, as contained in the Comments and Response Report, and conduct an assessment of all potentially significant impacts. Additional issues that have not been identified during Scoping should also be highlighted to the EAP for further investigations.
4. Ensure that the requirements of the environmental authorities that have specific jurisdiction over the various disciplines and environmental features are satisfied.
5. Approach to include desktop study and site visits, as deemed necessary, to understand the affected environment and to adequately investigate and evaluate salient issues. Indigenous knowledge (i.e. targeted consultation) should also be regarded as a potential information resource.
6. Assess the impacts (direct, indirect and cumulative) in terms of their significance (using suitable evaluation criteria) and suggest suitable mitigation measures. In accordance with the mitigation hierarchy, negative impacts should be avoided, minimised, rehabilitated (or reinstated) or compensated for (i.e. offsets), whereas positive impacts should be enhanced. A risk-averse and cautious approach should be adopted under conditions of uncertainty.
7. Consider time boundaries, including short to long-term implications of impacts for project life-cycle (i.e. pre-construction, construction, operation and decommissioning).
8. Consider spatial boundaries, including:
    a. Broad context of the proposed project (i.e. beyond the boundaries of the specific site);
    b. Off-site impacts; and
    c. Local, regional, national or global context.
9. The provision of a statement of impact significance for each issue, which specifies whether or not a pre-determined threshold of significance (i.e. changes in effects to the environment which would change a significance rating) has been exceeded, and whether or not the impact presents a potential fatal flaw or not. This statement of significance should be provided for anticipated project impacts both before and after application of impact management actions.
10. Recommend a monitoring programme to implement mitigation measures and measure performance. List indicators to be used during monitoring.

11. Appraisal of alternatives (including the No-Go option) by identifying the BPEO with suitable justification.
12. Advise on the need for additional specialists to investigate specific components and the scope and extent of the information required from such studies.
13. Engage with other specialists whose studies may have bearing on your specific investigation.
14. Present findings and participate at public meetings, as necessary.
15. Information provided to the EAP needs to be signed off.
16. Review and sign off on EIA Report prior to submission to DEA to ensure that specialist information has been interpreted and integrated correctly into the report.
17. Sign a declaration stating independence.
18. The appointed specialists must take into account the policy framework and legislation relevant to their particular studies.
19. All specialist reports must adhere to Appendix 6 of GN No. R 982 of 4 December 2014 (as amended).

14.4.3 Terms of Reference – Specific

14.4.3.1 Aquatic Impact Assessment

Summary of Key Issues & Triggers Identified During Scoping

- Potential impacts during construction:
  - Impacts to flow and river morphology during the instream works associated with the construction of the weirs and pipeline crossings.
  - Sedimentation from instream works.
  - Water quality impacts due to spillages and poor construction practices.
  - Encroachment of construction activities into riparian zones / wetlands.
  - Inundation of instream habitat as a result of the abstraction weir's backwater effect.
  - Loss of riparian and instream vegetation within construction domain.
  - Crossing of wetlands and pans by the pipeline and access roads
  - Inundation of wetlands as a result of the weir's backwater effect
  - Disruptions to aquatic biota community due to water contamination, temporary alteration of flow and disturbance to habitat during construction (instream works).
- Potential impacts during operational phase:
  - Alteration of flow regime by the weir structures.
  - During the maintenance of the pipeline and reservoirs the raw water conveyed and stored within this system, which is water of poor quality from the Crocodile River, will be released into the Matlabas River and other

watercourses from scour valves.

- Destabilisation of river structure due to inadequate reinstatement and rehabilitation.
- Disturbances of riparian vegetation may lead to erosion and encroachment of exotic vegetation.
- Destabilisation of wetlands due to inadequate reinstatement and rehabilitation.
- Impacts to wetlands downstream of the abstraction point (surface-groundwater interactions).
- The abstraction weir and gauging weirs will act as instream barriers that will prevent the migration of aquatic biota.
- The abstraction weir will serve as a morphological modification and the backwater created by the structure will change the affected upstream river reach from a lotic to more of a lentic ecosystem. This will result in changes to the aquatic community structure and remove certain habitats from potential utilisation.
- Management of sediment at abstraction works to be stored and returned to the Crocodile River (West) during operational phase.
- Impacts of water level fluctuations in Hartbeespoort Dam on aquatic ecology within the dam and downstream.

Approach

- ❖ Undertake desktop study (literature review, topographical maps and aerial photographs) and baseline aquatic survey and describe affected aquatic environments/watercourses within the project footprint.
- ❖ Determine ecological status of the receiving aquatic environment, including the identification of endangered or protected species.
- ❖ Delineate riparian habitat and all wetlands in accordance with the guideline: *A practical field procedure for identification and delineation of wetlands and riparian areas* (DWAF, 2005) (or any prevailing guidelines prescribed by DWS). This includes assessing terrain, soil form, soil wetness and vegetation unit indicators to delineate permanent, seasonal and temporary zones of the wetlands. Allocate conservation buffers from the outer edge of the temporary zones of the wetlands (provincial-specific).
- ❖ Provide a concise description of the importance of the affected aquatic environments/watercourses in terms of pattern and process, ecosystem goods and services, as appropriate.
- ❖ Assess impacts of proposed project to aquatic environments/watercourses.
- ❖ Provide suitable mitigation measures to protect the aquatic ecosystems during project life-cycle.
- ❖ Investigate the need for a fish ladder at the abstraction weir and gauging weirs.

- Recommend monitoring programme and indicators for project life-cycle, where findings from survey would serve as baseline data.

Nominated Specialist

Organisation:	Enviross
Name:	Mathew James Ross
Qualifications:	PhD – Aquatic Health
No. of years experience:	10
Affiliation (if applicable):	❖ Professional Natural Scientist ❖ South African Society for Aquatic Scientists (SASAqS)

14.4.3.2 Terrestrial Ecological Impact Assessment

Summary of Key Issues & Triggers Identified During Scoping

- Encroachment of project infrastructure into CBAs and ESAs.
- The potential loss of significant flora and fauna species, as well as ecosystem disruption, as a result of construction activities.
- Proliferation of exotic vegetation, which could spread beyond the construction domain.
- Fauna could be adversely affected through construction-related activities (noise, dust, light pollution, illegal poaching, and habitat loss). This is especially relevant to sensitive game species (including exotic game).
- The construction servitude will minimise animal movement. This is particularly significant on smaller game farms or in instances where access to watering points will be affected.
- Possible disturbance to the bat cave that is situated in the Mooivallei area during construction.

Approach

- Undertake baseline survey and describe affected environment within the project footprint from a biodiversity perspective.
- Take into consideration the provincial conservation goals and targets.
- Assess the current ecological status and the conservation priority within the project footprint and adjacent area (as deemed necessary). Provide a concise description of the importance of the affected area to biodiversity in terms of pattern and process, ecosystem goods and services, as appropriate.
- Identify protected and conservation-worthy species. Prepare a biodiversity sensitivity map with the use of GIS, based on the findings of the study.
- Assess impacts to fauna and flora, associated with the project. Consider cause-effect-impact pathways for assessing impacts to biodiversity related to the project.

- Comply with specific requirements and guidelines of DEA and LDEDET.
- Consider the Limpopo Conservation Plan and other relevant policies, strategies, plans and programmes.

Nominated Specialist (to be reviewed by an external specialist)

Organisation:	Nemai Consulting
Name:	Avhafarei Phamphe
Qualifications:	MSc – Botany
No. of years experience:	10
Affiliation (if applicable):	❖ Professional Natural Scientist-Ecological Science (Reg number: 400349/12) with South African Council for Natural Scientific Professions (SACNASP) ❖ Professional member of South African Institute of Ecologists and Environmental Scientists (SAIEES) ❖ Professional member of South African Association of Botanists (SAAB)

14.4.3.3 Heritage Impact Assessment

Summary of Key Issues & Triggers Identified During Scoping

- Potential occurrence of heritage resources, graves and structures older than 60 years within project footprint.

Approach

- Undertake a Heritage Impact Assessment in accordance with the National Heritage Resources Act (Act No. 25 of 1999).
- Engage with farm labourers to identify all potential heritage sites.
- The identification and mapping of all heritage resources in the area affected, as defined in Section 2 of the National Heritage Resources Act (Act No. 25 of 1999), including archaeological and palaeontological sites on or close (within 100 m) of the proposed developments.
- Undertake a desktop palaeontological assessment (evaluate site in terms of SAHRIS).
- The assessment of the significance of such resources in terms of the heritage assessment criteria as set out in the regulations.
- An assessment of the impact of development on such heritage resources.
- An evaluation of the impacts of the development on heritage resources.
- Prepare a heritage sensitivity map (GIS-based), based on the findings of the study.
- Identify heritage resources to be monitored.
- Comply with specific requirements and guidelines of LIHRA and SAHRA.

Nominated Specialist

Name:	Jean Beater (lead specialist)
Qualifications:	MA - Heritage Studies
No. of years experience:	21
Affiliation (if applicable):	❖ Member: HIA Adjudication Committee for the Gauteng Provincial Heritage Resources Authority ❖ Affiliate member - Association of Southern African Professional Archaeologists – member No. 349

14.4.3.4 Agricultural Impact Assessment

Summary of Key Issues & Triggers Identified During Scoping

- ❖ Potential impacts during construction:
  - Loss of cultivated land and grazing land within the construction domain.
  - Loss of stock watering points within construction domain.
  - Disruptions to farming operations as a result of construction-related use of existing access roads.
  - Loss of fertile soil through land clearance.
- ❖ Potential impacts during operational phase:
  - Potential impacts to water users (and associated agro-economic impact from reduced crop and food production) downstream of the abstraction works on the Crocodile River.
  - Permanent loss of cultivated land due to physical infrastructure.

Approach

- ❖ Determine agricultural potential in project footprint.
- ❖ Determine impacts of project from an agricultural perspective.
- ❖ Suggest suitable mitigation measures to address the identified impacts.
- ❖ Comply with specific requirements and guidelines of the Department of Agriculture and Rural Development.

Nominated Specialist

Name:	Dr Andries Gouws
Qualifications:	PhD Integrated Land Use Modelling
No. of years experience:	29
Affiliation (if applicable):	❖ Council of Natural Sciences.No:400036/93, Category: Agricultural sciences. ❖ Member of the Soil Science Society of South Africa

14.4.3.5 Socio-Economic Impact Assessment

Summary of Key Issues & Triggers Identified During Scoping

- Potential impacts during construction:
  - Loss of land (including structures and cultivated areas) through project infrastructure.
  - Loss of agricultural production.
  - Risk to game and livestock as a result of construction related hazards.
  - Loss of income in eco-tourism sector (hunting and game farming).
  - Potential damage to property (e.g. gates, fences, structures).
  - Servitude restrictions;
  - Impact to visual quality and sense of place.
  - Reduction in property value.
- Potential impacts during operational phase:
  - Loss of income along the Crocodile River (West) due to change in operating rules (changes in assurance of supply).
  - Impact to visual quality and sense of place due to permanent infrastructure such as abstraction works, balancing dam and reservoirs.
  - Cumulative impacts to properties that are already affected by existing linear infrastructure.
  - Impacts to smaller properties, where the servitude may affect the critical mass required to continue with the current land use.
  - Impacts of water level fluctuations in Hartbeespoort Dam.

Approach

- Determine the specific local socio-economic, land utilisation and acquisition implications of the project.
- Assess the impacts of both 'giving' and receiving water systems on livelihoods, health and safety of affected communities.
- Collect baseline data on the current socio-economic environment.
- Assess socio-economic impacts (positive and negative) of the project, and quantify the economic impacts.
- Undertake a thorough review of the following:
  - Minutes of public meetings and individual meetings; and
  - Comments and Responses Report.
- Suggest suitable mitigation measures to address the identified impacts.
- Make recommendations on preferred options from a socio-economic perspective.

Nominated Specialist

Organisation:	Nemai Consulting
Name:	Ciaran Chidley
Qualifications:	BA (Economics); BSc Eng (Civil); MBA
No. of years experience:	12
Affiliation (if applicable):	N/A

14.4.3.6 Social Impact Assessment

Summary of Key Issues & Triggers Identified During Scoping

- Potential impacts during construction:
  - Use of local road network.
  - Safety and security risks.
  - Nuisance from dust and noise.
  - Light pollution.
  - Influx of people seeking employment and associated impacts (e.g. foreign workforce, cultural conflicts, squatting, demographic changes, anti-social behaviour, and incidence of HIV/AIDS).
- Potential impacts during operational phase:
  - Use of local road network for operation and maintenance purposes.
  - Provision of light at infrastructure may cause light pollution.
  - Inundation of low level bridges due to the weir's backwater effect.
  - The pump stations will be operating continuously and may cause noise pollution.
  - Impacts of water level fluctuations in Hartbeespoort Dam.

Approach

- Describe communities to be affected by the project. Consider demographic profile, social drivers, social context and network, development plans. A combination of a technocratic and participatory approach is suggested (at discretion of specialist).
- Collect baseline data on the current social environment and historical social trends.
- Identify and collect data on impact assessment variables and social change processes related to the project.
- Undertake a thorough review of the following:
  - Minutes of the landowner meetings.
  - Minutes of public meetings and individual meetings;
  - Database of IAPs; and
  - Comments and Responses Report.

- Undertake additional consultation with affected individuals and communities, as deemed necessary.
- Assess the significance of social impacts associated with the project.

Nominated Specialist

Organisation:	Dr. Neville Bews & Associates
Name:	Neville Bews
Qualifications:	❖ BA (Hons) (Unisa) ❖ Henley Post-Graduate certificate in Management (United Kingdom) ❖ MA (cum laude) (RAU) ❖ D. Litt et Phil (RAU)
No. of years experience:	12
Affiliation (if applicable):	International Association of Impact Assessors South Africa IAIAsa

14.4.3.7 Wildlife Impact Assessment

Summary of Key Issues & Triggers Identified During Scoping

- Potential impacts during construction:
  - Sensitive game species (including exotic game) could be adversely affected through construction-related activities (noise, dust, light pollution, illegal poaching, and habitat loss).
  - Temporary relocation of game, if required, with associated arrangements to minimise impacts to affected game.

Approach

- Wildlife Management Plan to be developed, taking into consideration the types of game kept on the farms and the requisite mitigation measures (based on best practices).

Nominated Specialist

Organisation:	NABRO Ecological Analysts
Name:	Ben Orban
Qualifications:	MSc - Wildlife Management
No. of years experience:	24
Affiliation (if applicable):	Professional Natural Scientist

14.5 Public Participation – EIA Phase

14.5.1 Updating of IAP Database

The IAP database will be updated as and when necessary during the execution of the EIA.

14.5.2 Review of Draft EIA Report

A 30-day period will be provided to IAPs to review the Draft EIA Report, and copies of the document will be lodged for public review at the following venues:

Table 54: Locations for review of Draft EIA Report

Copy	Location	Address	Tel. No.
1.	Lephalale Public Library	Lephalale Civic Centre, c/o Joe Slovo & Dou Water St, Lephalale	014 762 1453
2.	Thabazimbi Public Library	4th Ave, next to Police station in Thabazimbi	014 777 1525
3.	National Library of South Africa (Pretoria)	c/o Johannes Ramokhoase St and Thabo Sehume St	012 401 9700
4.	Steenbokpan Winkel	Steenbokpan	014 766 0167

Copies of the Draft EIA Report will be provided to the regulatory and commenting authorities listed in **Section 12.6.3**, as well as the agricultural groups listed in **Section 12.6.4**. The Draft EIA Report will also be placed on the following website - http://www.nemai.co.za/environmental.html.

All parties on the IAPs database will be notified via email, fax or post of the opportunity to review the Draft EIA Report at the abovementioned locations, the review period and the process for submitting comments on the report. The public will also be notified in this regard via advertisements in the following newspapers:

- The Star;
- The Daily Sun;
- Die Kwêvoël;
- Beeld; and
- Mogol Pos;

All comments received from IAPs and the responses thereto will be included in the final EIA Report, which will be submitted to DEA.

14.5.3 Public Meetings

Public meetings will be held during the review period for the Draft EIA Report. The aims of these meetings will be as follows:

- To present the project details;
- To explain the EIA process;
- To present the findings of the specialist studies;

- To address key issues raised during the Scoping Phase;
- To elaborate on the potentially significant environmental impacts (qualitative and quantitative), and the proposed mitigation of these impacts; and
- To allow for queries and concerns to be raised, and for the project team to respond.

14.5.4 Comments and Responses Report

A Comments and Responses Report will be compiled and included in the EIA Report, which will record the date that issues were raised, a summary of each issue, and the response of the team to address the issue.

In addition, any unattended comments from the Scoping Phase or where the status of the previous responses has changed, will also be addressed in the Comments and Responses Report for the EIA phase.

14.5.5 Notification of DEA Decision

All IAPs will be notified via email, fax or post after having received written notice from DEA on the final decision on the application. Advertisements will also be placed in the newspapers listed in **Section 14.5.2**. These notifications will include the appeal procedure to the decision.

14.6 EIA Report

The EIA Report will contain the information that is necessary for DEA to consider and come to a decision on the application. As a minimum, the EIA Report will contain the information stipulated in Appendix 3 of GN No. R 982 of 4 December 2014 (as amended).

The following critical components of the EIA Report are highlighted:

- A description of the policy and legislative context;
- A detailed description of the proposed development (full scope of activities);
- A detailed description of the proposed development site, which will include a plan that locates the proposed activities applied for as well as the associated structures and infrastructure;
- A description of the environment that may be affected by the activity and the manner in which physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed development;
- The methodology of the stakeholder engagement process;
- The Comments and Responses Report and IAPs Database will be provided as an appendix to the EIA Report;
- A description of the need and desirability of the proposed development and the identified potential alternatives to the proposed activity;
- A summary of the methodology used in determining the significance of potential impacts;
- A description and comparative assessment of the project alternatives;

- A summary of the findings of the specialist studies;
- A detailed assessment of all identified potential impacts;
- A list of the assumptions, uncertainties and gaps in knowledge;
- An environmental impact statement;
- 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;
- 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;
- An opinion by the consultant as to whether the development is suitable for approval within the proposed site;
- An EMPr that complies with Appendix 4 of GN No. R 982 of 4 December 2014 (as amended);
- Copies of all specialist reports appended to the EIA report; and
- Any further information that will assist in decision making by the authorities.

14.7 Authority Consultation

The EIA will only commence if DEA accepts the Scoping Report and the Plan of Study for the EIA. If relevant, the necessary revisions will be made to the aforementioned documents if requested by this Department.

An authorities meeting will be scheduled during the EIA public participation process to present salient findings. In addition, copies of the Draft EIA Report will be provided to the following key regulatory and commenting authorities:

- DEA;
- LDEDET;
- DWS Limpopo Regional Office;
- DAFF;
- LIHRA;
- Department of Public Works, Roads and Infrastructure;
- Waterberg DM;
- Thabazimbi LM; and
- Lephalale LM.

The final EIA Report will be submitted to DEA. Any requested amendments will be discussed with the Department to ensure that their queries are adequately and timeously attended to.

For the remainder of the Scoping process and EIA the interaction with DEA will be as follows:

- Submission of the Final Scoping Report;

- Meet with designated DEA Environmental Officer to explain the project and arrange a site visit (if required by DEA);
- Address comments on Scoping Report;
- Arrange an authorities meeting during the EIA stage;
- Submit EIA Report;
- Address comments on EIA Report;
- Obtain a decision; and
- Notify IAPs of the appeal process through DEA's appeals unit.

14.8 EIA Timeframes

The table to follow presents the proposed timeframes for the EIA process. *Note that these dates are subject to change*.

Table 55: EIA Timeframes (dates may changes during the course of the EIA)

EIA Milestone	Start	Finish
Submit Application Form and Draft Scoping Report to DEA	05/03/18	
Review of Draft Scoping Report by authorities & IAPs	06/03/18	11/04/18
DEA Review and Decision	20/04/18	04/06/18
Review of Draft EIA Report by authorities & IAPs	23/07/18	30/08/18
Submit Final EIA Report & EMPr to DEA	17/09/18	
DEA Review and Decision	18/09/18	23/01/19

15 CONCLUSION

The scope of an environmental assessment is defined by the range of issues and alternatives it considers, the nature of the receiving environment, and the approach towards the assessment.

Key outcomes of the Scoping phase for the proposed MCWAP-2A are as follows:

- Stakeholders were effectively identified and were afforded adequate opportunity to participate in the scoping process;
- Alternatives for achieving the objectives of the proposed activity were duly considered;
- Potentially significant issues pertaining specifically to the pre-construction, construction and operational phases of the project were identified;
- Sensitive elements of the environment that may be affected by the project were identified;
- A Plan of Study was developed to explain the approach to executing the EIA phase, which also includes the Terms of Reference for the identified specialist studies; and
- The scoping exercise set the priorities for the ensuing EIA phase.

No fatal flaws were identified in terms of the proposed activities and the receiving environment that would prevent the environmental assessment from proceeding beyond the Scoping phase. It is the opinion of the EIA team that Scoping was executed in an objective manner and that the process and report conform to the requirements of Regulation 21 and Appendix 2 of GN No. R 982 of 4 December 2014 (as amended), respectively. It is also believed that the Plan of Study for EIA is comprehensive and will be adequate to address the significant issues identified during Scoping, to select the BPEO, and to ultimately allow for informed decision-making.

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APPENDICES