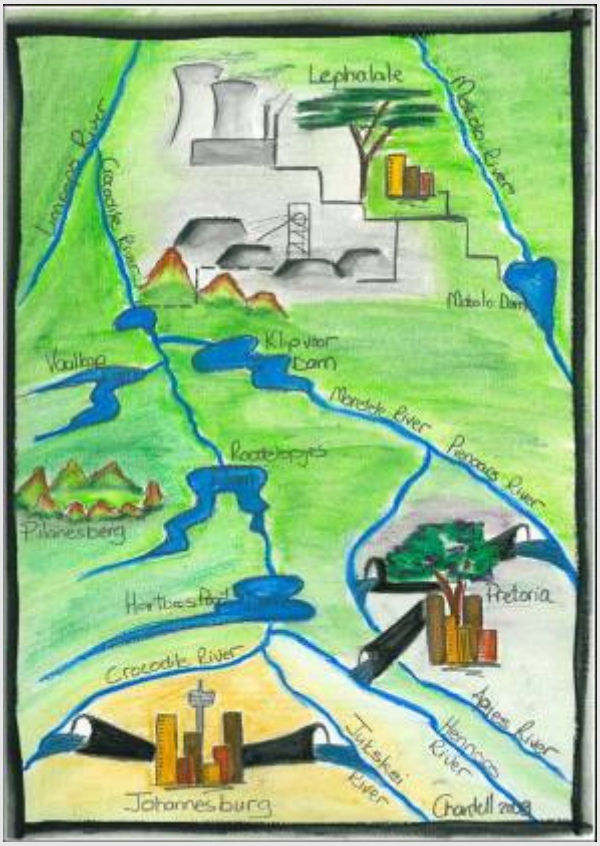
water affairs
Department:
Water Affairs
REPUBLIC OF SOUTH AFRICA

# MOKOLO AND CROCODILE RIVER (WEST) WATER AUGMENTATION PROJECT (MCWAP)

## Phase 1: Augment Supply from Mokolo Dam

**[DEA Reference Number: 12/12/20/1465]**




# DRAFT
# ENVIRONMENTAL IMPACT ASSESSMENT REPORT

**June 2010**

NEMAI CONSULTING

**ENVIRONMENTAL AND SOCIAL CONSULTANTS**


P.O. BOX 1673
SUNNINGHILL
2157

147 Bram Fischer Drive
FERNDALE
2194

Tel: 011 781 1730
Fax: 011 781 1731
Email: info@nemai.co.za



**Copyright Nemai Consulting 2010**

# TITLE AND APPROVAL PAGE

| | |
|---|---|
| *Project name:* | ***Mokolo and Crocodile River (West) Water Augmentation Project (MCWAP) - Phase 1: Augment Supply from Mokolo Dam*** |
| *Report Title:* | ***Draft Environmental Impact Assessment Report – MCWAP Phase 1*** |
| *Authors:* | ***D Henning, S Pienaar*** |
| *DWAF report reference no.:* | |
| *Status of report:* | ***Final*** |
| *First issue:* | ***June 2010*** |
| *Final issue:* | |

***Aurecon***

*Approved for Project Coordinator by:*

---

*SC Vogel*

*Project Coordinator & Manager*

***DEPARTMENT WATER AFFAIRS (DWA)***

*Approved for Chief Directorate: Integrated Water Resources Planning by:*

---

*OJS van den Berg*

*Chief Engineer: Options Analysis North*

---

*LS Mabuda*

*Director: Options Analysis*

# UITVOERENDE OPSOMMING

## 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 oor die volgende 20 jaar.

Weens die beperkte beskikbaarheid van water in die Lephalale area het die Departement van Waterwese (DWA) die Mokolo en Krokodilrivier (Wes) Wateraanvullingsprojek (MKWAP) Uitvoerbaarheid Studie van stapel gestuur om opsies vir die voorsiening in die water behoeftes te ondersoek. Die fases vir die voorgestelde infrastruktuur vir die oordrag van water vanaf die Mokolodam en Krokodilrivier (Wes) word hieronder getabuleer.

**Oorsig van MKWAP komponente**

| Komponent | Kort samevatting |
|---|---|
| **Fase 1** | Parallelle pyplyn ter 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. Fase 1 bestaan uit die volgende:<br>• Styglyn vanaf Mokolodam na Wolvenfontein balanseerdamme;<br>• Gravitasielyn vanaf Wolvenfontein balanseerdamme na Matimba kragstasie;<br>• 'n Nuwe gravitasielyn vanaf Matimba kragstasie na Steenbokpan; en<br>• Drukbreektenk by Rietspruitnek. |
| **Fase 2** | Oordrag skema vanaf Krokodilrivier (Wes) by Vlieëpoort naby Thabazimbi, na Lephalale area via 'n sisteem bestaande uit:<br>• 'n Stuwal en onttrekkingswerke, insluitende 'n balanseerdam, ontslikkingswerke, en 'n hoëdruk pompstasie by Vlieëpoort (naby Thabazimbi);<br>• Oordragskema (ongeveer 100 km);<br>• Drukbreekreservoir;<br>• Operasionele Storingsdam; en<br>• 'n Leweringstelsel wat bestaan uit 'n gravitasiepyplyn (ongeveer 30km) vanaf die Operasionele Storingsdam na die Steenbokpan area. |
| **Verwydering van Bottelnek** | Die bottelnek op die bestaande pyplyn wat aan Exxaro behoort en wat strek vanaf die Mokolodam tot by Lephalale moet verwyder word. Dit sluit in die konstruksie van die eerste 9km van die nuwe gravitasie pyplyn (vir MKWAP Fase 1) vanaf Wolvenfontein balanseerdamme, met inlaste tot die bestaande pyplyn. Die doelwit van die verwydering van die bottelnek is om die hidroliese gradiënt by Rietspruitnek te verbeter, waar die bestaande pyplyn bo-oor 'n hoogte punt gaan. |

Die doelwit van MKWAP is om die voorsiening van water aan nuwe verbruikers te bewerkstellig sonder om te impakteer op die regmatige toekennings van bestaande verbruikers. Dit sal bereik word deur:

- Allokasie van die addisionele lewering vanuit Mokolodam en die gebruik daarvan deur middel van die Fase 1 infrastruktuur;
- Die allokasie van surplus terugvloeie in die Krokodilrivier (Wes) en die gebruik daarvan deur middel van die Fase 2 infrastruktuur;
- In geval van die voorgenoemde nie voldoende is nie kan die water in die Krokodilsisteem aangevul word met terugvloeie vanuit die Vaalrivier.

Die volgende verbruikers moet gelisensieer word vir Fase 1:

1. Die dorp Lephalale wat huidiglik water gebruik wat geallokeer is aan Grootegelukmyn en Eskom. Exxaro en Eskom lewer tans water aan die huishoudelike verbruikers namens die munisipaliteit;
2. Exxaro (voorheen Yskor) se Grootegelukmyn, vir myngebruik alleenlik;
3. Eskom se Matimba kragstasie, vir kragstasie gebruik alleenlik; en
4. Eskom se Medupi kragstasie, vir kragstasie gebruik alleenlik.

MKWAP is deur die Nasionale Departement van Omgewingsake as ‘n Strategiese Belangrike Ontwikkeling geïdentifiseer, wat gedefinieer word as infrastruktuur ontwikkelings deur staatsentiteite wat ‘n noemenswaardige bydrae maak tot die Nasionale ekonomiese ontwikkeling van Suid Afrika.

## OMVANGSBEPALING EN OIB PROSES

MKWAP bestaan uit sekere aktiwiteite wat goedkeuring vereis in terme van die Nasionale Wet op Omgewingsbestuur (Wet No. 107 van 1998) (NEMA). Die proses wat gevolg word om goedkeuring te verkry word geneem ingevolge die Omgewing Impak Bepaling (OIB) Regulasies (Staatskennisgewing No. R385, R386 en R387 van 21 April 2006), geproklameer interme van Hoofstuk 5 van NEMA. Die OIB besluitnemende owerheid is die Nasionale Departement van Omgewingsake, aangesien die projek aansoeker (DWA) ’n Nasionale Departement is. Nemai Consulting is aangestel deur DWA as die

onafhanklike Omgewingsimpakbepalings Praktisyn (OIP) om die Omgewingsimpakondersoek uit te voer vir MKWAP.

Tydens konsultasie met DEA, voor die aanvang van die projek, is daar besluit om 'n Klas Aansoek in te dien vir die drie MKWAP sub-projekte, waar afsonderlike omgewings bepalings uitgevoer word vir elke komponent.

**MKWAP Omgewings Ondersoeke**

| MKWAP Komponente | Omgewingsbepalings Proses | DEA Verwysings Nr. |
|---|---|---|
| Fase 1 | Omvangsbepaling en OIB | 12/12/20/1465 |
| Fase 2 | Omvangsbepaling en OIB | 12/12/20/1466 |
| Verwydering van Bottelnek | Basiese Bepaling | 12/12/20/1467 |

Die Omvangsbepaling fase wat uitgevoer was gedurende die eerste deel van die omgewingsbepaling proses, voorsien die benadering wat gevolg moet word vir die uitvoering van die OIB vir MKWAP Fase 1 deur belangrike kwessies te identifiseer wat verdere inagneming en prioritisering sal vereis.

## PROJEK LIGGING

Die hoof roete vir die voorgestelde pyplyn roete begin by Mokolodam, in die suid-oostelike punt van die projek area, waarna dit hoofsaaklik die roete volg van die bestaande Exxaro pyplyn, in 'n noord-westelike rigting tot by die Zeeland Watersuiweringswerke en daarna die Matimba aftappunt. Hierna draai die pyplynroete in 'n westelike rigting tot by Steenbokpan. Die totale lengte van die roete is ongeveer 80km

## PROJEK KOMPONENTE

Die hoof skema komponente vir MKWAP Fase 1 is opgesom in die tabel wat volg.

**Opsomming van hoof skema komponente vir MKWAP Fase 1**

| Komponente |
|---|
| Hoëdruk pompstasie |
| 900mm: Styglyn |
| 1000mm: gravitasielyn |
| 800mm: gravitasielyn (aftappunt na Medupi) |
| 900mm: gravitasielyn (Medupi aftappunt na leweringstelsel konneksie) |
| 800mm: gravitasielyn (Steenbokpan aftappunt na Matimba konneksie) |
| 1900mm: gravitasielyn (leweringstelsel konneksie na Steenbokpan) |

## ALTERNATIEWE

Die volgende alternatiewe is in ag geneem vir die pyplyn roete:

- **Styglyn - Mokolodam tot Wolvenfontein balanseerdamme**
  - Alternatief – Hoof Roete

Die eerste deel van die hoof roete vanaf Mokolodam verskil van die roete van die bestaande Exxaro pyplyn, waar dit die roete van die toegangspad volg op die plaas Witbank 647LQ vir ± 1.3km (hoofsaaklik in ‘n noordwestelike rigting) tot by die punt waar Alternatiewe A en B split.

  - Alternatief A

Vanaf die hoof roete bly Alternatief A langsaan die toegangspad oor die plase Witbank 647LQ en Wolvenfontein 645LQ tot en met waar die lyn aansluit by die Wolvenfontein balanseerdamme.

  - Alternatief B

Alternatief B beweeg weg vanaf die toegangspad om ‘n bestaande kraglyn te volg vir ± 300m oor die plaas Witbank 647LQ. Die roete draai dan verder noordwaarts en loop vir ± 1.4km oor die plaas Wolvenfontein 645LQ. Hierna draai die roete in ‘n suid-westelike rigting en loop vir ‘n verdere ± 1.6km op die laasgenoemde plaas tot by die Wolvenfontein balanseerdamme.

- **Gravitasielyn (vanaf Wolvenfontein balanseerdamme na die Matimba aftap)**
  - Alternatief – Hoof Roete

  Vanaf die Wolvenfontein balanseerdamme volg die hoof roete die bestaande Exxaro pyplyn tot by die Matimba kragstasie aftap op die plaas Grootestryd 465LQ.

- **Gravitasielyn (Matimba kragstasie tot Steenbokpan)**
  - Alternatief – Hoof Roete

  Vanaf die aftappunt vanuit die Wolvenfontein-Matimba gravitasielyn, loop die leweringslyn weswaarts langsaan die bestaande pad vir ± 2km oor die plaas Hanglip 508LQ, tot by die split tussen Alternatiewe C en D. Van waar Alternatiewe C en D weer bymekaar uitkom, loop die hoof roete verder weswaarts tot by Steenbokpan.
  - Alternatief C

  Vanaf die plaas Hanglip 508LQ, loop Alternatief C in ‘n westelike rigting langsaan ‘n bestaande pad (nuwe pad om Medupi kragstasie) vir ± 1.3km. Daarna kruis die lyn oor verskeie plase tot by die plaas Kringgatspruit 318LQ.
  - Alternative D

  Vanaf die plaas Hanglip 508LQ, loop Alternatief D in ‘n suid-westelike rigting langsaan ‘n bestaande pad vir ± 3.7km tot by die plaas Naauw Ontkomen 509LQ. Daarna volg die roete die bestaande spoorlyn verder oor verskeie plase.

## PROJEK LEWENSIKLUS

Die OIB verslag voorsien ‘n oorsig van die projek en beskryf die hoof aktiwiteite gedurende die verskillende fases van die projek lewensiklus.

## OMGEWING OORSIG

Om impakte te minimaliseer, is probeer om die voorgestelde Fase 1 pyplyn roete langs bestaande ontwikkelings grense (bv. plaasgrense) en liniêre-tipe infrastruktuur te hou. Die omgewing word hier as minder sensitief geag, soos byvoorbeeld:

- Pyplyne (met verwysing na die bestaande Exxaro pyplyn vanaf die Wolvenfontein balanseerdamme na Zeeland Watersuiweringswerke),

- Paaie,
- Treinspore,
- Transmissie lyne, en
- Industriële korridors.

'n 200m Korridor (m.a.w. 100m weerskante van die middellyn) is ingesluit in die studie area, wat vir enige moontlike afwykings van die voorgestelde roete binne hierdie korridor voorsiening maak.

Die OIB Verslag gee 'n algemene beskrywing van die stand van die omgewing in die projek area, en verduidelik ook die area en terrein-spesifieke omgewingsfaktore wat ondersoek was deur die spesialiste. Sodoende word die sensitiewe omgewingsfaktore en die elemente van die omgewing wat moontlik geaffekteer kan word deur die projek beter verstaan. Die volgende omgewingsfaktore word in die verslag beskryf:

- Klimaat
- Topografie
- Oppervlak water
- Geologie en grond
- Geohidrologie
- Flora
- Fauna
- Sosio-Ekonomiese Aspekte
- Beplanning
- Landbou Potensiaal
- Lug Kwaliteit/ Gehalte
- Geraas
- Argeologiese en Kulturele kenmerke
- Infrastruktuur en dienste
- Vervoer
- Visueel
- Toerisme

## OPSOMMING VAN SPESIALIS STUDIES

Die OIB Verslag voorsien 'n sinopsis van die volgende spesialis studies:

- <u>Ekologiese Studie – Terrestrieel –</u>
  Alternatief B is die gekose opsie, waar Alternatief A moontlik kan lui na impakte op twee sensitiewe *Euphorbia* spesies in die kloof deur rotsstortings. Alternatief C, wat suid van die nuwe pad rondom Medupi kragstasie loop wat reeds versteur is, is ook

die gekose roete. Die studie sluit in flora en fauna (soogdiere, voëls, reptiele en amfibieë).

- Ekologiese Studie – Akwaties

  Alternatief B (suidelike opsie) is gekose omdat dit minder impak sal hê op die ekologiese integriteit van die akwatiese sisteme in die area. Geen voorkeur word verleen aan Alternatiewe C of D vanuit 'n akwatiese perspektief nie. Generiese versagtende maatreëls vir vleilande word voorsien.

- Verkeersbestuursplan

  Die volg van bestaande paaie deur die pyplyn, wat aanvaar word as minder sensitiewe roetes, veroorsaak dat die projek area goeie toegang geniet. Beste praktyke word voorsien vir die bestuur van verkeersaspekte.

- Erfenis Impak Studie

  Erfenis bronne langsaan die hoof roete sluit in 'n begraafplaas en plaashuis op die plaas Goedgedacht 602LQ, informele grafte op die plaas Sterkfontein 642LQ, Hennie de Lange se Kafee Theunispan en Steenbokpan Bosveld Drankwinkel.

- Ekonomiese Impak Studie

  Die ekonomiese impakte van MKWAP in die Mokolo opvangsgebied word opgesom hieronder.

| | Aktiwiteit | Intensiteit van Impak | Tydperk |
|---|---|---|---|
| MKWAP – Konstruksie Fase | Beesboerdery | Laag | Tydelik |
| | Wildsboerdery en gepaardgaande aktiwiteite | Laag | Tydelik |
| | Besproeiing (water afnames) | Geen | Tydelik |
| | Besigheidstoerisme | Medium | Tydelik |
| | Lephalale Munisipaliteit | Medium | Tydelik |
| MKWAP – Bedryfsfase | Beesboerdery | Laag | Permanent |
| | Wildsboerdery en gepaardgaande aktiwiteite | Laag | Permanent |
| | Besproeiing (water her-allokasie risiko) | Medium | Permanent |
| | Besigheidstoerisme | Laag | Permanent |
| | Lephalale Munisipaliteit | Laag | Permanent |

- Sosiale Impak Studie

  Die Sosiale Impak Studie het gebruik gemaak van 'n multi-faset benadering om die bestaande sosiale omgewing te verstaan en om die moontlike sosiale impakte (bv.

toegang, misdaad en sekuriteit, grensdrade, impakte op boerdery aktiwiteite, ens.) gedurende die konstruksie en bedryfsfases te bepaal.

- Visuele Impak Studie

  Twee studie areas is in ag geneem, naamlik:

  - Die alternatiewe korridors vanaf Mokolodam tot Wolvenfontein balanseerdamme; en
  - Die drukbreektenk by Rietspruitnek, op die plaas Fancy 556LQ.

  Versagtende maatreëls word voorsien om die visuele impakte van die projek te verminder.

## ONTLEDING VAN ALTERNATIEWE

'n Vergelykende ontleding van die verskillende pyplyn roetes is uitgevoer, wat gebaseer is op die voordele en nadele geassosieer met elke opsie. Die ontleding is uitgevoer deur tegniese bydraes en bevindinge van die spesialiste.

Die volgende gekose alternatiewe roetes is geïdentifiseer na die vergelykende ontleding:

- Styglyn (Mokolodam tot Wolvenfontein balanseerdamme) – Alternatief B; en
- Gravitasielyn (Matimba kragstasie tot Steenbokpan) – Alternatief C.

## IMPAK BEPALING

Impakte was as volg geïdentifiseer:

- Ontleding van projek beskrywing en die omliggende omgewingsfaktore;
- Impakte geassosieer met aktiwiteite bevat in Staatskennisgewing Nommer R386 en R387;
- Impakte geïdentifiseer deur omgewingsowerhede;
- Bevindinge van die spesialiste; en
- Kommentaar ontvang tydens die openbare deelname proses.

Die impakte geassosieer met gelyste aktiwiteite en wat geïdentifiseer is deur omgewingsowerhede word bespreek op 'n kwalitatiewe vlak.

Ten einde die impakte geassosieer met MKWAP beter te verstaan, was die aktiwiteite en omgewingsaspekte tydens die projek lewensiklus geïdentifiseer. Die volgende noemenswaardige omgewingsimpakte van MKWAP Fase 1 word op 'n kwantitatiewe vlak ontleed en versagtende maatreëls word voorsien.

**Pertinente omgewingsimpakte van MKWAP Fase 1**

| KONSTRUKSIE FASE | |
|---|---|
| **Faktor** | **Impak** |
| **Oppervlak Waterbronne** | • Pyplyn kruisings van die Mokolorivier (sytak), Rietspruit (sytak en hooftak), Kutangspruit (sytak en hooftak) en Sandlooprivier (sytak en hooftak) kan die struktuur van die riviere verander, die oewer plantegroei beskadig, lui na toename in siltasie (water kwaliteit verslegting) en die akwatiese diere benadeel (bv. verstopping van kieue). |
| **Grond** | • Erosie by steil hellings.<br>• Verlies van bogrond.<br>• Impakte geassosieer met skepping van leengroewe.<br>• Impakte geassosieer met skietwerke.<br>• Impakte geassosieer met wegdoening van groot hoeveelhede oortollige materiaal. |
| **Grondwater** | • Versteuring van die akwifer, veroorsaak deur skietwerke |
| **Flora** | • Impakte op beskermde spesies.<br>• Skade aan oewer plantegroei by rivier kruisings.<br>• Verlies van biodiversiteit deur indringerspesies. |
| **Fauna** | • Stroping.<br>• Verhinder beweging van diere.<br>• Verhoed toegang tot suipingspunte.<br>• Beskadiging deur konstruksie aktiwiteite.<br>• Verlies van diere deur swak toegangsbeheer. |
| **Lug** | • Impakte geassosieer met stof vanaf grond paaie, vervoer van materiaal. |
| **Geraas** | • Impakte geassosieer met geraas vanaf konstruksie aktiwiteite (bv. voertuie, kragopwekkers). |
| **Visuele Kwaliteit** | • Impakte op visuele kwaliteit van die area as gevolg van slordige terrein en konstruksie aktiwiteite |
| **Veiligheid en Sekuriteit** | • Impakte geassosieer met ineenstorting van groef.<br>• Impakte geassosieer met swak toegangsbeheer.<br>• Kriminele aktiwiteite geassosieerd met konstruksie. |
| **Afval** | • Impakte geassosieer met swak / geen ablusie fasiliteite.<br>• Lug, grond en water besoedeling as gevolg van swak bestuur van afval. |
| **Konstruksie Kamp** | • Impakte geassosieer met die ligging van die kamp – visuele impak, verwydering van plantegroei, stroping, sekuriteit.<br>• Impakte geassosieer met swak storing van materiaal. |

| | |
|---|---|
| **Sosio-ekonomiese aspekte** | • Beskadiging van eiendom, insluitend strukture, drade, hekke, diere.<br>• Impakte geassosieer met die tydelike konstruksie serwituut.<br>• Verlies van inkomste (bv. tydelike verlies van landbou grond, invloed op ekotoerisme aktiwiteite) as gevolg van konstruksie aktiwiteite.<br>• Impakte geassosieer met toename in persone was opsoek is na werksgeleenthede.<br>• Verbruik van plaaslike arbeid en verskaffers, sover moontlik (positiewe impak).<br>• Beskadiging van eiendom en risiko vir persone afkomstig vanaf Phumolong Gemeenskap Trust. |
| **Erfenis** | • Beskadiging van erfenis bronne. |
| **Infrastruktuur en Dienste** | • Beskadiging van bestaande rivier kruising by Rietspruit hooftak en oostelike sytak.<br>• Steuring van verkeer langs paaie (veral R510, toegangspad na Mokolodam en nuwe pad om Medupi).<br>• Beskadiging van grondpaaie na Wolvenfontein deur swaar konstruksie voertuie.<br>• Steuring van verkeer as gevolg van verbruik van R510 en hoof padnetwerk deur vervoer van pype. |

| **BEDRYFSFASE** | |
|---|---|
| **Faktor** | **Impak** |
| **Oppervlak Waterbronne** | • Impakte geassosieer met beskadiging van pyplyn.<br>• Erosie tydens vrylating van water. |
| **Flora** | • Verspreiding van indringerspesies. |
| **Fauna** | • Versteuring van beweging van akwatiese biota by rivier kruisings. |
| **Sosio-ekonomiese aspekte** | • Impakte geassosieer met die moontlike beperking of inkorting van water verbruik stroomaf van Mokolodam.<br>• Impakte geassosieer met beperkings op grond gebruik op permanente serwituut. |
| **Visuele Kwaliteit** | • Visuele impakte geassosieer met bogrondse strukture (bv. klepkaste elke 500m langs roete; pyplyn merkers; Drukbreektenk). |
| **Infrastruktuur en Dienste** | • Verbruik van pyplyn toegangspad kan dalk erosie veroorsaak en die padoppervlak beskadig. |
| **Instandhouding** | • Konstruksie-verwante impakte vir enige instandhoudingswerke. |
| **Landbou Potensiaal** | • Impakte geassosieer met grond gebruik beperkings binne serwituut.<br>• Landbou-ekonomiese impakte.<br>• Moontlike impakte of voedselsekuriteit. |

## OPENBARE DEELNAME

'n Volledige verslag word voorsien van die openbare deelname proses wat gevolg is vir die OIB fase van MKWAP Fase 1.

Die doel van openbare deelname vir MKWAP sluit in:

1. Om Belanghebbende en Geaffekteerde Partye (B&GP'e) die geleentheid te bied om inligting rakende MKWAP te verkry;
2. Om B&GP'e die geleentheid te bied om hulle menings, kwessies en bekommernisse te opper;
3. Om B&GP'e die geleentheid te bied om maatreëls voor te stel om ongunstige impakte te vermy of te minimaliseer, sowel as om positiewe impakte geassosieer met MKWAP te vergroot; en
4. Om DWA en die projekspan die geleentheid te gee om die behoeftes, bekommernisse en aanbevelings van B&GP'e te inkorporeer in die projek.

Bo-en-behalwe openbare deelname geassosieer met die OIB protokol, word 'n breër Openbare Deelname Proses ook uitgevoer vir MKWAP om te verseker dat omvattende en kragtige konsultasie prosedures gevolg word. Die mees prominente belange groep, inagnemend die kwessies rondom die water beskikbaarheid en die grondgebruik tipe, wat in die projek area voorkom is die Landbou Sektor.

## GEVOLGTREKKING

Deur om bestaande liniêre-tipe infrastruktuur te volg en die impakte te bestuur deur die voorgestelde versagtende maatreëls, en om te verseker dat die projek voldoen aan die kondisies van die Reserwe en bestaande waterregte (deur die water verbruik goedkeuringsproses), kan daar tot die gevolgtrekking gekom word dat daar geen rede is waarom die projek nie kan voortgaan nie. Dit kan ook aanbeveel word dat die projek goedkeuring kan ontvang, gebaseer op die bevindinge van die spesialiste en die impak bepaling, met die nodige voldoening aan die geïdentifiseerde versagtende maatreëls.

# 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 will significantly increase over the next 20 years.

Due to the limited availability of water in the Lephalale area, the Department of Water Affairs (DWA) commissioned a feasibility study of the Mokolo Crocodile (West) Water Augmentation Project (MCWAP) to establish how the future water demands could be met. The phases for the proposed infrastructure for transferring water from the Mokolo Dam and Crocodile River (West) are tabulated below.

**Overview of MCWAP Components**

| Component | Brief Overview |
|---|---|
| **Phase 1** | An underground pipeline parallel to the existing pipeline, to augment the supply from Mokolo Dam. This is to supply in the growing water requirement and also to supply more water for the interim period until a transfer pipeline from the Crocodile River (West) can be implemented. The system will utilise the available yield from Mokolo Dam. Phase 1 consists of the following:<br>• Rising main from Mokolo Dam to Wolvenfontein balancing dam;<br>• Gravity line from Wolvenfontein to Matimba Power Station;<br>• Gravity line from Matimba Power Station to Steenbokpan; and<br>• Break pressure tank at Rietspruitnek. |
| **Phase 2** | Transfer scheme from the Crocodile River (West) at Vlieëpoort near Thabazimbi to the Lephalale area via a system consisting of:<br>• A weir and abstraction infrastructure, including a balancing dam, desilting woks, and a high lift pumpstation at Vlieëpoort (near Thabazimbi);<br>• Transfer system (approximately 100 km of underground pipeline): consisting of various alternative pipeline routes;<br>• A Break Pressure Reservoir;<br>• An Operational Reservoir; and a<br>• Delivery , consisting of alternative routes for a gravity pipeline (underground) running from the Operational Reservoir to the Steenbokpan area, connecting to the Phase 1 works. |
| **De-bottlenecking** | De-bottlenecking of the existing pipeline that stretches from Mokolo Dam to Lephalale, which belongs to Exxaro. This entails the construction of the first 9km of the proposed underground gravity pipeline (for Phase 1) from Wolvenfontein balancing dam, with interconnections to the existing pipeline. The intention of the de-bottlenecking is to improve the hydraulic gradient at Rietspruitnek, where the existing pipeline passes over a high point. |

The objective of the MCWAP is to enable the supply of water to the new users without impacting on the legal entitlements of the existing users. This will be achieved by:

- Allocating the additional yield from the Mokolo Dam and utilise it through Phase 1 infrastructure;
- Allocating surplus return flow in the Crocodile River (West) and utilise it through Phase 2 infrastructure; and
- In the case of the aforementioned not being adequate, the water in the Crocodile system can be augmented from return flows in the Vaal River.

The following users will need to be licensed for Phase 1:

1. The Town of Lephalale that are currently using water allocated to the Grootegeluk mine and Eskom. Exxaro and Eskom are currently supplying water to domestic users on behalf of the municipality;
2. Grootegeluk mine of Exxaro (previously Iscor) for mine use only;
3. Matimba Power Station of Eskom for power station use only; and
4. Medupi Power Station of Eskom for power station use only.

MCWAP was identified by the National Department of Environmental Affairs as a Strategically Important Development (SID), which is defined as infrastructure developments by State Owned Entities that contribute or will contribute significantly to the national economic growth of South Africa.

## SCOPING AND EIA PROCESS

MCWAP entails certain activities that require authorisation in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA). The process for seeking authorisation is undertaken in accordance with the Environmental Impact Assessment (EIA) Regulations (Government Notice No. R385, R386 and R387 of 21 April 2006), promulgated in terms of Chapter 5 of NEMA. The EIA decision-making authority is DEA, as the project proponent (i.e. DWA) is a national department. Nemai Consulting was

appointed by DWA as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment for MCWAP.

Following pre-consultation with DEA it was decided to submit a Class Application for the three MCWAP sub-projects, where separate environmental assessments are being undertaken for each component.

**MCWAP Environmental Assessments**

| MCWAP Component | Environmental Assessment Process | DEA Reference No. |
|---|---|---|
| Phase 1 | Scoping and EIA | 12/12/20/1465 |
| Phase 2 | Scoping and EIA | 12/12/20/1466 |
| De-bottlenecking | Basic Assessment | 12/12/20/1467 |

The Scoping phase, which was completed as part of the initial stage of the overall environmental assessment process, served to define the Terms of Reference for the subsequent EIA phase by identifying key issues that need further consideration and prioritisation.

## PROJECT LOCATION

The main route for the proposed pipeline commences from Mokolo Dam, in the south-east of the project area. From there it predominantly follows the route of the existing Exxaro pipeline in a north-westerly direction up to the Zeeland Water Treatment Works (WTW) and thereafter to the Matimba / Medupi off take. The alignment then turns westerly and continues until Steenbokpan. The total length is approximately 80km.

## PROJECT COMPONENTS

The major scheme components for MCWAP Phase 1 are summarised in the table to follow.

**Summary of major scheme components for MCWAP Phase 1**

| Component |
|---|
| High lift pump station |
| 900mm: rising main |
| 1000mm: gravity main |
| 800mm: gravity main (T-off to Medupi) |
| 900mm: gravity main (Medupi T-off to delivery pipeline connection) |
| 800mm: gravity main (Steenbokpan T-off to Matimba connection) |
| 1900mm: gravity main (delivery connection to Steenbokpan) |

## ALTERNATIVES

The following alternatives to the pipeline alignment were considered:

- **Rising Main - Mokolo Dam to Wolvenfontein Balancing Dam**
  - Alternative – Main Route

From Mokolo Dam the Main Route follows the existing access road on the Farm Witbank 647LQ for ± 1.3km (in a predominantly north-westerly direction) until it reaches the split between Alternatives A and B.

  - Alternative A

From the Main Route, Alternative A stays parallel to the access road over the Farms Witbank 647LQ and Wolvenfontein 645LQ until it reaches the Wolvenfontein balancing dam.

  - Alternative B

Alternative B leaves the access road to follow an existing power line for ± 300m over the Farm Witbank 647LQ. The route then turns in a more northerly direction and continues for ± 1.4km on the Farm Wolvenfontein 645LQ. The alignment then turns in a south-westerly direction and runs for another ± 1.6km on the last-mentioned farm until it reaches the Wolvenfontein balancing dam.

- **Gravity Line - Wolvenfontein Balancing Dam to Matimba Power Station**

  - Alternative – Main Route

From the Wolvenfontein balancing dam, the Main Route follows the route of the existing Exxaro pipeline. It continues to the Matimba Power Station termination point, situated on the Farm Grootestryd 465LQ.

- **Gravity Line - Matimba Power Station to Steenbokpan**

This section of the MCWAP Phase 1 pipeline is a new line (i.e. no existing parallel pipeline as is the case as described above with the Exxaro pipeline).

  - Alternative – Main Route

From the tee off from the Wolvenfontein-Matimba gravity pipeline, the delivery line travels westwards along the existing road for ± 2km over Portion 3 and the Remainder of the Farm Hanglip 508LQ, until the split between Alternatives C and D. From where Alternatives C and D converge, the Main Route continues westwards until it reaches Steenbokpan.

  - Alternative C

From the split on the Farm Hanglip 508LQ, Alternative C continues westwards alongside a secondary road (constructed to accommodate the Medupi Power Station) for a further ± 1.3km before crossing over various farms until Kringgatspruit 318LQ.

  - Alternative D

From the split on the Farm Hanglip 508LQ, Alternative D continues south-westerly along a secondary road for ± 3.7km until it reaches the Farm Naauw Ontkomen 509LQ where it turns further south-west to follow alongside the railway line. From here it traverses various farms (continuing parallel to the railway line):

## PROJECT LIFE-CYCLE

A project description is provided in the EIA report, listing the primary activities during the pre-construction, construction, operation and decommissioning phases of the project.

## PROFILE OF THE RECEIVING ENVIRONMENT

To minimise impacts, the proposed route attempts to remain alongside existing development footprints (e.g. farm boundaries) and linear-type infrastructure where the environment is regarded as less sensitive, such as:

- Pipelines (i.e. existing Exxaro Pipeline from the Wolvenfontein balancing dam to Zeeland WTW),
- Roads,
- Railway lines,
- Transmission lines; and
- Industrial corridors.

A 200m corridor (i.e. 100m on either side of the centre line) was adopted as the study area, which allows for possible deviations (deemed technically feasible) from the proposed alignment within this corridor based on on-ground constraints and sensitive features.

The EIA Report provides a general description of the status quo of the receiving environment in the project area, and also provides local and site-specific discussions on those environmental features investigated by the respective specialists. This allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project. The following environmental features are discussed:

- Climate
- Topography
- Surface Water
- Geology and Soil
- Geohydrology
- Flora
- Fauna
- Socio-Economic Aspects
- Planning & Land Use
- Agricultural Potential
- Air Quality
- Noise
- Archaeological and Cultural Features
- Infrastructure and Services
- Transportation
- Visual Quality
- Tourism

## SUMMARY OF SPECIALIST STUDIES

A synopsis of the following specialist studies is provided in the EIA Report:

- Ecological Study – Terrestrial –

  In terms of the pipeline route options, Alternatives B (prevents impacts to two sensitive *Euphorbia* species in the kloofs from falling rocks and disturbance to sensitive fauna species within the Waterberg Biosphere) and C (south of the new road around the Medupi power station in the already degraded area) are preferred. No fatal flaws identified. Sub-sections for study include:
  - Flora;
  - Mammalogy;
  - Avifauna;
  - Herpetology;
- Ecological Study – Aquatic

  Alternative B (the southern alternative) is preferred above Alternative A, as it will impinge the least on the ecological integrity of the localised aquatic systems. The study did not allocate preference between Alternatives C and D from an aquatic conservation perspective. General mitigation measures which are applicable to all wetland areas are provided.
- Traffic Management Plan

  The alignment along existing road infrastructure was an influential factor in the route selection process, as these sections would be less environmentally sensitive due to the environment already being disturbed. This proposed route alignment therefore enjoys good accessibility from the existing road network. Best practices are provided in the high-level Traffic Management Plan.
- Heritage Impact Assessment

  Along the Main Route identified heritage resources included a cemetery and farmhouse on the Farm Goedgedacht 602LQ, informal graves on the Farm Sterkfontein 642LQ, Hennie de Lange's Kafee Theunispan and Steenbokpan Bosveld Drankwinkel.

- Economic Study

  The economic impacts of MCWAP in the Mokolo Catchment is summarised as follows:

| | Activity | Intensity of Impact | Duration |
|---|---|---|---|
| MCWAP -Construction | Cattle Farming | Low | Temporary |
| | Game farming and Related Activities | Low | Temporary |
| | Irrigation (water reduction) | None | Temporary |
| | Business Tourism | Medium | Temporary |
| | Lephalale Local Municipality | Medium | Temporary |
| MCWAP - Operational | Cattle Farming | Low | Permanent |
| | Game farming and Related Activities | Low | Permanent |
| | Irrigation Farming (water re-allocation risk) | Medium | Permanent |
| | Business Tourism | Low | Permanent |
| | Lephalale Local Municipality | Low | Permanent |

- Social Impact Assessment

  The SIA employed a multi-faceted methodological technique to scope the base line social environment within which the project will unfold and to identify and assess the likely social impacts of the project across both the construction and operational phases. In this manner the impacts (e.g. access issues, crime and security, fencing, impact on farming operations, etc.) were assessed in accordance with a recognised technique.

- Visual Impact Assessment

  There are two study areas. The one study area entails the area covered by the alternative corridors from the Mokolo Dam rising main towards the Wolvenfontein balancing dams. The second study area is around the Break Pressure Tank at Rietspruitnek on the Farm Fancy 556LQ. Mitigation measures are provided to reduce or alleviate the intrusive contrast between the proposed project components and activities, and the receiving landscape to a point where it is acceptable to visual and landscape receptors.

## ANALYSIS OF ALTERNATIVES

A comparative analysis of the alternative alignment corridors is undertaken, based on the advantages and disadvantages associated with each option. The analysis was completed through technical (i.e. engineering) input and environmental specialists' findings.

Based on the comparative analysis, and consensus amongst the specialists, the following alternatives were regarded as preferable:

- Rising Main (Mokolo Dam to Wolvenfontein Balancing Dams) – Alternative B; and
- Gravity Line (Matimba Power Station to Steenbokpan) – Alternative C.

## IMPACT ASSESSMENT

Impacts were identified as follows:

- An appraisal of the project description and the receiving environment;
- Impacts associated with listed activities contained in GN No. R386 and R387;
- Issues highlighted by environmental authorities;
- Findings from specialist studies; and
- Comments received during public participation.

The impacts associated with the listed activities and raised by environmental authorities are discussed on a qualitative level.

In order to understand the impacts related to MCWAP's components, the activities and environmental aspects associated with the project life-cycle were identified. The following significant environmental impacts associated with MCWAP Phase 1 are assessed quantitatively and concomitant mitigation measures are provided.

**Significant environmental impacts associated with MCWAP Phase 1**

| CONSTRUCTION PHASE | |
|---|---|
| **Feature** | **Impact** |
| **Watercourses** | • The pipeline crossings of the Mokolo River (tributary only), Rietspruit (tributary and main stem), Kutangspruit (tributary and main stem) and Sandloop River (tributary and main stem) could lead to the alteration of the structure (i.e. bed and banks), damage to the riparian habitat, lead to increased siltation (water quality deterioration) and adversely affect aquatic biota (e.g. clogging of gills, influence movement). |
| **Soil** | • Erosion on steep slopes.<br>• Loss of topsoil.<br>• Impacts associated with the establishment of borrow pits.<br>• Blasting-related impacts.<br>• Impacts associated with the disposal of large quantity of spoil material. |
| **Geohydrology** | • Disturbance of the aquifer from blasting |
| **Flora** | • Damage to / removal of protected trees and medicinal plants.<br>• Damage to riparian vegetation at river crossings.<br>• Encroachment by exotic species, with subsequent loss of biodiversity. |
| **Fauna** | • Poaching.<br>• Obstruction of movement.<br>• Preventing access to watering points.<br>• Harm from construction activities.<br>• Loss of animals due to improper access control. |
| **Air** | • Impacts associated with the dust from use of dirt roads, transportation of fill and spoil material and from bare areas. |
| **Noise** | • Impacts associated with the noise emanating from construction activities (e.g. vehicle movement, trenching, generators). |
| **Aesthetics** | • Impacts to visual quality of the area through poor housekeeping and construction-related activities. |
| **Safety and Security** | • Impacts associated with trench collapse.<br>• Impacts associated with the uncontrolled access.<br>• Criminal activities associated with construction. |
| **Waste** | • Impacts associated with the use of veld for ablution purposes.<br>• Land, air and water pollution through poor waste management practises. |
| **Construction camp** | • Impacts associated with the siting of construction camp – visually obtrusive, vegetation clearing, poaching, security.<br>• Impacts associated with the improper storage of material. |

| | |
|---|---|
| **Socio-economic aspects** | • Damages to property, including structures, fencing, gates, animals.<br>• Impacts associated with the establishment of temporary construction servitude.<br>• Loss of income (e.g. temporary loss of agricultural land, influence to eco-tourism activities) due to construction-related activities.<br>• Impacts associated with the influx of job seekers.<br>• Use of local labourers and suppliers, as far as possible (positive impact).<br>• Damage to property and risk to residents of the Phumolong Community Trust. |
| **Heritage** | • Damage to heritage resources. |
| **Infrastructure and Services** | • Damage to existing river crossings at the Rietspruit main stem and eastern tributary.<br>• Influence to traffic along roads (particularly R510, access road to Mokolo Dam, and new road around Medupi).<br>• Damage to dirt road to Wolvenfontein through use by heavy vehicles.<br>• Traffic disruptions due to use of R510 and major road network by trucks delivering pipe material. |

| **OPERATIONAL PHASE** | |
|---|---|
| **Feature** | **Impact** |
| **Watercourses** | • Impacts associated with the de-stabilisation of encased pipeline at river crossing or tie-ins at riverbanks.<br>• Erosion during scouring. |
| **Flora** | • Spreading of exotic vegetation and associated loss of biodiversity. |
| **Fauna** | • Obstruction of movement of aquatic biota at river crossings. |
| **Socio-economic aspects** | • Impacts associated with the potential restriction or curtailment of water use downstream of the Mokolo Dam.<br>• Impacts associated with land use restrictions as a result of registration of permanent servitude / extension of existing Exxaro pipeline servitude. |
| **Aesthetics** | • Visual impacts associated with aboveground infrastructure (i.e. access/valve chambers at approximately 500m intervals along the route; pipeline markers; Break Pressure Tank). |
| **Infrastructure and Services** | • Continual use of maintenance road will lead to erosion and damage to road surface. |
| **Operation & Maintenance** | • Construction-related impacts for any maintenance related work to pipeline infrastructure. |
| **Agricultural Potential** | • Impacts associated with land use restrictions within servitude.<br>• Agro-economical impact.<br>• Possible impacts to food security. |

## PUBLIC PARTICIPATION

The EIA Report provides a full account of the public participation process that was followed for the EIA phase for MCWAP Phase 1.

The purpose of public participation for MCWAP includes:

1. Providing Interested and Affected Parties (I&APs) with an opportunity to obtain information about MCWAP;
2. Allowing I&APs to present their views, issues and concerns regarding MCWAP;
3. Granting I&APs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with MCWAP; and
4. Enabling DWA and the project team to incorporate the needs, concerns and recommendations of I&APs into the project.

Over-and-above public participation associated with the EIA protocol, a broader Public Involvement Process (PIP) is also being conducted for MCWAP to ensure that comprehensive, inclusive and robust consultative procedures are followed. The Agricultural Sector is the most prominent interest group, considering the issues surrounding water availability and the land use type encountered in the project area.

## CONCLUSION

By following existing linear infrastructure and managing the impacts through the advocated mitigation measures, ensuring conformance to the Reserve conditions and upholding existing water use entitlements (through the water use authorisation process), it can be concluded that there are no fatal flaws associated with the project. It is also concluded that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified mitigation measures.

# TABLE OF CONTENTS

## LIST OF TABLES

## LIST OF FIGURES

## LIST OF APPENDICES

# LIST OF ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| **AGIS** | Agricultural Geo-Referenced Information System |
| **BID** | Background Information Document |
| BPEO | Best Practicable Environmental Option |
| **°C** | Degrees Celsius |
| **CW RMA** | Crocodile (West) River Management Authority |
| **DEA** | Department of Environmental Affairs |
| **DEAT** | Department of Environmental Affairs and Tourism |
| **DEDET** | Department of Economic Development Environment and Tourism |
| **DMR** | Department of Mineral Resources |
| **DWA** | Department of Water Affairs |
| **DWAF** | Department of Water Affairs and Forestry |
| **EAP** | Environmental Assessment Practitioner |
| **EIA** | Environmental Impact Assessment |
| **EI&S** | Ecological Importance and Sensitivity |
| **EMP** | Environmental Management Plan |
| **EWR** | Ecological Water Requirements |
| **FGD** | Flue Gas Desulphurisation |
| **GDACEL** | Gauteng Department of Agriculture, Conservation, Environment and Land Affairs |
| **GIS** | Geographical Information System |
| **GN** | Government Notice |
| **ha** | Hectare |
| **HFY** | Historic Firm Yield |
| **I&AP** | Interested and Affected Party |
| **IDP** | Integrated Development Plan |
| **IPP** | Independent Power Producer |
| **km** | Kilometre |
| **kV** | Kilovolt |
| **l** | Litres |
| **l/s** | Litres per second |
| **LIHRA** | Limpopo Heritage Resources Authority |
| **m** | Metre |
| **m/s** | Metres per second |
| **$m^3$** | Cubic metre |
| **MAR** | Mean Annual Runoff |
| **Ml** | Mega litre |

| | |
|---|---|
| **mm** | Millimetre |
| **$Mm^3$** | Million cubic metres |
| **$Mm^3/a$** | Million cubic metres per annum |
| **MCWAP** | Mokolo Crocodile (West) Water Augmentation Project |
| **MVA** | Mega Volt Amperes |
| **NAFU** | National African Farmers' Union |
| **NEMA** | National Environmental Management Act (No. 107 of 1998) |
| **NWRS** | National Water Resources Strategy |
| **OHS** | Occupational Health and Safety |
| **OS** | Operational Reservoir |
| **PIP** | Public Involvement Process |
| **PLC** | Programmable Logic Controller |
| **PMF** | Probable Maximum Flood |
| **PSC** | Project Steering Committee |
| **RI** | Recurrence Intervals |
| **RDM** | Resource Directed Measures |
| **RHP** | River Health Programme |
| **SAHRA** | South African Heritage Resources Agency |
| **SANBI** | South African National Biodiversity Institute |
| **SANDF** | South African National Defence Force |
| **SANS** | South African National Standards |
| **SASAqS** | South African Society for Aquatic Scientists |
| **SCADA** | Systems Control and Data Acquisition |
| **SDF** | Spatial Development Framework |
| **SIA** | Social Impact Assessment |
| **SID** | Strategically Important Development |
| **SMA** | Scheme Management Authority |
| **TAU** | Transvaal Agricultural Union |
| **TCTA** | Trans-Caledon Tunnel Authority |
| **TDS** | Total Dissolved Solids |
| **ToR** | Terms of Reference |
| **UNESCO** | United Nations Educational, Scientific and Cultural Organization |
| **VIA** | Visual Impact Assessment |
| **VSD** | Variable Speed Drive |
| **WMA** | Water Management Area |
| **WRC** | Water Research Commission |
| **WTW** | Water Treatment Works |

# 1 DOCUMENT ROADMAP

This EIA Report for the proposed Mokolo Crocodile (West) Water Augmentation Project (MCWAP) Phase 1 aims to satisfy the requirements stipulated in Government Notice (GN) No. R385 (21 April 2006), regulation 32(2). **Table 1** presents the document's composition, in terms of the aforementioned requirements.

**Table 1: MCWAP Phase 1 EIA Report Roadmap**

| Chapter | Title | Correlation with G.N. No. R385 | Description |
|---|---|---|---|
| 2 | Project Background and Motivation | R32(2)(f) | A description of the need and desirability of the proposed activity. |
| 3 | Scoping and EIA Process | – | – |
| 4 | Environmental Assessment Practitioner | R32(2)(a) | Details of –<br>(i) the EAP who compiled the report; and<br>(ii) the expertise of the EAP to carry out an environmental impact assessment. |
| 5 | Project Location | R32(2)(c) | A description of the location of the activity. |
| 6 | Project Description | R32(2)(b) | A detailed description of the proposed activity. |
| | | R32(2)(c) | A description of the property on which the activity is to be undertaken and the route of the linear activity. |
| 7 | Profile of the Receiving Environment | R32(2)(d) | A description of the environment that may be affected by the activity. |
| 8 | Summary of Specialist Studies | R32(2)(i) | A summary of the findings and recommendations of any specialist reports. |
| 9 | Analysis of Alternatives | R32(2)(f) | A description identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity. |
| | | R32(2)(h) | A description and comparative assessment of all alternatives identified during the environmental impact assessment process. |
| 10 | Impact Assessment | R32(2)(d) | A description of the manner in which the physical, biological, social, economic and cultural features of the environment may be affected by the proposed activity. |
| | | R32(2)(g) | An indication of the methodology used in determining the significance of potential environmental impacts. |
| | | R32(2)(j) | (j) a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures; |

| Chapter | Title | Correlation with G.N. No. R385 | Description |
|---|---|---|---|
| | | R32(2)(k) | An assessment of each identified potentially significant impact, including –<br>(i) cumulative impacts;<br>(ii) the nature of the impact;<br>(iii) the extent and duration of the impact;<br>(iv) the probability of the impact occurring;<br>(v) the degree to which the impact can be reversed;<br>(vi) the degree to which the impact may cause irreplaceable loss of resources; and<br>(vii) the degree to which the impact can be mitigated. |
| 11 | Legislation and Guidelines Considered | – | – |
| 12 | Public Participation | R32(2)(e) | Details of the public participation process. |
| 13 | Assumptions, Uncertainties and Gaps in Knowledge | R32(2)(l) | A description of any assumptions, uncertainties and gaps in knowledge. |
| 14 | EIA Conclusions and Recommendations | R32(2)(m) | An opinion as to whether the 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. |
| | | R32(2)(n) | An environmental impact statement |
| Appendix J | | R32(2)(o) | A draft Environmental Management Plan. |
| Appendix H | | R32(2)(p) | Copies of any specialist reports and reports on specialised processes. |
| N/A | N/A | R32(2)(q) | Any specific information that may be required by the competent authority. |

# 2 PROJECT BACKGROUND AND MOTIVATION

## 2.1 Increased Need for Water in the Lephalale Area

The Lephalale municipal area falls in the Limpopo catchment area. 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 and is thus an international watercourse.

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 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, 2008d). 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 will significantly increase over the next 20 years.

| Box 1: | Why is water needed in Lephalale? |
|---|---|

Water demand will increase in the 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 (presently underway);
- Development of further Eskom power stations;
- Possible development of power stations by Independent Power Producers (IPPs);
- Extension of the Exxaro mining operations and further mines;
- Possible petrochemical industries to be developed around the coal field further west of Lephalale;
- Possible exploitation of gas; and
- Accelerated growth in the population in the area.

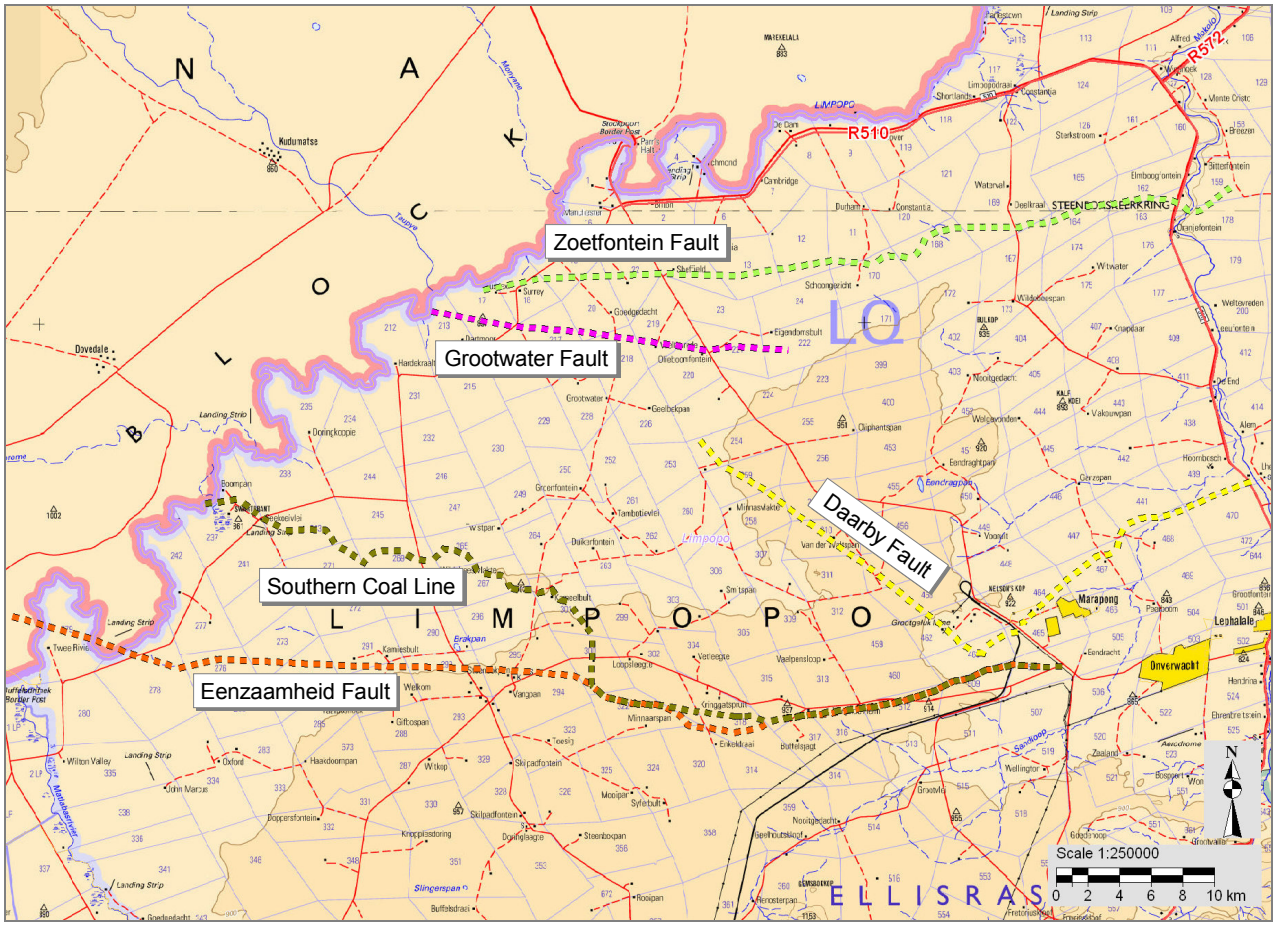



**Figure 1: Fault lines of the Waterberg Coalfield**

## 2.2 Water Requirements

Water requirements scenarios were developed using water use projections provided by the large users (i.e. Eskom, Exxaro and Sasol). The projected water requirements for the local municipality were derived using the existing number of households in Lephalale and adding the projected growth in households as a result of the establishment of new mines, power stations and coal-to-liquid fuel facilities. A planning horison until 2030 was considered.

Further work on the demands indicates that fewer power stations may be constructed during the period until 2030 and that the demands may grow slower as initially anticipated. This may lead to a total demand of about 140 $Mm^3/a$ in 2030 instead of the 198 million cubic metres per annum ($Mm^3/a$) shown in **Table 3**.

The water requirement forecast for the interim period (i.e. period during which water will be delivered from Mokolo Dam only – MCWAP Phase 1) was adjusted to match the quantity that can be safely abstracted up to the end of 2014.

According to the MCWAP Phase 2 Feasibility Stage report (DWA, 2008b), MCWAP was sized to transfer the water requirements for the Scenario 9 development projection. Projects that were considered during the preparation of Scenario 9 curve are tabulated below. Due to the dynamic nature of MCWAP's planning process, the exact scenario and concomitant details may change depending on the requirements of the end users and their ability to raise funds for the investment. Further work on the demands indicates that fewer power stations may be constructed during the period until 2030 and that the demands may grow slower as initially anticipated. The implications are that the sizing of the MCWAP infrastructure may vary, however the proposed siting and alignment of the fixed and linear infrastructure should remain the same if the planning scenario is updated.

**Table 2: Development scenario projects used to determine water requirements**

| No. | Proponent | Details |
|---|---|---|
| 1 | Eskom | Matimba, Medupi + 4 coal fired power stations power stations |
| 2 | Independent Power Producers (IPPs) | Equivalent of 1 Eskom power station |
| 3 | Exxaro | Matimba coal supply + further projects |
| 4 | Coal mining | Allowance for 4 additional coal mines each supplying a power station |
| 5 | Sasol | Mafutha 1 Coal to Liquid Fuel (CTL) plant and associated coal mine |
| 6 | Municipality | Estimate based on projected growth in households for construction and permanent workforce |

The annual water requirements for the abovementioned projects are shown in **Table 3** and the resultant annual demand is presented in **Figure 2**.

**Table 3:** **Total annual water requirements ($Mm^3/a$) for major user groups – based on planning Scenario 9 (18 May 2009) (DWA, 2008b)**

| Year | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2020 | 2025 | 2030 |
|---|---|---|---|---|---|---|---|---|---|---|
| Eskom | 4.3 | 4.3 | 4.9 | 6.8 | 9.3 | 10.9 | 14.3 | 50.9 | 77.6 | 77.6 |
| IPP's | - | 0.4 | 0.9 | 0.9 | 1.5 | 4.4 | 13.2 | 15.6 | 15.6 | 15.6 |
| Coal Mining (Power) | - | - | 1.1 | 2.7 | 4.4 | 5.3 | 6.8 | 14.1 | 20.0 | 20 |
| Exxaro Projects | 3.0 | 3.2 | 3.7 | 4.7 | 6.6 | 9.2 | 10.8 | 16.9 | 16.2 | 19.2 |
| Sasol (Mafutha 1) | - | - | 0.4 | 6.1 | 6.6 | 9.9 | 25.2 | 43.5 | 43.5 | 44.0 |
| Municipality | 5.6 | 5.9 | 7.7 | 10.4 | 12.0 | 13.6 | 14.5 | 20.4 | 21.2 | 21.6 |
| **Total** | 12.9 | 13.8 | 18.7 | 31.7 | 40.4 | 53.4 | 84.8 | 161.4 | 194.1 | 198.0 |
| Irrigation + Mokolo River | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 | 10.4 |
| **Total + Irrigation** | 23.3 | 24.2 | 29.1 | 42.1 | 50.8 | 63.8 | 95.2 | 171.8 | 204.5 | 208.4 |

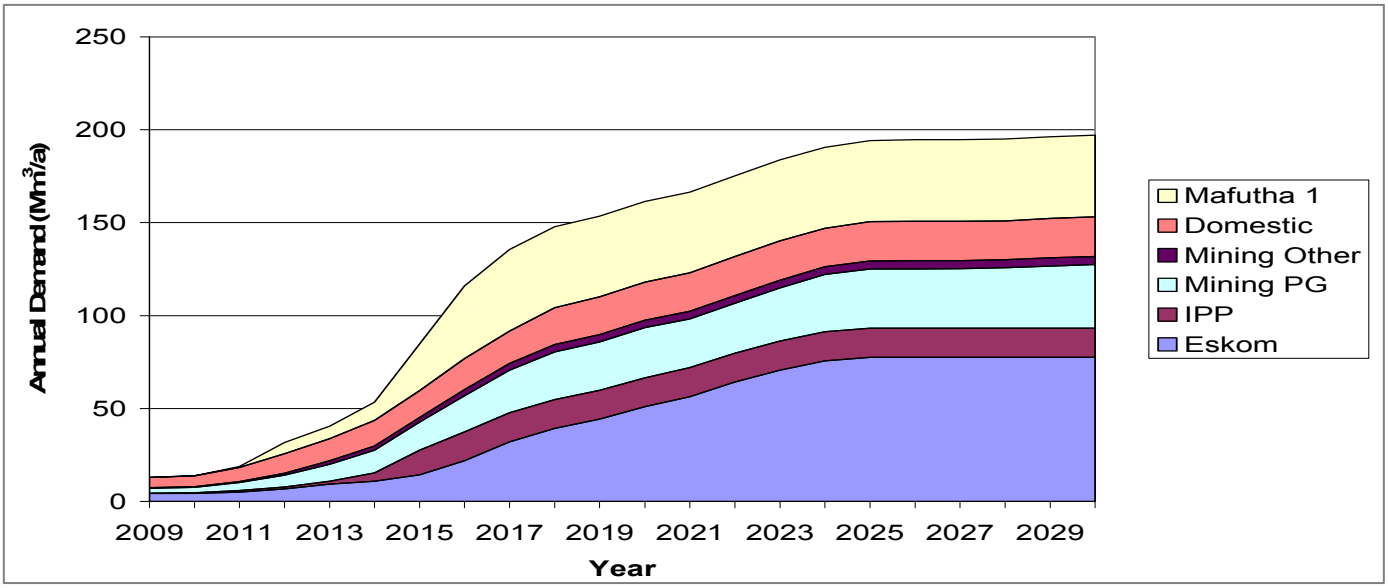



**Figure 2:** **Demand Projection per User for planning Scenario 9 (18 May 2009)**

## 2.3 Meeting the Increased Water Demands

Due to the limited availability of water in the Lephalale area, the Department of Water Affairs (DWA) commissioned a feasibility study of the Mokolo Crocodile (West) Water Augmentation Project (MCWAP) to establish how the future water demands could be met. The phases for the proposed infrastructure for transferring water from the Mokolo Dam and Crocodile River (West) are tabulated below (refer to **Figure 3**).

**Table 4: MCWAP Components**

| Component | Brief Overview |
|---|---|
| **Phase 1** | An underground pipeline parallel to the existing pipeline, to augment the supply from Mokolo Dam. This is to supply in the growing water requirement and also to supply more water for the interim period until a transfer pipeline from the Crocodile River (West) can be implemented. The system will utilise the available yield from Mokolo Dam. Phase 1 consists of the following:<br>• Rising main from Mokolo Dam to Wolvenfontein balancing dam;<br>• Gravity line from Wolvenfontein to Matimba Power Station;<br>• Gravity line from Matimba Power Station to Steenbokpan; and<br>• Break pressure tank at Rietspruitnek. |
| **Phase 2** | Transfer scheme from the Crocodile River (West) at Vlieëpoort near Thabazimbi to the Lephalale area via a system consisting of:<br>• A weir and abstraction infrastructure, including a balancing dam, desilting woks, and a high lift pumpstation at Vlieëpoort (near Thabazimbi);<br>• Transfer system (approximately 100 km of underground pipeline): consisting of various alternative pipeline routes;<br>• A Break Pressure Reservoir;<br>• An Operational Reservoir; and a<br>• Delivery linem, consisting of alternative routes for a gravity pipeline (underground) running from the Operational Reservoir to the Steenbokpan area, connecting to the Phase 1 works. |
| **De-bottlenecking** | De-bottlenecking of the existing pipeline that stretches from Mokolo Dam to Lephalale, which belongs to Exxaro. This entails the construction of the first 9km of the proposed underground gravity pipeline (for Phase 1) from Wolvenfontein balancing dam, with interconnections to the existing pipeline. The intention of the de-bottlenecking is to improve the hydraulic gradient at Rietspruitnek, where the existing pipeline passes over a high point. |

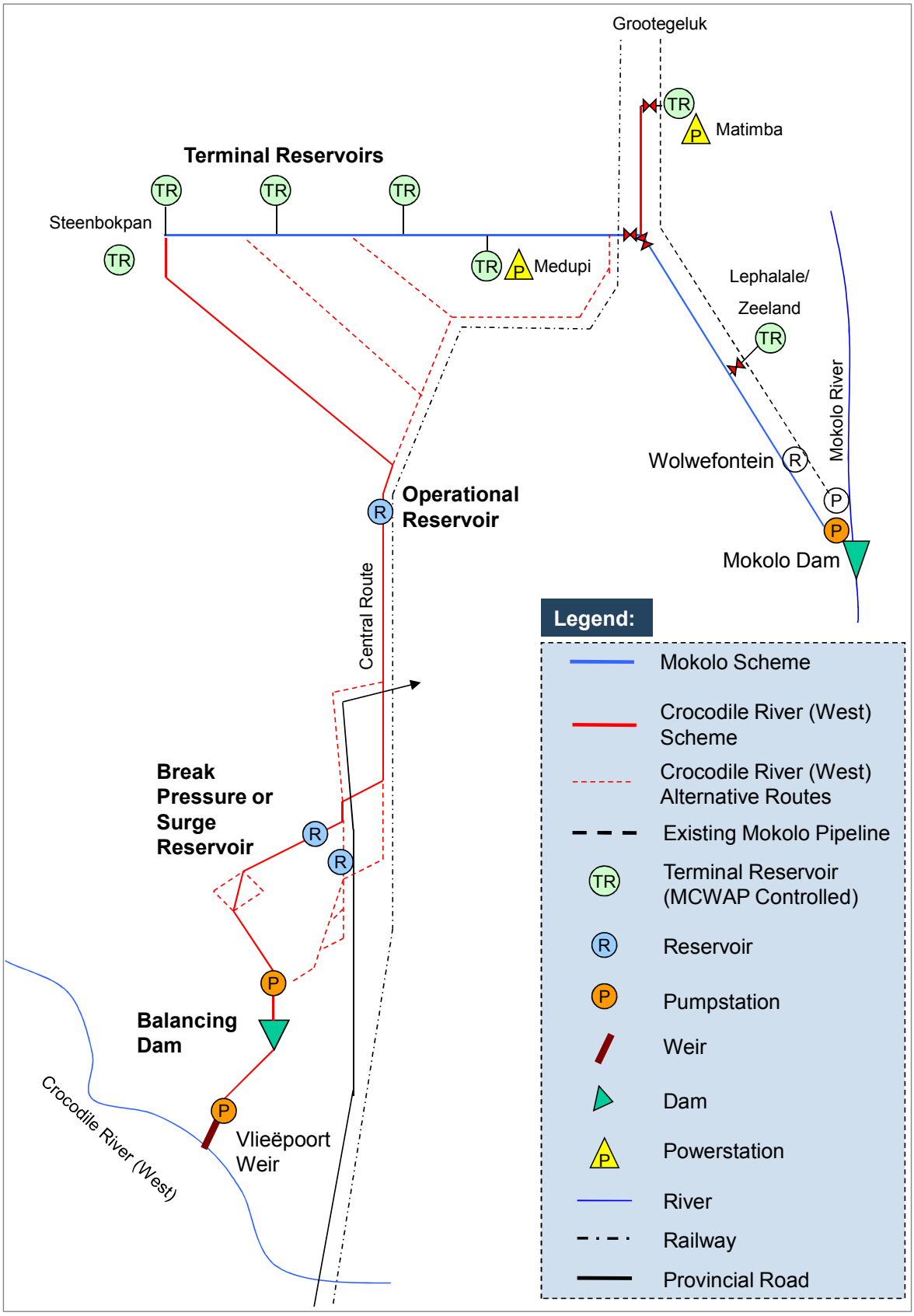



**Figure 3: MCWAP schematic layout**

Based on development Scenario 9, the net water requirements for the respective phases of the project were calculated as follows (DWA, 2008b):

**Phase 1:**

- Long term augmentation from the Mokolo Dam = 28.7 $Mm^3/a$ at 99.5% assurance of supply and 32.4 $Mm^3/a$ at a mixed assurance, as will be dealt with through the water use licensing process of DWA;
- Peak capacity of the existing Exxaro pipeline = 17.98 $Mm^3/a$;
- Average capacity of the existing Exxaro pipeline (incorporating 20% reliability allowance and 2% losses) = 14.7 $Mm^3/a$;
- Average capacity of the Mokolo system following the de-bottlenecking of the first 9.0 km (incorporating 20% reliability allowance and 2% losses) = 18.8 $Mm^3/a$;
- Water requirement from Mokolo Dam to be supplied via new pipeline: 30.5 $Mm^3/a$;
- Long term yield of the Mokolo Dam = 39.1 $Mm^3/a$ at 99,5% assurance;
- Irrigation allocation = 10.4 $Mm^3/a$;
- Losses on the Mokolo Scheme will result in a slight reduction in the volume of water ultimately delivered to end users. These losses are allowed for in the transfer capacity of the Crocodile River (West) Scheme to ensure that the total net water requirements of all end users are supplied by the combined project.

**Phase 2:**

- 2030 net water requirement = 198 $Mm^3/a$;
- Long term minimum augmentation from the Mokolo Dam = as above;
- Ultimate annual Phase 2 transfer capacity: 198 – 29.4 = 168.6 $Mm^3/a$ (excluding system losses and reliability and redundancy requirements);
- The supply from the Crocodile River (West) must make allowance for losses on both the Mokolo and Crocodile River (West) Schemes resulting in a slight increase in the required transfer capacity of the Crocodile River (West) Scheme.

The resultant increase in capacity of MCWAP is illustrated in **Figure 4**. For the possible demands indicated in **Figure 4** the transfer capacity for Phase 2(A) will be 110 $Mm^3/a$, but the capacity of Phase 1 works will not be affected. In the case that the demand is reduced this infrastructure will be scaled down somewhat.

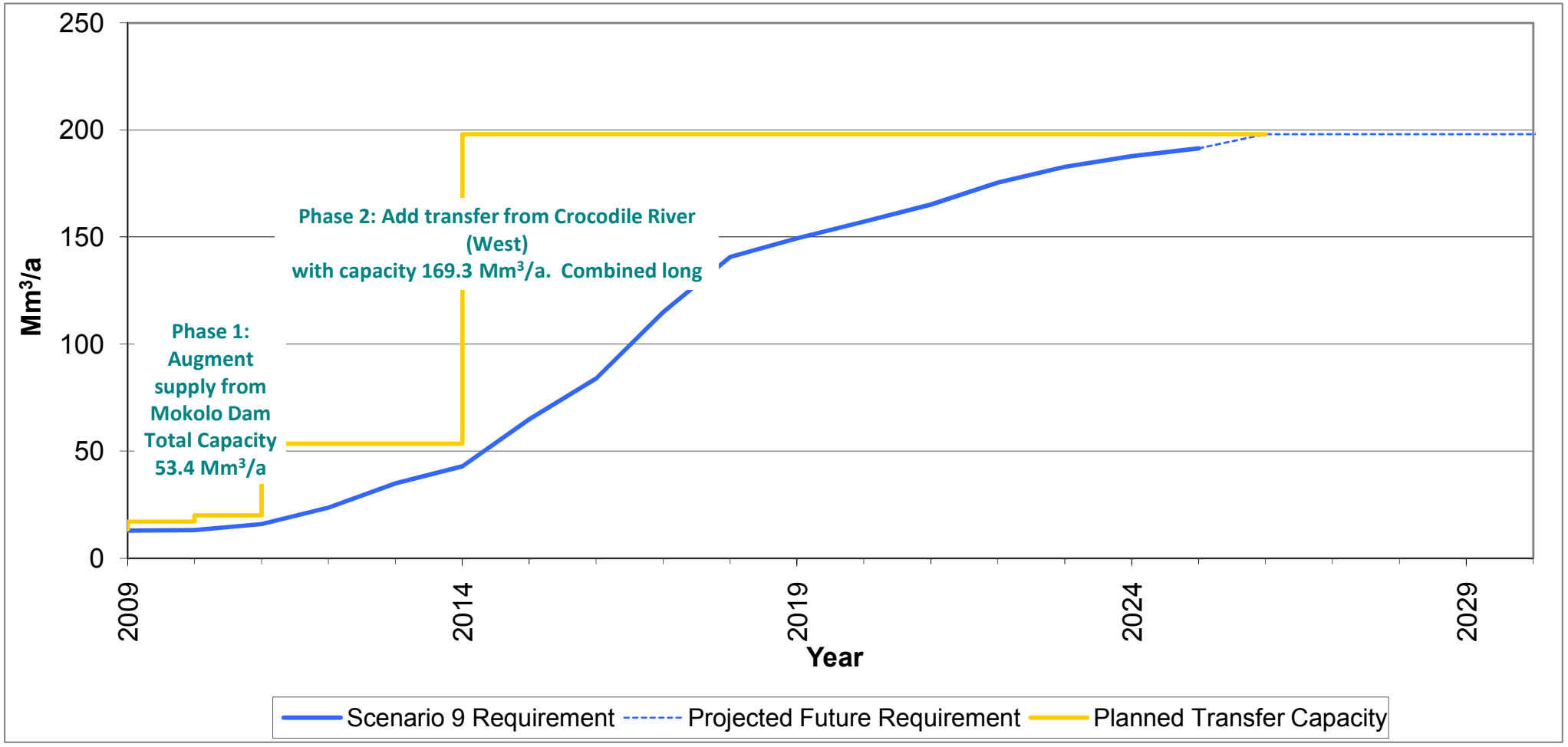



**Figure 4: Projected Annual Water Requirement and Planned Transfer Capacity (Scenario 9)**

The projected monthly water requirement for Phase 1 is shown below.

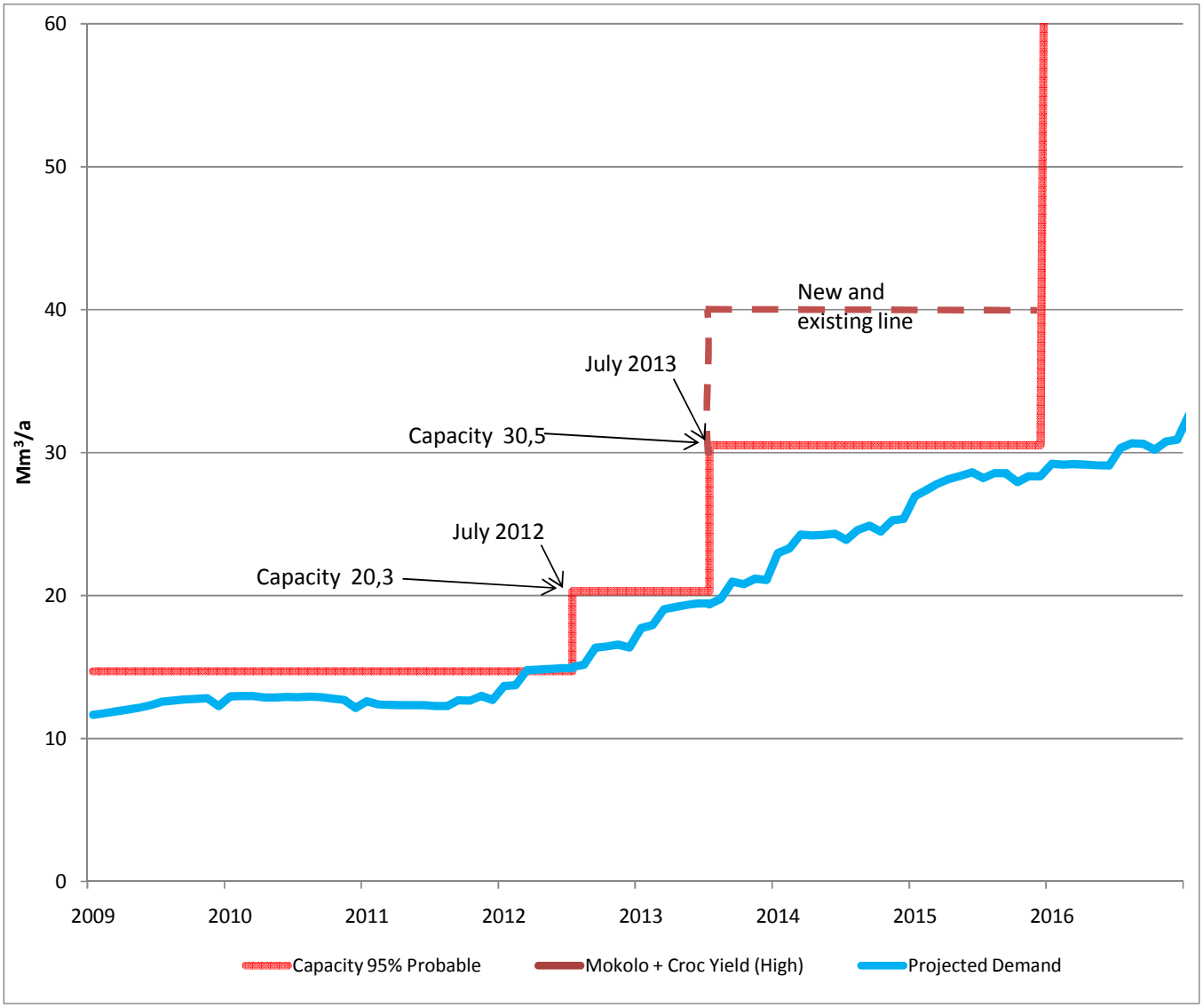



**Figure 5: Projected Monthly Water Requirement for Phase 1**

**Appendix O** provides a brief description of the water resources situation and planning processes followed by DWA, whereby the proposed project to augment water supplies to the Lephalale area was derived at.

## 2.4 Water Resources of Mokolo River

The Mokolo Dam was constructed in 1970's with the purpose to supply water to the Matimba Power Station, Grootegeluk mine and the domestic use of what would later become a municipality. Provision was made to supply a volume of 10,4 $Mm^3/a$ to stabilise/augment the irrigation that is taking place downstream of the dam from the river and the alluvium aquifer.

It was found that due to the change in land use upstream from the dam from irrigation to game farming, more water was flowing to the dam and that the yield of the dam is now higher than that calculated in the 1970s. The upstream irrigation decreased from approximately 13 500 ha in 1970 to approximately 8 500 ha currently. The yield of the dam is now calculated as 39,1 $Mm^3/a$ at 99,5% assurance. At a mixed assurance more water can be allocated.

The allocation of water to the users from Mokolo Dam will need to be dealt with through the licensing process in accordance to the requirements of the National Water Act (Act 36 of 1998). The available yield of the Mokolo Dam and the Phase 1 works enables the following:

1. Supply more water from the dam on a sustainable basis without impacting on the legal entitlement of the existing users.
2. To transfer the water from the irrigation to other users on a temporary and short-term basis if required. This can serve as a bridging arrangement until MCWAP Phase 2 is commissioned. This measure will need to be on the basis of compensation being paid to irrigators.

The objective of the MCWAP is to enable the supply of water to the new users without impacting on the legal entitlements of the existing users. This will be achieved by:

- Allocating the additional yield from the Mokolo Dam and utilise it through Phase 1 infrastructure;

- Allocating surplus return flow in the Crocodile River (West) and utilise it through Phase 2 infrastructure; and
- In the case of the aforementioned not being adequate, the water in the Crocodile system can be augmented from return flows in the Vaal River.

The DWA embarked on a process to determine the Reserve requirements and to determine the operating rules for the Mokolo River. The outcome of these will feed into the licensing process of the DWA and the operationalising of the system.

The following users will need to be licensed for Phase 1:

5. The Town of Lephalale that are currently using water allocated to the Grootegeluk mine and Eskom. Exxaro and Eskom are currently supplying water to domestic users on behalf of the municipality;
6. Grootegeluk mine of Exxaro (previously Iscor) for mine use only;
7. Matimba Power Station of Eskom for power station use only; and
8. Medupi Power Station of Eskom for power station use only.

The irrigation users' allocation will not change and does not need to be licensed at this stage.

The MCWAP project is currently envisaged with a rapid implementation of Phase 2 to be commissioned shortly after Phase 1. This is important as the yield from Mokolo Dam can only support limited development. The demands for scenario 9 is shown as **Figure 2** and represents the implementation of the developments listed in **Table 2** and is to be supplied by water through a Phase 1 and a Phase 2 at the full capacity as described. It is however possible that some of the power station developments listed in **Table 2** may be delayed due to the current global economic downturn, the shortage of funding, the view taken by the Department of Energy on future coal fired Power Generation in the Integrated Resource Plan, etc. **Figure 4** represents a possible lower scenario that delays certain prospective developments to a timeframe beyond the current horizon. These lower demands may impact on the project with regard to the required capacity of the infrastructure. That means that the pipe diameters for Phase 2(A) may be slightly smaller.

It will also put some less pressure on the availability of water in the Crocodile River (West) for abstraction from 168 to 110 $Mm^3/a$ and decrease the possible transfers from the Vaal River System.

A risk/sensitivity analysis was performed to analyse the situation where the Phase 2 works cannot proceed in good time and where the water supply from Mokolo Dam only, will need to supply in the requirements. This represents a "worst case" scenario for the utilisation of Mokolo Dam. For such a situation it is clear that the demands as originally projected in scenario 9 cannot be sustained and the demands of the **Table 2** possible developments must then be tailored according to the water that can be made available on a sustainable basis from Mokolo Dam. The users that can be considered for supply from Mokolo Dam only are:

- Existing irrigation allocation;
- Lower growth in the existing Lephalale town;
- Existing Matimba Power Station;
- Exxaro Mine;
- Medupi Power Station with no Flue Gas Desulphurisation (FGD); and
- The FGD requirements for Medupi Power Station.

These are graphically shown in **Figure 6**.

Some additional local sources are identified as possible contingency water resources and include the increased utilisation of the existing return flows of the Lephalale Municipality and the deep ground water aquifer along the Eenzaamheid fault. These resources are considered as small in relation to the Phase 2 capacity and cannot serve as an alternative to Phase 2, but are considered to be important as a contingency measure. [Separate EIA processes will need to be executed for those once investigated in more detail and implementation is required].

A graphical representation of a water balance for such a measure is indicated in **Figure 6** including a provision for the Reserve. From **Figure 6** it is clear that the FGD technology at Medupi Power Station cannot be fully implemented without MCWAP Phase 2 in place

or without the full return flow and ground water resources in place. The recommended engineering approach is that the FGD implementation should commence when Phase 2 is committed to and the implementation thereof already initiated.

Operating rules for Mokolo Dam will need to be implemented in order to set the rules of determining how and when restrictions are applied during times of drought. The determination of these is currently the subject of a study with consideration of the current operating rules utilised by the Irrigation Board.

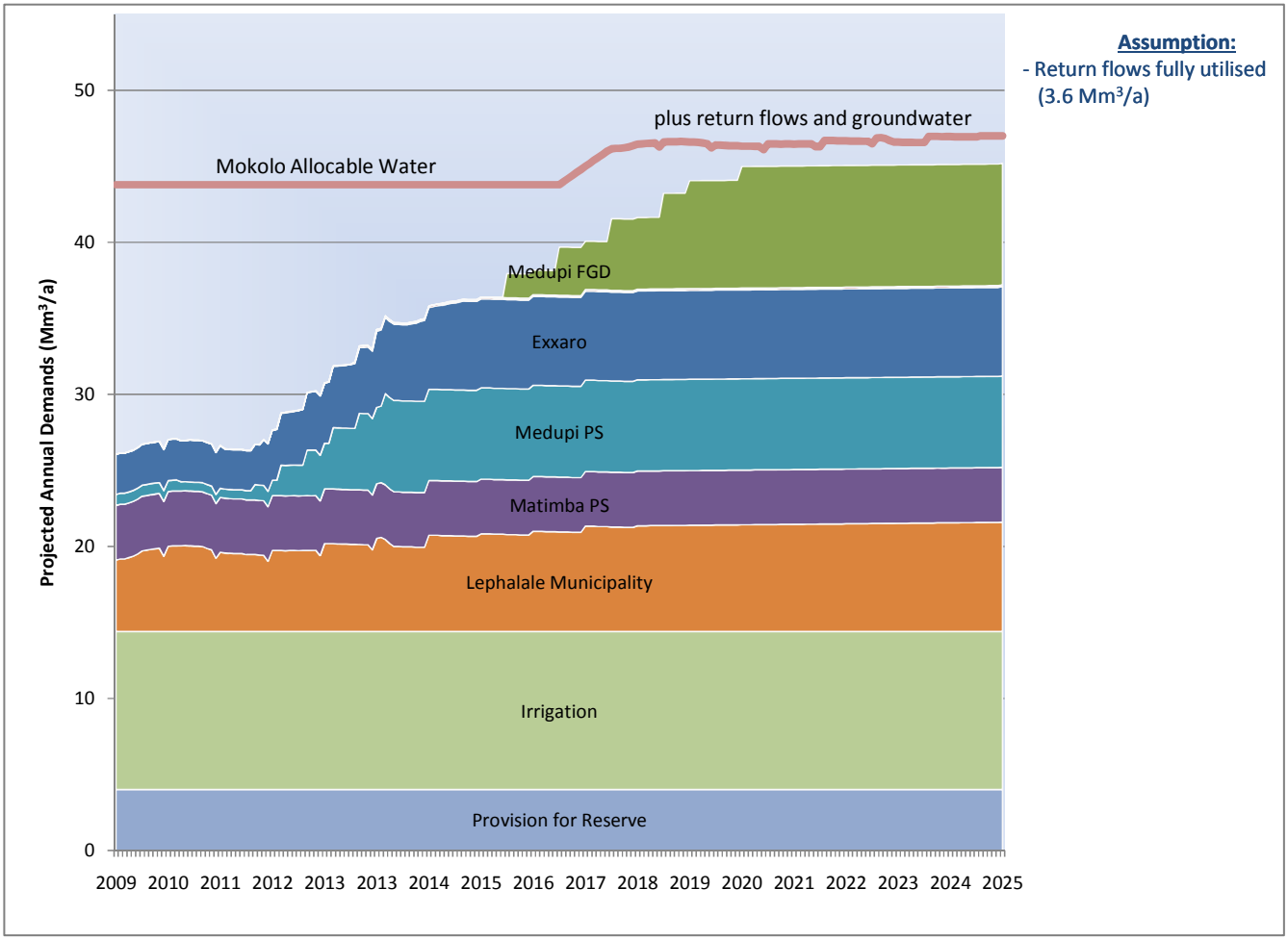



**Figure 6: Allocable water versus demands without MCWAP Phase 2**

# 3 SCOPING AND EIA PROCESS

## 3.1 Environmental Assessment Triggers

MCWAP entails certain activities that require authorisation in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA). Refer to **Section 11** for further discussion on the project's legal framework.

## 3.2 Environmental Assessment Authorities

The Environmental Assessment decision-making authority is the National Department of Environmental Affairs (DEA), as the project proponent (i.e. DWA) is a national department. The Minister of Justice and Constitutional Development will act as the appeal authority.

The Limpopo Department of Economic Development, Environment and Tourism (DEDET) is regarded as a key authority during the execution of the EIA, and all documentation will thus be forwarded to this Department.

DEA issued approval for the MCWAP Phase 1 Scoping Report on 03 February 2010 and requested an amended Plan of Study for the EIA (as contained in **Appendix A**), which was approved on 25 March 2010. Copies of the aforementioned correspondence, as well as a letter (dated 08 January 2010) received from DEDET pertaining to the Scoping Report, are contained in **Appendix B**.

## 3.3 EIA Process

The process for seeking authorisation for the listed activities is undertaken in accordance with the Environmental Impact Assessment (EIA) Regulations (GN No. R385, R386 and R387 of 21 April 2006), promulgated in terms of Chapter 5 of NEMA.

As explained, MCWAP is divided into three main components, namely de-bottlenecking of the existing Exxaro pipeline, Phase 1 and Phase 2 (see **Table 4**). Following pre-consultation with DEA it was decided to submit a Class Application for the three aforementioned sub-projects, where separate environmental assessments were undertaken for each MCWAP component, as shown in **Table 5**.

**Table 5: MCWAP Environmental Assessments**

Focus of this document

| MCWAP Component | Environmental Assessment Process | DEA Reference No. |
|---|---|---|
| Phase 1 | Scoping and EIA | 12/12/20/1465 |
| Phase 2 | Scoping and EIA | 12/12/20/1466 |
| De-bottlenecking | Basic Assessment | 12/12/20/1467 |

The environmental assessment for MCWAP Phase 1, which is the focus of this report, is thus a Scoping and EIA process. An outline of the process is provided in **Figure 7**.

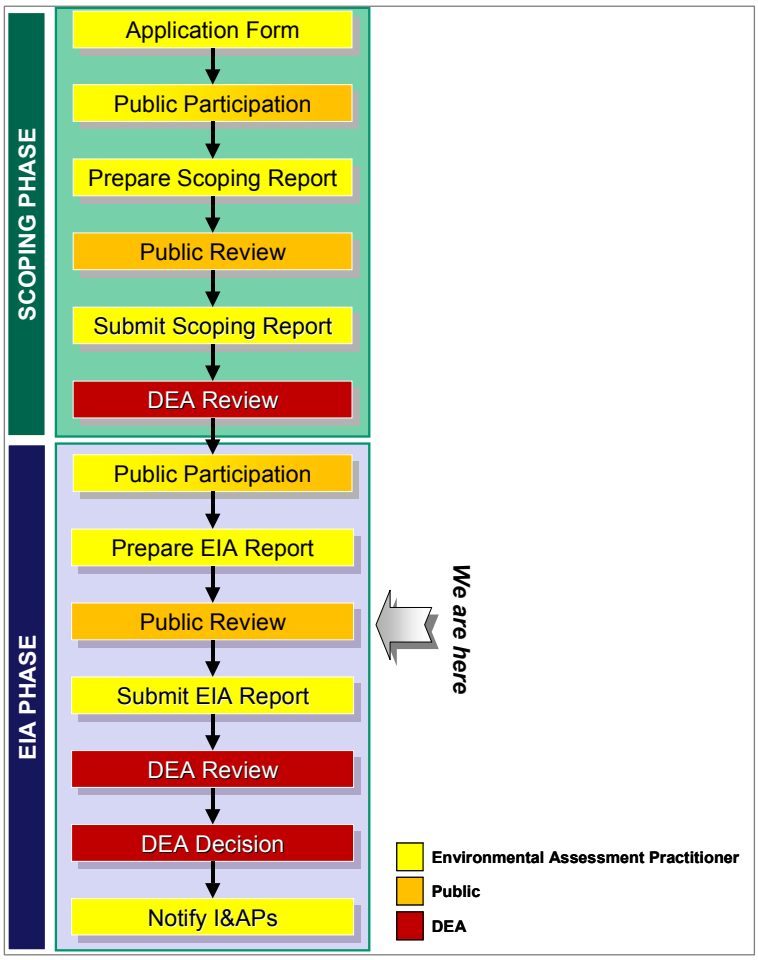



**Figure 7: Overview of Scoping and EIA process**

The Scoping phase, which was completed as part of the initial stage of the overall environmental assessment process, served to define the Terms of Reference for the subsequent EIA phase by identifying key issues that need further consideration and prioritisation. A crucial element of the Terms of Reference was to identify and provide the scope of the requisite specialist studies triggered during Scoping.

## 3.4 MCWAP's Qualification as a SID Project

MCWAP was endorsed by the Department of Public Enterprise as a Strategically Important Development (SID), which is defined as infrastructure developments by State Owned Entities that contribute or will contribute significantly to the national economic growth of South Africa.

An EIA application for a SID project is afforded a shorter processing period by DEA than that prescribed in the EIA Regulations (2006).

# 4 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Nemai Consulting was appointed by DWA as the independent Environmental Assessment Practitioner (EAP) to undertake the environmental assessment for MCWAP.

In accordance with Regulation 32(2)(a) of GN No. R. 385 of 21 April 2006, 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), Rustenburg (North West Province), and Durban (KwaZulu Natal).

Previous examples of related environmental assessments completed by Nemai Consulting are as follows:

1. Installation of the P1 water pipeline from Randfontein (Gauteng) to Rustenburg (North West), for Rand Water;
2. Raising of Hazelmere Dam (KwaZulu-Natal), for DWAF;
3. Edenville Bulk Water Supply (Free State), for Ngwathe Local Municipality;
4. Mhlabatshane Dam (KwaZulu-Natal), for Ugu District Municipality;
5. Mooi-Mngeni Transfer Scheme Fish-barrier EIA (KwaZulu-Natal), for DWAF; and
6. Blanket environmental consultant to Johannesburg Water (Gauteng) on all water (including pipelines and reservoirs) and sanitation projects for the 2003/2004 and 2004/2005 financial years, which included in excess of 50 EIAs.

The members of Nemai Consulting that are involved with the MCWAP Phase 1 Scoping and EIA process are captured in **Table 6** below, and their respective Curricula Vitae are contained in to **Appendix C**.

**Table 6: Scoping and EIA Team Members**

| Name | Duties |
|---|---|
| Ms D. Naidoo | Project Director |
| Mr D. Henning | • Project Manager<br>• Compiling Scoping and EIA Reports |
| Mr S. Pienaar | Public Participation Coordinator |
| Mr C. Chidley | Quality Reviewer |

# 5 PROJECT LOCATION

The study area is situated in the Limpopo Province, and falls under the Waterberg District Municipality and Lephalale Local Municipality. The geographical area of the municipality is 19 605 km$^2$.

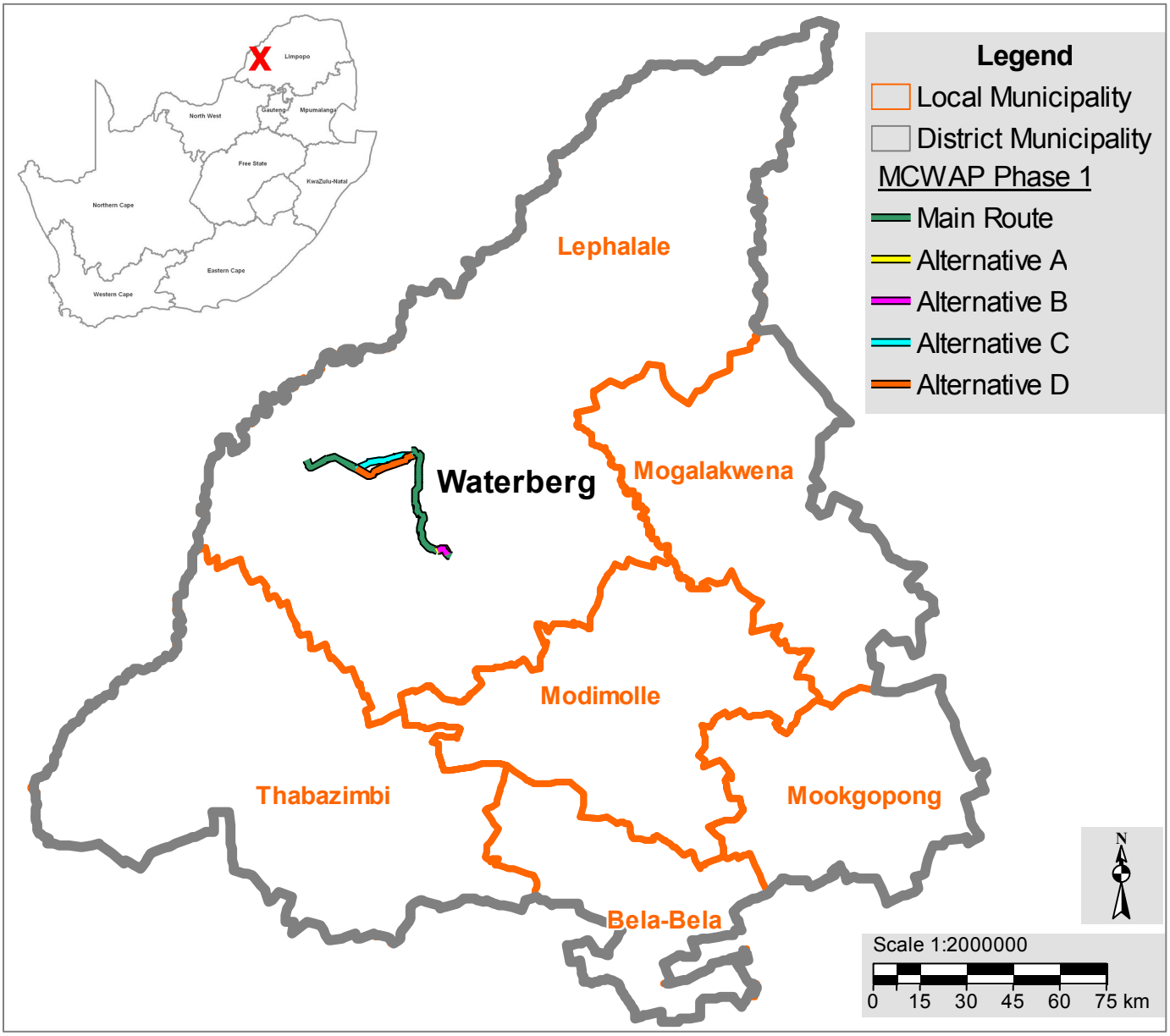



**Figure 8: Municipal Map**

Refer to the locality map contained in **Figure 9** for the discussion to follow. The main route for the proposed pipeline commences from Mokolo Dam, in the south-east of the project area. From there it predominantly follows the route of the existing Exxaro pipeline in a north-westerly direction up to the Zeeland Water Treatment Works (WTW) and thereafter to the Matimba / Medupi off take. The alignment then turns westerly and continues until Steenbokpan. The total length is approximately 80km. A detailed route description is provided in **Section 6.4.4**.

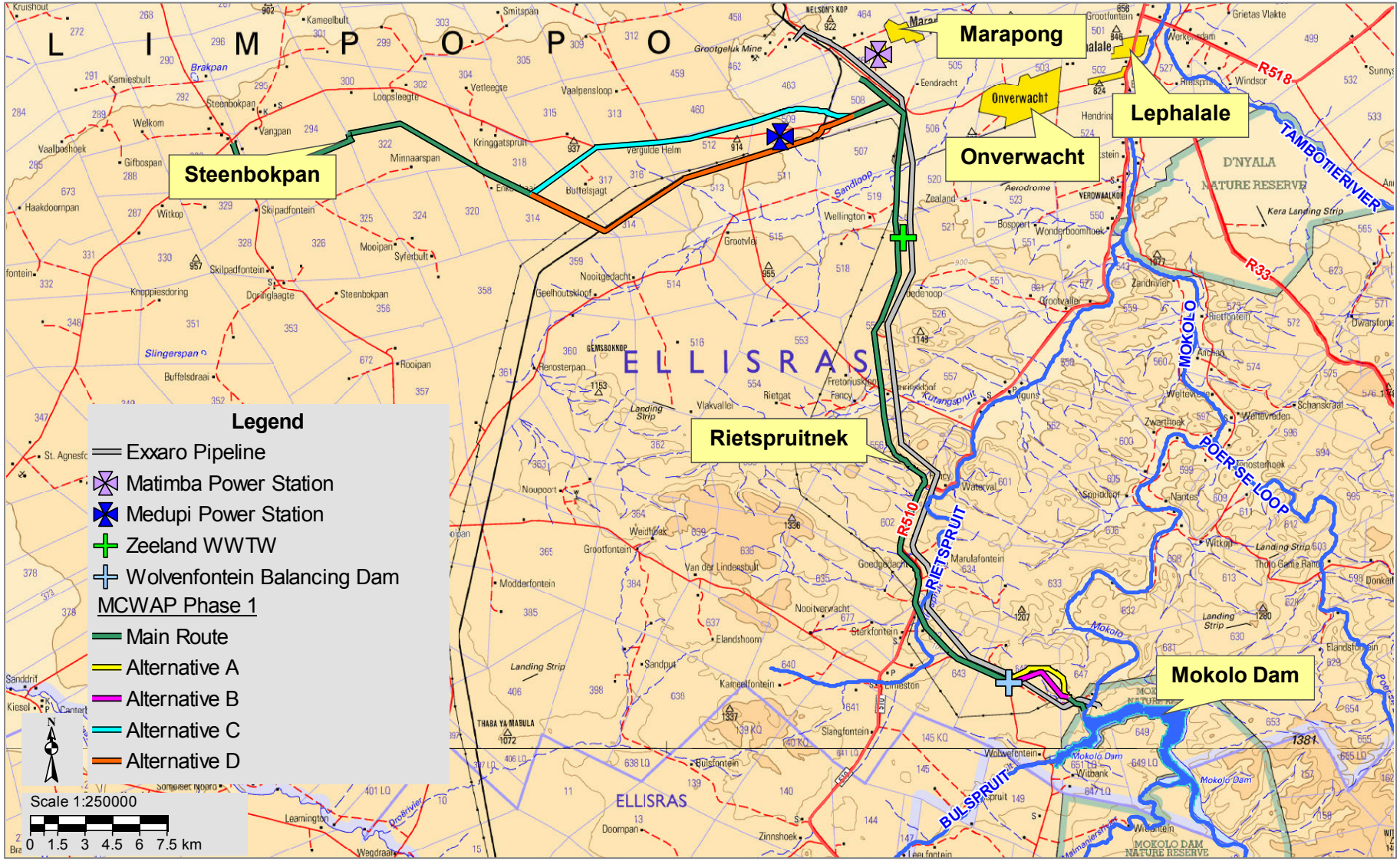



**Figure 9: Locality Map**

# 6 PROJECT DESCRIPTION

Even though it is regarded as one single project, three separate environmental assessments are being undertaken for the three sub-components of MCWAP (i.e. Phase 1, Phase 2 and De-bottlenecking), as discussed in **Section 2**. The focus of this EIA Report is MCWAP Phase 1.

## 6.1 MCWAP Phase 1 Project Components

The major scheme components for MCWAP Phase 1 are summarised in **Table 7**.

**Table 7: Summary of major scheme components for MCWAP Phase 1 (DWAF, 2008a)**

| Component | Description |
|---|---|
| High lift pump station | • Static head 221m<br>• Total head pumped (peak) = 262.9m<br>• Proposed Design Flow = 1 423 l/s |
| 900mm: rising main | 5 681m |
| 1000mm: gravity main | 35 856m |
| 800mm: gravity main (T-off to Medupi) | 7 590m |
| 900mm: gravity main (Medupi T-off to delivery pipeline connection) | 30 347m |
| 800mm: gravity main (Steenbokpan T-off to Matimba connection) | 1 936m |
| 1900mm: gravity main (delivery connection to Steenbokpan) | 13 870m |

*Note: *The exact specifications of the scheme components may change during the design stage of the project.*

The various MCWAP Phase 1 scheme components are discussed in the sections to follow. The technical information was primarily extracted from the MCWAP Phase 1 Feasibility Report (DWAF, 2008a).

## 6.2 Abstraction Pump Station at Mokolo Dam

Refer to plans contained in **Appendix D**.

Figure 10: Entrance to existing pump station

A new pump station will be constructed at the Mokolo Dam directly downstream of the existing pump station. The top of the pump well as well as electrical infrastructure (switchgear, gantry crane, access road, etc) of the pump station will be sited above the maximum tailwater level directly downstream of the dam, so as to ensure that the pump station is not flooded during a Probable Maximum Flood (PMF) event. The new station will take water directly from Mokolo Dam via one suction pipeline connected to both outlet pipes from the dam, giving 100% standby capacity for the outlet works.

The new pump station together with the existing pump station will have to provide the total requirements until the completion of the Crocodile River Transfer Scheme (MCWAP Phase 2) (currently October 2015). The existing pump station is likely to be decommissioned over time due to the inherent flood risk and ageing works.

The pump station will by its design be capable of delivering the widest range of flows at a high efficiency by means of variable speed drives (VSD's).

As the dam will in effect act as a large settling tank, no de-silting structures will be required.

All pump sets will be controlled via a Programmable Logic Controller (PLC) either locally or from a remote control centre.

## 6.3 Power Supply

A new bulk power supply line as well as a new substation will be required to feed the new pump station. Refer to **Figure 10** for the discussion to follow. The environmental authorisation for the aforementioned activities fall outside of the ambit of the MCWAP application and the requisite approvals will be sought by Eskom.

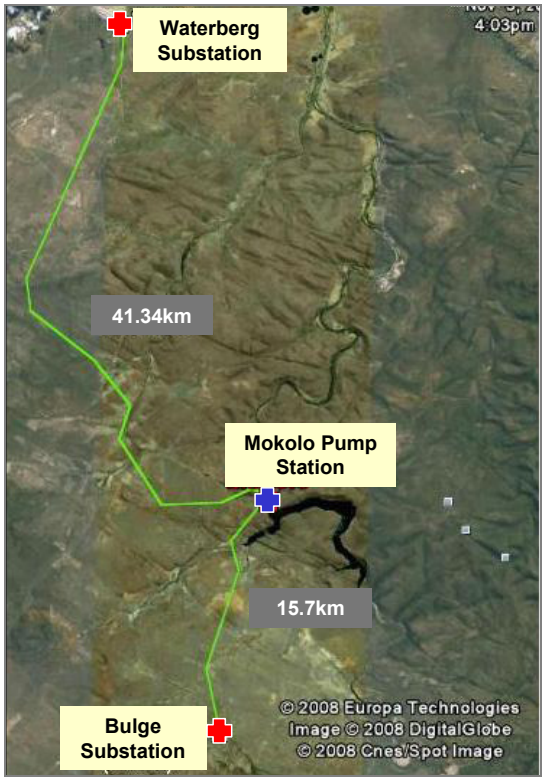



Figure 11: Power Supply to Mokolo Dam

The existing 33kV line feeding from Waterberg substation will be upgraded to a 132kV line, but utilized as a 33kV line (existing 3.3kV pump station) until the new voltage level is required (new pump station). The substation will be converted to either a 132/33/3.3kV or a 132/3.3kV substation. This is applicable to both the upgrading of the new substation, and/or to building a new substation. The capacity of this line after the upgrade will be more than 100MVA, and will form part of Eskom's network strengthening.

A new 132kV line is planned from Bulge River substation to Mokolo dam. Both the substation and line is in Eskom's Concept Release Approval stage. The line route is not finalised as yet.

Redundant power supply from the planned upgrade of the existing Waterberg line (with anticipated surplus for Mokolo Dam) and the planned new Bulge River line will ensure a reliable supply to Mokolo Dam with adequate capacity.

The present switch yard is unsuitable for extension for the following reasons:

- The switch yard will be fully submerged by the tailwater level at PMF (depth of submergence ± 1,0m).
- New transformers will be installed for the new pump station. The existing transformers are at 3,3 KV which is unlikely to be chosen for the new motors.

An extension to the yard will be required, which cannot be done during operation of the existing switch yard. It is therefore proposed that an entirely new switch yard be constructed. Furthermore, because of the history of unreliability of the existing power line due to lightning strikes and bush fires (the existing lines are supported on wooden poles), an additional new power supply is strongly recommended. The final decision on the location of the switch yard lies with Eskom.

## 6.4 Pipeline

All pipelines referred to will be installed below-ground.

### *6.4.1 Rising mains from Mokolo Dam (new and existing)*

There will be two rising mains from Mokolo Dam to Wolvenfontein balancing dam, namely:

- The existing rising main will be retained. It currently has an accepted annual average capacity of 14.7 $Mm^3/a$ (570 l/s). For permanent retention the internal lining will need to be refurbishment once the Crocodile River Transfer Scheme becomes operational; and
- A new pipeline with a design capacity to supply the interim to long-term water requirement for Phase 1.

The economics of the retention of the existing Exxaro-owned rising main for the long term has not yet been investigated, as the pipeline will need to be decommissioned for at least 3 months. It is recommended that it be investigated after the Crocodile River Transfer System becomes operational. Should refurbishment of the existing rising main be

warranted, the two pipelines will be interconnected so that both can be used to reduce the overall energy consumption and either used as and when necessary.

.

The philosophy employed in selecting the route of the new rising main was to remain alongside existing linear infrastructure where the environment has already been disturbed, thus minimising the potential environmental impacts.

The following facilities and structures normally associated with pipelines will be installed en-route:

- Air valves;
- Scour valves;
- Pipe access points;
- Road crossings;
- River crossings;
- Cathodic protection system;
- AC-mitigating system;
- Protective measures required to curb surge in a pipeline such as, reflux valves, surge tank(s);
- Any bulk off-takes that may be agreed on by DWA; and
- Farmers off-takes (directly impacted landowners only) following negotiations with DWA.

### *6.4.2 Wolvenfontein Balancing Dam (existing)*

This Wolvenfontein Balancing Dam consist of two compartments for purposes of normal operation and maintenance, and:

- Has top entry and bottom outlets, and
- Has level indication linked to the high lift pump station as well as the interim and final control rooms for normal operational purposes.

The capacity of the two compartments is approximately 52,000 m³/s, which will result in approximately 10 hours of storage under the peak 2014 requirements.

The inlet and outlet structures are likely to be upgraded to cater for the increased throughput.


**Figure 12: Aerial view of Wolvenfontein balancing dams**

### *6.4.3 Gravity pipelines (new and existing)*

The gravity pipeline system delivers water into the terminal reservoirs serving the consumers supplied from the Mokolo Dam Scheme (i.e. Lephalale / Zeeland WTW, Matimba Power Station, Medupi Power Station and can be used to supply in some initial demand of Steenbokpan, Eskom and Sasol consumers).

The Steenbokpan link, which constitutes the section of the gravity pipe tee off from the Wolvenfontein-Matimba gravity pipeline at the Steenbokpan/Lephalale Road T-section, will be operated in reverse for the long-term to provide water from the Crocodile River to the users such as Medupi and Exxaro.

The following facilities and structures normally associated with pipelines will be installed en-route:

- Air valves;
- Scour valves;
- Pipe access points;
- Cross connections;
- Road crossings;
- River crossings;
- Cathodic protection system;
- AC-mitigating system;

- Protective measures required to curb surge in a pipeline such as, reflux valves, surge tank(s);
- Any bulk off-takes that may be agreed on by DWA; and
- Farmers off-takes (directly impacted landowners only) following negotiations with DWA.

### *6.4.4 Pipeline Route*

For detailed maps on the pipeline route, please refer to **Appendix E**.

The following aspects were considered in defining the MCWAP Phase 1 pipeline route:

- Impacts to the social, biophysical and economic environment;
- Existing servitudes;
- Abstraction and water supply locations;
- Existing roads, as well as boundaries between landowners along the routes;
- 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.

An overview of the pipeline route alternatives follows below. All distances provided should be regarded as approximates, as they are based on a desktop estimate from a Geographical Information System (GIS). Where the pipeline follows linear infrastructure (e.g. roads) 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.

- **Rising Main - Mokolo Dam to Wolvenfontein Balancing Dam**

  - Alternative – Main Route

The initial section of the Main Route from Mokolo Dam follows the existing access road (see **Figure 13**) on the Farm Witbank 647LQ for ± 1.3km (in a predominantly north-westerly direction) until it reaches the split between Alternatives A and B.

This route is a deviation from the alignment of the existing Exxaro pipeline, where the last-mentioned follows the narrow valley for a large section and presents difficulties for construction and more significant impacts to the ecological environment.

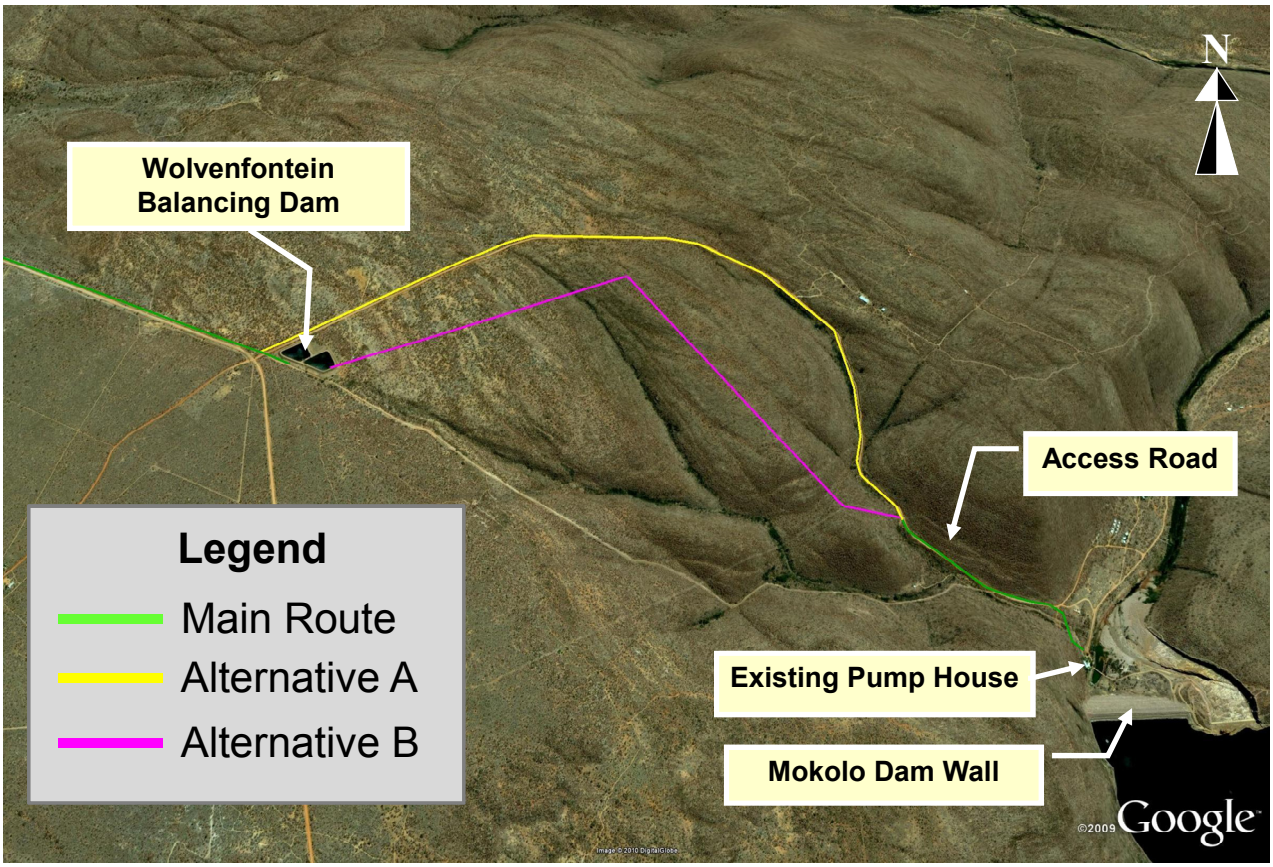



**Figure 13: Northern view of route from Mokolo Dam**

- Alternative A

From the Main Route, Alternative A stays parallel to the access road over the Farms Witbank 647LQ and Wolvenfontein 645LQ for ± 4.5km until it reaches the Wolvenfontein balancing dam.

- Alternative B

Alternative B leaves the access road to follow an existing power line for ± 300m over the Farm Witbank 647LQ. The route then turns in a more northerly direction and continues for ± 1.4km on the Farm Wolvenfontein 645LQ. The alignment then turns in a south-westerly direction and runs for another ± 1.6km on the last-mentioned farm until it reaches the Wolvenfontein balancing dam.

- **Gravity Line - Wolvenfontein Balancing Dam to Matimba Power Station**

- Alternative – Main Route

From the Wolvenfontein balancing dam, the Main Route follows the route of the existing line along a secondary road over the Farm Wolvenfontein 645LQ for a further ± 1.8km. It continues along the secondary road over the Farm Toulon 643LQ for ± 1.8km, and turns away more sharply to the north as it crosses a tributary of the Rietspruit.

The route crosses over the Farm Wolvenfontein 645LQ for ± 4.7km. It follows the existing access road over the Farm Toulon 643LQ for ± 1.8km, where it turns away more sharply to the north as it crosses a tributary of the Rietspruit.

The route runs for ± 3.2km on the Farm Sterkfontein 642LQ, where it crosses the main stem of the Rietspruit. At the boundary of the Farm Nooitverwacht 635LQ, the route turns northwards and travels alongside the R510 (see **Figure**

**Figure 14: North-westerly view of route along R510 (existing Exxaro pipeline runs to the left)**

**14**), on the boundaries of the Farms Goedgedacht 602LQ and Fancy 556LQ. After ± 7km the route turns westwards along the access road of the existing Exxaro pipeline. The route passes over the Rietspruitnek ridge on the Farm Fancy 556LQ.

For the following 7km the route remains alongside the Exxaro access road, and traverses the Farms Fourieskloof 557LQ (Portion 1) and Goedehoop 552LQ. At the boundary of the Farm Grootgenoeg 529LQ, the route turns north-easterly and traverses this property for ± 2.5km. It then crosses over ± 650m of the Farm Zeeland 526LQ.

Hereafter the route changes to a northerly direction, and travels along the boundaries of the following Farms:

- Zeeland 526LQ and Fancy 518LQ for ± 2.7km;
- Wellington 519LQ and Worchester 520LQ for ± 3km; and
- Zwartwater 507LQ and Altoostyd 506LQ for ± 2.8km.

The route then turns north-westerly along a secondary road and splits on Portion 3 of the Farm Hanglip 508LQ, where it continues to the Matimba Power Station termination point, situated on the Farm Grootestryd 465LQ.

- **Gravity Line - Matimba Power Station to Steenbokpan**

This section of the MCWAP Phase 1 pipeline is a new line (i.e. no existing parallel pipeline as is the case as described above with the Exxaro pipeline). During the design phase the timing of the construction of this section will be optimised.

- Alternative – Main Route

From the tee off from the Wolvenfontein-Matimba gravity pipeline, the delivery line travels westwards along the existing road for ± 2km over Portion 3 and the Remainder of the Farm Hanglip 508LQ, until the split between Alternatives C and D.

From where Alternatives C and D converge, the Main Route continues north-westerly along the boundaries of the following Farms:

- Kringgatspruit 318LQ and Enkeldraai 314LQ for ± 2.8km;
- Loopleegte 302LQ and Taaiboschpan 320LQ for ± 570m; and
- Loopleegte 302LQ and Minnaarspan 322LQ for ± 4.5km.

The line then turns south-westerly to follow the boundaries of the Farms Zandbult 300LQ and Minnaarspan 322LQ for ± 2.9km, and thereafter Vangpan 294LQ and Toezicht 323LQ for ± 5.4km.

The route finally turns north-westwards, and crosses over the Farm Theunispan 293LQ for ± 2.4km before it reaches Steenbokpan.

- Alternative C

From the split on the Farm Hanglip 508LQ, Alternative C continues alongside a secondary road (constructed to accommodate the Medupi Power Station) for a further ± 1.3km before crossing over the following farms:

- Naauw Ontkomen 509LQ for ± 4km (alongside secondary road);
- Eenzaamheid 512LQ for ± 5km (alongside secondary road);
- Hieromtrent 460LQ for ± 414m (alongside secondary road);
- Boundary of Vaalpensloop 313LQ and Vergulde Helm 316LQ for ± 3.4km (alongside secondary road);
- Boundary of Hooikraal 315LQ and Buffelsjagt 317LQ for ± 2.4km (alongside access road); and
- Kringgatspruit 318LQ for ± 1.8km.

- Alternative D

From the split on the Farm Hanglip 508LQ, Alternative D continues south-westerly along a secondary road for ± 3.7km until it reaches the Farm Naauw Ontkomen 509LQ where it turns further south-west to follow alongside the railway line. From here it traverses the following farms (continuing parallel to the railway line):

- Naauw Ontkomen 509LQ for ± 4.3km;
- Eenzaamheid 512LQ for ± 940m;
- Kaffirsdraai 513LQ for ± 3.1km;

- Vergulde Helm 316LQ for ± 1.9km;
- Buffelsjagt 317LQ for ± 1.3km;
- Buffelsjagt 317LQ and Enkeldraai 314LQ (on the boundaries) for ± 1.1km;
- Kringgatspruit 318LQ for ± 265m; and
- Buffelsjagt 317LQ and Enkeldraai 314LQ (on the boundaries) for ± 1.1km.

Alternative D then turns away from the railway line to travel on the boundary of the Farms Kringgatspruit 318LQ and Enkeldraai 314LQ for ± 4.4km.

### *6.4.5 Pipeline Termination Points*

The users will be responsible for the construction of the respective pipelines and storage dams from the central termination point or en-route at take-off points to their storage facilities. According to DWAF (2008a), the proposed Phase 1 pipeline was designed to supply water to the following termination points.

- **Zeeland WTW**

An interconnection will be provided to supply water to Zeeland WTW, situated on the Farm Zeeland 526LQ. This interconnection will also be utilised when refurbishment of the existing pipeline takes place. It is envisaged that the refurbishment will take place shortly after commissioning of the Crocodile River (West) Transfer Scheme. There will thus be sufficient capacity through the new pipeline to completely dry the existing pipeline for refurbishment.


**Figure 15: Aerial view of Zeeland WTW**

A 16 - 18 day storage dam will have to be provided at Zeeland WTW to ensure redundancy for themselves and to the downstream users. The storage dam will be funded and implemented by the user.

- **Matimba Power Station and Grootegeluk Mine**

  The gravity pipeline will terminate at the existing manifold west of Matimba Power Station, on the Farm Grootestryd 465LQ.

- **Medupi Power Station**

  It was assumed that Medupi's water requirements until the Crocodile transfer is operational be supplied at the Matimba termination point. Eskom is currently in the process of designing and constructing a 600mm pipe that will transfer water from the existing Matimba manifold to a proposed new raw water dam to be constructed just south of Medupi power station. The storage dam will be funded and implemented by the user.

- **Steenbokpan Area**

  Due to the fact that the exact locations of the future infrastructure of the end users have not yet been finalized, only a termination point was allowed for at Steenbokpan for the feasibility planning. When final locations are confirmed for the detail design, take-off points will be provided on the main pipeline.

### *6.4.6 Pipeline Specifications*

| | | |
|---|---|---|
| **Pipe diameter** | : | Different ranges up to 2400 mm |
| **Pipe material** | : | Steel pipes with welded joints. Pipes to be lined and coated to safeguard against rusting (and associated impacts on water quality) and lengthen their lifespan. |
| **Installation** | : | • Underground, with a minimum cover above the pipe of 1.0m.<br>• 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 up to 40 m to allow for future expansion. |
| **Servitude Conditions** | : | • Permanent access to the pipeline servitude will be required after construction.<br>• Pipeline markers (concrete posts) will be installed at changes in direction and at regular intervals along the route<br>• Farming activities (stock and crop farming) can continue within the servitude area after construction, taking cognisance of the need for permanent access to the pipeline servitude. |

### *6.4.7 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 powerline routes, and (b) electrified railway lines. Cathodic protection is also required in corrosive soil and groundwater environments.

AC mitigation is necessary, as mutual interference effects between the pipeline and a high voltage powerline could result in the following:

- 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.

## 6.5 Break Pressure Tank at Rietspruitnek

A Break Pressure Tank with storage capacity between 3000 $m^3$ and 5000$m^3$ may be required for the optimum hydraulic solution at Rietspruitnek, on the Farm Fancy 556LQ (refer to **Figure 16**).

It is envisaged that this structure, if required, will be a water retaining, reinforced concrete structure (tank diameter 25m-35m, height 5 -10m) with a flat concrete roof.

The structure can be constructed on the southern side of the existing pipeline servitude to mitigate potential visual impact.

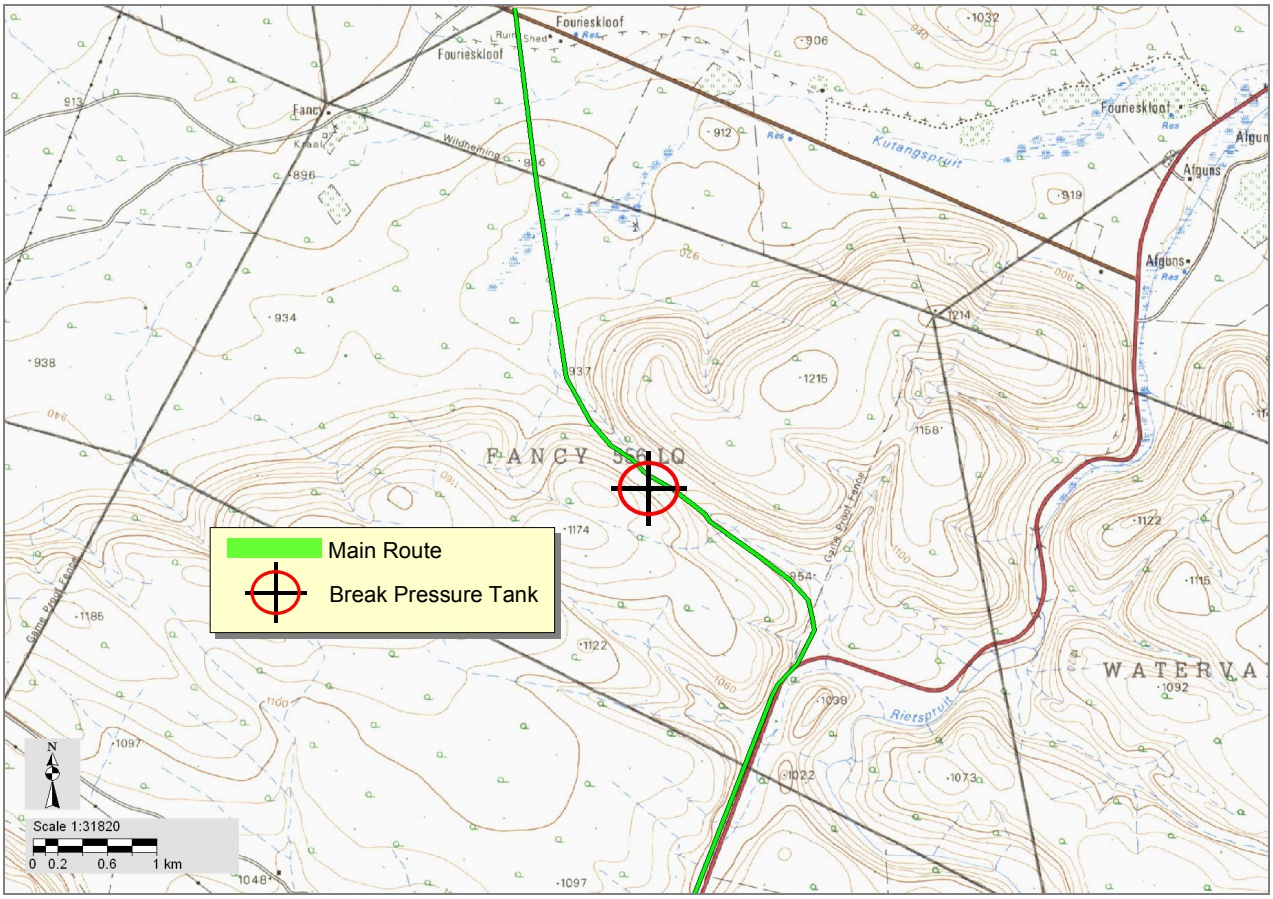



**Figure 16: Break Pressure Tank at Rietspruitnek**

## 6.6 Pre-construction Phase

The main activities during the pre-construction phase include *inter alia* the following:

- Detailed engineering design.
- Detailed geotechnical investigations.
- Geophysical investigations.
- Survey and mark construction servitude.
- Survey and map topography for determination of post-construction landscape, rehabilitation and shaping.
- Survey river cross-sections for post-construction river bank reinstatement.
- Confirmation of sensitive terrestrial habitats where special care needs to be taken.
- Possible removal of trees within construction servitude.
- Possible further phases of heritage site investigation and fencing of heritage sites.

- Confirmation of arrangements with individual landowners and/or land users (both farmers and mining houses) for managing and mitigating issues such as possible loss of access, water supply lines, fencing and gate dimensions for traversing servitude, traversing patterns of game and/livestock over servitude, access to game and/livestock drinking points, security, opening and closing of gates and access to private property.
- Confirmation of the location and condition of all buildings, assets and structures within the servitude.
- Determining and documenting the road conditions for all identified haul roads.
- Procurement process for Contractors.

## 6.7 Construction Phase

### *6.7.1 Methodology – Normal*

The methodology for the installation of the pipeline is as follows:

- Site clearing;
- 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 **Appendix F** 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.

**Figure 17: 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.

**Figure 18: Typical examples of chambers (left - during construction; right – completed)**

- Re-shape the impacted area to its original topography and replace stripped topsoil.

**Figure 19: Typical views of reinstated (left) and rehabilitated (right) pipeline routes**

- Install final Cathodic Protection measures.
- Install AC mitigation measures.
- Install pipeline markers (concrete posts) at changes in direction and at regular intervals along the route.

- Rehabilitation.

### *6.7.2 Methodology – Watercourse Crossings*

Watercourse crossings will generally consist of pipe sections encased in concrete in accordance with the relevant DWA criteria, as illustrated in **Appendix G**. The typical construction methodology for a river crossing is as follows:

- 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 20: Typical river crossing showing concrete encased pipe section**

### *6.7.3 Construction Programme*

At an average construction rate of 50 m per day for rocky areas and restricted work space in close proximity of the existing pipeline and 150 m per day for all other sections and allowing for start-up time and the annual break, the total construction period for the pipelines will be approximately 24 months. Note that the aforementioned distances and durations should be regarded as estimates only.

Indicative implementation dates for the construction phase are as follows:

- Commencement of construction : First Quarter 2011
- Commissioning : Final Quarter 2012

### *6.7.4 Construction Camps*

The following potential sites have been identified for the location of construction camps (shown in **Figure 21**):

- Portion 1 of the Farm Vangpan 294LQ;
- Zeeland 526LQ;
- Portion 1 of the Farm Fourieskloof 557LQ;
- Portion 3 of the Farm Wolvenfontein 645LQ; and
- Portion 5 of the Farm Witbank 647LQ.

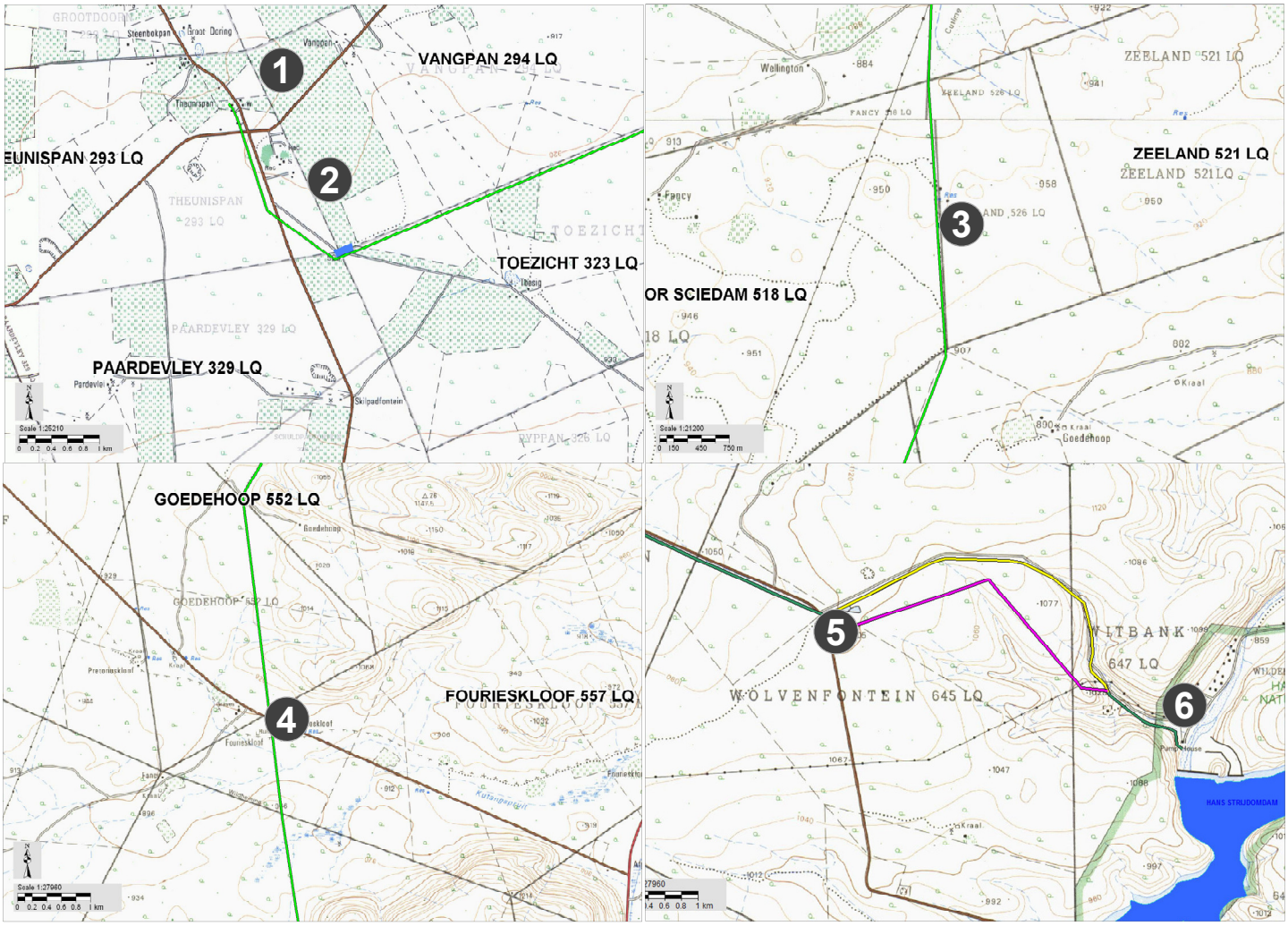



**Figure 21: Potential sites for construction camps**

Note that only site no. 6, which is vacant land next to Mokolo Dam, will possibly be utilised for accommodation for core personnel. The remaining sites are for facilities only. It is anticipated that provision will be made for the following facilities at the construction camps:

- Concrete Batching Plants;
- 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).

In terms of the solid waste disposal facility listed above, the main camps would be required to have a waste management area where waste from site will be handed in, sorted, weighed and placed in skips and recycling containers for removal to service providers and appropriate registered landfill sites (hazardous and general sites separately).

**Table 8** provides a brief overview of each site, based on current land use, sensitivity and access.

**Table 8: Overview of potential sites for construction camps**

| Site No | Site Description | Farm Details & Photograph (where available) |
|---|---|---|
| 1 | • Disturbed from previous agricultural practices undertaken on site.<br>• Currently used for cattle grazing. Preferred by landowner above site no. 2.<br>• Site accessed from Steenbokpan – Lephalale tar road. | **Site 1 - Farm Vangpan294 LQ**<br>  |

| Site No | Site Description | Farm Details & Photograph (where available) |
|---|---|---|
| 2 | • Disturbed from previous agricultural practices undertaken on site.<br>• Currently used for game farming.<br>• Site accessed from Steenbokpan – Lephalale tar road / Steenbokpan – Soutpan gravel road | **Site 2 - Farm Vangpan294 LQ**<br>  |
| 3 | • Disturbed from activities at Zeeland Water Treatment Works<br>• Site accessed from existing access road from Onverwaght. | **Site 3 - Farm Zeeland 521 LQ**<br>  |
| 4 | • Small unused section of farm.<br>• Currently used for cattle grazing.<br>• Site accessed from Kuipersbult gravel road. | **Site 4 - Farm Fourieskloof 1/557 LQ**<br>  |

| Site No | Site Description | Farm Details & Photograph (where available) |
|---|---|---|
| 5 | • Forms part of the Sable Hills Eco Park development.<br>• Position of existing borrow pit.<br>• Potential visual impacts at access point to Sable Hills Eco Park.<br>• Site accessed from existing Mokolo Dam access road. | **Site 5 - Farm Wolvenfontein 3/645 LQ**<br>  |
| 6 | • Vacant land next to Mokolo Dam.<br>• Previously disturbed area, which was used for residential dwellings. Site accessed from existing Mokolo Dam access road.<br>• Anticipated site for accommodation of core personnel. | **Farm Witbank 5/647 LQ**<br>  |

### *6.7.5 Borrow Pits*

Suitable soft material for use as bedding, selected or general soft backfill for the pipeline will need to be sourced from borrow pits.

Note that the EIA does not make provision for the detailed assessment of the borrow pits. Permits are required for the proposed borrow pits, in terms of the Minerals and Petroleum Resources Development Act (No. 28 of 2002).

The locations of the proposed borrow pits for MCWAP Phase 1 are shown in **Figure 22** and **Table 9**.

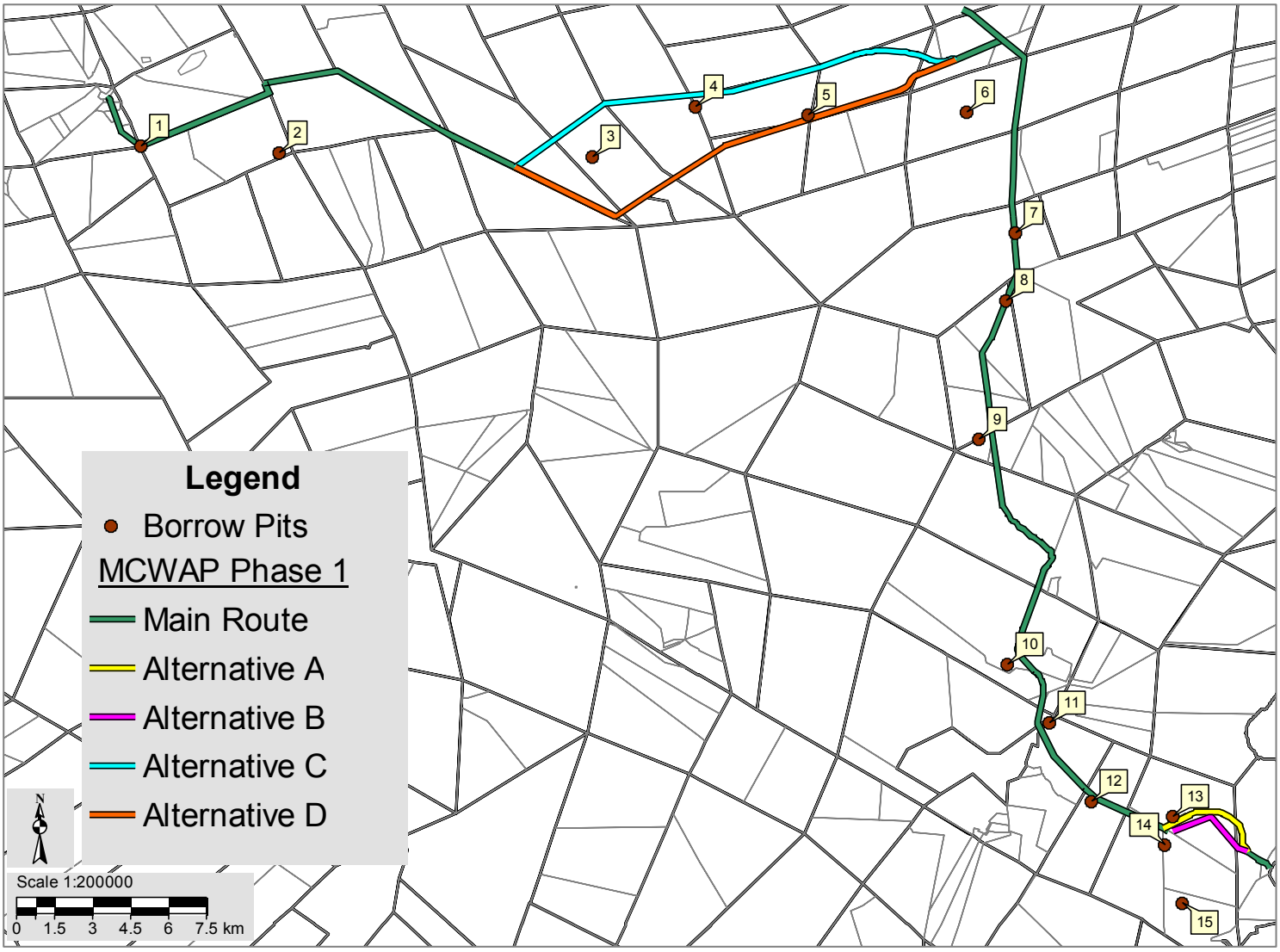



**Figure 22: Proposed sites for MCWAP Phase 1 Borrow Pits**

**Table 9: Overview of potential sites for borrow pits**

| Site No | Description | Farm Details & Photograph (where available) |
|---|---|---|
| 1. | • Disturbed from previous agricultural practices undertaken on site.<br>• Currently used as a game farm.<br>• Site accessed from Steenbokpan – Soutpan gravel road, or the Steenbokpan – Lephalale tar road.<br>• Landowner also has an existing sand mining permit for a portion of the area and plans to start a commercial sand mine. | **Farm Vangpan 1/294 LQ**<br>  |
| 2. | • Currently used as a game farm.<br>• Overall area accessed from Steenbokpan – Soutpan gravel road, or the Steenbokpan – Lephalale tar road. No direct access. | **Farm Toezicht 323LQ**<br>  |
| 3. | • Disturbed from previous agricultural practices undertaken on site.<br>• Site accessed from Steenbokpan – Lephalale tar road.<br>• Farm used as a cattle- and game farm. | **Farm Buffelsjaght 317 LQ**<br>  |

| Site No | Description | Farm Details & Photograph (where available) |
|---|---|---|
| 4. | • Natural veld.<br>• Site accessed from Steenbokpan – Lephalale tar road.<br>• Farm used as a cattle- and game farm. | **Farm Vergulde Helm 316 LQ**<br>  |
| 5. | • Natural veld.<br>• Location directly next to Medupi Power Station.<br>• Site accessed from Steenbokpan – Lephalale tar road.<br>• Land currently vacant | **Farm Eenzaamheid 512 LQ**<br>  |
| 6. | • Falls within in Matimba ash dump's progress line. Will therefore be forming part of ash dump in future.<br>• Should this location be selected it must be confirmed with ESKOM when the ash dump will progress up to the borrow pit.<br>• Location directly next to new Medupi Power Station.<br>• Site accessed from Steenbokpan – Lephalale tar road as well as existing secondary roads created by ESKOM.<br>• Strict access security on premises and access first to be arranged with ESKOM. | **Farm Zwartwater 507 LQ**<br>  |

| Site No | Description | Farm Details & Photograph (where available) |
|---|---|---|
| 7. | • Next to Zeeland WTW<br>• Natural veld with disturbed areas in between.<br>• Site accessed from existing gravel road from Onverwaght.<br>• Farm used as a cattle- and game farm. | **Farm Zeeland R/526LQ**<br>  |
| 8. | • Site partially accessed from Kuipersbult gravel road, further access still to be provided.<br>• Farm used as a cattle- and game farm. | **Farm Goedehoop 529 LQ**<br>*No photograph available* |
| 9. | • Site accessed from Kuipersbult gravel road.<br>• Farm used as a cattle- and game farm. | **Farm Fourieskloof 1/557 LQ**<br>*No photograph available* |
| 10. | • Disturbed from previous agricultural practices undertaken on site.<br>• Site accessed from R510 tar road.<br>• Farm used as a cattle- and game farm.<br>• Larger area open area than No. 10. | **Farm Goedgedaght 6/602 LQ**<br>  |

| Site No | Description | Farm Details & Photograph (where available) |
|---|---|---|
| 11. | • Disturbed from previous agricultural practices undertaken on site.<br>• Site accessed from R510 tar road.<br>• Farm used as a game farm. | **Farm Sterkfontein 3/642 LQ**<br>  |
| 12. | • Disturbed from previous agricultural practices undertaken on site.<br>• Site accessed from Mokolo Dam gravel road.<br>• Farm used as a cattle- and game farm.<br>• Landowner has earth moving equipment for hire. | **Farm Toulon 643 LQ**<br>*No photograph available* |
| 13. | • Old borrow pit currently still in use by landowner to source sand.<br>• Site accessed from Mokolo Dam gravel road.<br>• Farm is rezoned to Sable Hills Eco Park and consists out of residential stands surrounded by a game farm. | **Farm Wolvenfontein R/645 LQ**<br>  |

| Site No | Description | Farm Details & Photograph (where available) |
|---|---|---|
| 14. | • Old borrow pit.<br>• Site accessed from Mokolo Dam gravel road.<br>• Land currently vacant. | **Farm Wolvenfontein 3/645 LQ**<br>  |
| 15. | • Old borrow pit in area.<br>• Site accessed from Mokolo Dam gravel road.<br>• Land currently vacant. | **Farm Wolvenfontein 2/645 LQ**<br>  |

## 6.8 Operational Phase

### *6.8.1 General*

Key activities to by undertaken as part of the operation and maintenance of the scheme include the following:

- Create access track along servitude (same as existing track for Exxaro pipeline), with suitable stormwater protection. Access will be required for a 10-ton truck with a portable crane for lifting of manhole covers.
- Conduct routine maintenance inspections of the project infrastructure (including the cathodic protection system).

- 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.
- Ongoing consultation with directly affected parties.

### *6.8.2 Operation and Maintenance Philosophy*

The information contained in this section was extracted from the Operation and Maintenance Philosophy DWAF (2009b), and it provides an overview of the MCWAP operational phase. For the sake of completeness, operational matter pertaining to MCWAP Phase 2 are also included in the discussions to follow.

**Operation of Mokolo Dam**

The Mokolo Dam will remain a DWA asset and will be operated by DWA (or DWA may opt to appoint an agent to operate the dam). Abstraction from the dam will be undertaken based on operating rules which DWA will develop, which will typically include an allocation to each user based on the dam level at a decided date (currently April) of each year and the level of assurance at which water is allocated to different users. The process is to assess the risk of non-supply based on the dam level and estimated demands on the dam for the year. Restrictions may be implemented if necessary, if it is a period of low flow and low dam level, to ensure supply to the users (in accordance to their assurance) and households. This measure is to protect all users.

Mitigation measures (e.g. compensation to affected water users) will not be implemented should the cause of restriction be natural (e.g. drought - a period of reduced runoff). Compensation is only relevant in the case of a temporary or a permanent reallocation of water from irrigation to other users (i.e. the “lease” or procurement of the water allocation).

**Operational Control Centre**

The information contained in this section was extracted from the Operation and Maintenance Philosophy (DWAF, 2009b).

Since it is envisaged that both transfer systems (i.e. Crocodile River and Mokolo Dam) 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.

This control centre will comprise the administration offices, a central control room, stores and workshops, and will be conveniently located more or less at the centre of the operational activities (e.g. Lephalale).

A communications network will link the operations control room to all the main components of both transfer systems, including security. The communications network is proposed to be a fibre-optic cable from the control centre to each site, with a backup system such as a GSM network.

The control and operation of all sites will be monitored and managed by means of a SCADA (Systems Control And Data Acquisition) system from the control room. The following facilities will also be provided:

- Full operational control of all sites
- Monitoring of river releases and flows as provided by the Crocodile (West) River Management Authority (CW RMA)
- The control of the abstraction of surplus river flows into off-channel storage to optimize water usage.

It is envisaged that the operational control centre from which all the sites, together with the functions that will be monitored and controlled/operated at each site, will be manned on a 24 hr day basis.

The following functions will be performed:

1. Abstraction Pump Station at Mokolo Dam -
    - Monitor the water level in Mokolo Dam;
    - Start and stop the high lift and booster pumps;
    - Change the flow by means of the variable speed drives (VSD's) on the high lift pumps;
    - Monitor the "general health" of all the mechanical & electrical equipment;
    - Monitor all security and control access;
    - Monitor the flow from the high lift pump station;
2. Rising mains from Mokolo Dam (new and existing) -
    - Monitor the cathodic protection system (i.e. transformer rectifier installations if installed) and AC mitigation;
    - Open and close relevant inter-connecting valves as may be required;
3. Wolvenfontein Balancing Dam (existing) -
    - Flow into the reservoir;
    - Flow out of the reservoir;
    - The water level in both the reservoir compartments. The operational one(s) will be used to manage the pumping rate from the high lift pump station;
    - Security installations and control access;
4. Gravity pipelines (New and Existing) -
    - Read all revenue water meters;
    - Monitor the cathodic protection system (i.e. transformer rectifier installations if installed).

### *6.8.3 Maintenance*

Maintenance is generally divided into the three major engineering disciplines namely: mechanical; electrical and civil. For each of these disciplines maintenance will be categorised as follows:

- Routine planned maintenance;
- Major Breakdown repairs; and
- Minor breakdown repairs.

These are expanded on below.

**Table 10: MCWAP Maintenance Aspects**

| Mechanical | |
|---|---|
| Routine planned maintenance | A schedule of routine maintenance will be compiled to cover all mechanical components such as:<br>• Exchange of pump and motor unit(s);<br>• Bearing replacements;<br>• Water and oil seal adjustment and replacement;<br>• Servicing (lubrication, oil changing and or refilling);<br>• Inspection and repair of leaks<br>• Painting of components such as valves, pipes and gates<br>• Inspection and repair of valves and gate seals in the pump stations, weirs and the de-gritting and de-silting channels at the abstraction works<br>• Inspection and repair of any hydraulic piping<br>• All gates, sluices, and valves.<br><br>In certain instances maintenance functions will be based on efficiency monitoring of pump sets and other mechanical components.<br><br>Routine maintenance will generally be done by any one or a combination of the following:<br>• Staff exchanging strategic spares units and taking old units in for refurbishment or replacement<br>• Contractors doing maintenance repairs<br>• Contractors doing SCADA maintenance on call out<br>• Pump contractors servicing/maintaining units on a regular basis. |
| Major breakdown repairs | These repairs will include the rectification of faults shown by SCADA, such as:<br>• Bearing faults<br>• Power supply breakdowns<br>• Rectifying loss of efficiency on pump sets.<br><br>These breakdown repairs can be done by any of the methods listed for routine planned maintenance (see above). |
| Minor breakdown repairs | These repairs will cover mechanical components such as:<br>• Exchange of pump and motor unit(s);<br>• Bearing replacements;<br>• Water and oil seal adjustment and replacement;<br>• Repair of leaks<br>• Repair of all gates, sluices, and valves<br>• Inspection and repair of any hydraulic piping.<br><br>Breakdowns of this nature can be done by staff or large/small contractors (i.e. mechanics, etc.) |
| **Electrical** | |
| Routine planned maintenance | A schedule of routine maintenance will be compiled to cover all electrical components such as:<br>• Checking/servicing transformer oils,<br>• Switchgear components,<br>• Routine calibration of instruments and<br>• Routine cleansing of equipment depending on design.<br><br>In certain instances maintenance functions could be based on efficiency monitoring of electrical motors and components.<br><br>These maintenance inspections and resulting actions can be done by any of the methods listed for mechanical routine planned maintenance (see above) |
| Major breakdown repairs | These repairs will cover the rectification of faults shown by SCADA, such as:<br>• Power supply breakdowns |

| | |
|---|---|
| | • Motor faults.<br><br>These maintenance repairs can be done by any of the repair units listed for mechanical routine planned maintenance (see above) |
| Minor breakdown repairs | Breakdowns of the following nature can be done by staff or large/small contractors (i.e. electricians, etc.)<br>• Replacement of lights and bulbs,<br>• Repair of light and other switches,<br>• Faulty control units,<br>• Replacement of transducers and switches and<br>• Repair of wiring faults. |
| **Civil** | |
| Routine planned maintenance | A schedule of routine maintenance will be compiled to cover all components such as:<br>• Five yearly dam safety inspections of river abstraction works and other qualifying reservoirs, subject to being delegated to MCWAP SMA;<br>• Regular inspection and repair of pipelines and chambers including fencing, gates, access roads, road crossings, etc.;<br>• Regular painting of valves and pipes in chambers;<br>• Inspection and repair of pipe linings at intervals (say 5 years);<br>• Inspection and repair of all reservoir embankments, structural and other concrete elements of all the principal components mentioned above. This will include checking for leaks and leakage rates from all reservoirs;<br>• Inspect and repair erosion and flood damage caused at any of the principal components;<br>• Keeping the pipeline servitudes free of shrubs and trees;<br>• Painting of buildings, and<br>• Maintenance of building services.<br><br>These maintenance inspections and resulting actions can be done by any of the methods listed for mechanical routine planned maintenance (see above) |
| Major breakdown repairs | These repairs will include aspects such as:<br>• Repair of leaks in reservoir linings<br>• Structural repairs to the abstraction works structures<br>• Fighting of veld fires<br>• Repair major erosion damage.<br><br>These maintenance repairs can be done by any of the repair units listed for mechanical routine planned maintenance (see above) |
| Minor breakdown repairs | These repairs will include aspects such as:<br>• Repairs to buildings and structures (i.e. safety handrails, doors, roofs, windows, etc).<br><br>These maintenance repairs can be done by any of the repair units listed for mechanical routine planned maintenance (see above) |

## 6.9 Decommissioning Phase

Decommissioning of the pipeline is not envisaged, under suitable maintenance, as pipes are usually removed or refurbished in South Africa instead of being decommissioned.

However, should decommissioning be required the activity will need to comply with the appropriate environmental legislation and best practices.

## 6.10 Screened Alternatives

Alternatives considered during the technical pre-feasibility and feasibility studies and initial environmental screening are discussed in this section. The options taken forward from Scoping to the EIA phase are examined and evaluated in **Section 9**.

### *6.10.1 Eskom switch yard*

Two alternative positions for the Eskom switch yard, options 1 and 2 (as shown in **Appendix D**), include the following (DWAF, 2008a):

- *Option 1* is on higher ground close to the existing yard, and
- *Option 2* is just behind the proposed new pump station.

Option 2 is preferred because it is the most suitable for supply to the pump station switch rooms because of its proximity. It will however be more expensive in the sense that the yard terrace will have to be benched into the hillside behind the pump station.

Option 1, although the terrain is fairly level, has the following disadvantages:

- It is approximately 200m away, and
- The cables need to cross a stream between the switch yard to the pump station, which may be inundated by up to 6m by the tailwater downstream of the dam when a flood occurs.

Option 1 poses a greater risk because of the route thereof and the longer length of cabling required. The final decision on the location of the switch yard lies with Eskom.

### *6.10.2 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 resources in the Lephalale area -

Current studies are being done by DWA as well as the Water Research Commission (WRC) on the potential of the groundwater in the Lephalale area. Although the results of these studies are not yet available, preliminary indications are that water can be abstracted from of a deep aquifer. The sustainable yield is expected to be between 2 and 3 $Mm^3/a$, which will be insufficient to be utilised as an alternative resource in the long-term water requirement of the area (DWAF, 2008a). Although this resource was found to be inadequate for the volumes required, some of it can possibly be used as a local resource;

- Raising of the Mokolo Dam on Mokolo River -

  The dam raising options that were assessed are (DWAF, 2008c):

  (1) Raising of FSL without raising the dam embankment. On the basis of preliminary analyses it appears as if the present total freeboard of 10.0m is more than what is required. Therefore it is possible to raise the existing FSL to some extent without having to raise the crest of the rockfill embankment. This will avoid the likely problem of not finding sufficient quantities of suitable soil for the clay core within economical haul distances.

  (2) Raise the embankment crest by 12.0m to reduced level (RL) 934.00 corresponding to the deck level of the intake tower.

**Figure 23: Crump weir and rock spillway at Mokolo Dam**

For the two raising options two spillway options were assessed:

(i) A straight uncontrolled concrete ogee type spillway, and

(ii) A reinforced concrete labyrinth spillway. Because of the better discharge characteristics of a labyrinth spillway an approximately 3m increase in FSL can be achieved.

This was found to be problematic as it does not provide adequate volumes of water and comes at a high cost. It also requires a long lead time in terms of the protocols that need to be followed with the neighbouring countries. As such it was not considered as a feasible option at this stage for the current fast track developments, but may be considered at a later development phase. The raising of Mokolo Dam was thus discarded as a solution.

- Water transfer from rivers beyond the borders of South Africa -
  It was found that the cost and the time frames required for such development renders it not feasible.

### *6.10.3 Transfer Scheme*

The following two most viable options of transferring water from the Mokolo Dam to the end users were identified and investigated during the MCWAP pre-feasibility study (DWAF, 2008b):

1. **Option 1:** Construct a pump station and new pipeline from Mokolo Dam to Zeeland, Matimba and Medupi power stations as well as Steenbokpan. This pipeline will be constructed parallel (or close) to the existing pipeline for most of the route. A total length of 83 700m (including the rising main from the Mokolo Dam and the gravity main to the end consumers) will be required including the extension to Steenbokpan.
2. **Option 2:** Construct a weir, abstraction works and a high lift pump station downstream of Mokolo Dam as well as a pipeline to deliver water to Zeeland, Matimba and Medupi power stations as well as Steenbokpan. This option includes

a mass gravity concrete weir in the Mokolo River approximately 41 km downstream of Mokolo Dam between the farms Sandier 559LQ and Rivers Bend 591LQ and immediately downstream of the confluence of the Rietspruit. This site was selected on the basis that it is located at the end of the deep and narrow valley section with only a small amount of developed irrigation along the river, and a short rising main to Zeeland. The objective was to minimise river losses and to limit the degree of water resource management that would be required. The low-lift pump station to abstract the sediment laden water from the river, located on the left flank of the weir, will be provided with 2 pumping bays to each accommodate a 750 ℓ/s submersible pump. Degritting and desilting facilities to remove coarse sediment and a balancing dam with 4 hours storage capacity will be provided between the low and high-lift pump stations. Water will be pumped from the high-lift pump station to the Zeeland WTW, Matimba raw water dam and Steenbokpan area. The total length of pipeline will be approximately 63.23 km.

From an engineering and environmental perspective, Option 1 (i.e. Mokolo Dam pipeline option) was considered as preferable due to the following reasons:

a) The Option 1 pipeline route will mostly follow the existing Exxaro pipeline alignment, which is already disturbed. Option 2 will create more environmental disturbance by clearing a new area for the pipeline.
b) For Option 2, the weir will impact on the flow of the river and therefore the migration of fish species. The change in the flow speed will also lead to the alteration of the riverine habitat. The possibility also exists that some terrestrial ecosystems next to the river may be inundated. The weir will also result in the increase in the 1:100 year flood line, which will make some of the adjacent land unavailable for use for landowners. It is therefore foreseen that some of the land along the river will have to be acquired by the client.
c) The capital cost of Option 2 is estimated to be marginally less than that of Option 1, but the implementation time with the weir included renders it unfeasible.
d) Higher risk attached to the cost and construction of the weir in the river due to the very limited geotechnical information available and uncertainties concerning river losses.

e) Option 2 will require a larger transfer from Crocodile River (West) (i.e. MCWAP Phase 2) with the associated operational and maintenance costs.
f) Option 2 has a higher overall operational cost due to the cost of the water lost in the river.
g) Due to the high water losses expected along the river between the Mokolo Dam and the proposed weir site, Option 2 may not have sufficient water to provide in the interim water requirement until the Phase 2 infrastructure can be implemented.

Option 1 was thus regarded as the more feasible alternative.

### *6.10.4 Pipeline Routing*

The following alternatives to the pipeline alignment were considered (DWAF, 2008a):

a) **Rising main (from Mokolo Dam to Wolvenfontein balancing dams)** -
The first 5.7km (±) of the route from Mokolo Dam deviates from the alignment of the existing Exxaro pipeline due to the following reasons:
- The existing route:
  - Traverses very rugged terrain;
  - Has very steep crossfalls;
  - Has rock outcrop over about 90% of its length;
  - Is often on a bench blasted into the side slope;
  - Has no soft material for bedding/backfill; and
  - Limits the number of working fronts to two (i.e. from either end).
- To follow the existing route would:
  - Require extensive blasting right next to the existing pipe;
  - Result in a very low production rate, due to having to limit blast loadings;
  - Impose a very real risk of damage to the existing pipe;
  - Result in risk of erosion and damage if it were placed on the downslope side of the existing pipe; and
  - All pipes and backfill material would have to be hauled in along the pipe route. The cover over the existing pipe is insufficient for heavy equipment to be used across it. There is insufficient space to provide for the trench

for the new pipe and to provide space to haul along the route, next to the existing pipe.

In particular, the production rate along the alternative routes (Alternatives A and B) is estimated to be about three times that achievable along the existing pipe route. Conditions along the access road are similar, with extensive outcrop present, but crossfalls are generally less steep and access is possible along the whole route (allowing work on multiple fronts). A "normal" production rate should be possible along this route.

The following alignment options for the rising main were considered:

1. **Alternative A:** Follows existing access road to Mokolo Dam.
2. **Alternative B:** This alternative alignment was suggested by the landowner of the Farms Wolvenfontein 645LQ and Witbank 647LQ, and the routes follows an existing power line for ± 300m and then greenfields for the remainder of the route until Wolvenfontein balancing dams.

b) **Gravity Main (from Wolvenfontein balancing dam to Matimba take-off)** –
An alternative alignment was considered to follow Road R510 to Lephalale. This was investigated to eliminate passing through the high point at Rietspruitnek. This option is not regarded as preferable due to the steep rocky slopes on the north-eastern side of the road and the spruit on the south-eastern side which leaves no space for the gravity pipeline.

c) **Gravity Main (between the Farms Hanglip 508LQ to Kringgatspruit 318LQ)** –
In general, the alignment of the pipeline to Steenbokpan was selected to be south of the coalfield, thus not sterilizing the coal. The two alignment alternatives for the gravity main to Steenbokpan include:

1. **Alternative C:** Chosen to follow alignment of new Steenbokpan tar road that runs north of Medupi Power Station, but south of the coalfield. This will minimize further impact on the environment and other services.

2. **Alternative D:** Follows the railway line to the south of Medupi Power Station and farm boundaries to minimize the impact on environment. Less favourable route as higher quantities of hard rock excavation will be required. Is also further away from coalfield where water will be used in mining operations i.e. distance to supply point from pipeline and associated cost. In addition, it would also require more AC mitigation.

### *6.10.5 No Go Option*

The Mokolo Dam is considered to be the only viable source of water that can satisfy the water requirements of some of the users and can possibly be used to also supply some water for other users in the interim period until the Crocodile River (West) Transfer System (i.e. MCWAP Phase 2) has been constructed.

The no go option will have the following implications:

- The development of new power stations is of high strategic importance with tight timeframes. Commissioning of the first generation unit is planned for end 2010 and additional water needs to be available by mid 2011 according to the expected water requirements. Without the implementation of MCWAP Phase 1, this will not be able to take place until Phase 2 is executed, subject to a separate authorisation. Provision of additional electricity by Eskom would thus be delayed by about 4 years, with severe implications for the national economy.
- The absence of water will suppress development, with associated socio-economic implications on a national scale.

### *6.10.6 Alternatives Suggested by Interested and Affected Parties*

The following concerns were raised by an Interested and Affected Party (I&AP), during the Scoping phase of the project, regarding the proposed MCWAP Phase 1 route:

- Mr. G. Viljoen has indicated that the Sable Hills Eco Park is to be developed on the Farms Wolvenfontein 645LQ and Witbank 647LQ. In consultation with a blasting expert, concerns have been raised by Mr. G. Viljoen regarding the impact of the route along the Mokolo Dam access road to the envisaged development, which include

*inter alia* matters related to visual impacts (along construction footprint and in ravine), rehabilitation, ecology as well as access and future usage of the road.

## 6.11 De-bottlenecking

An option to phase the construction of the MCWAP Phase 1 pipeline by first increasing the capacity of the existing gravity section from Wolvenfontein balancing dam with interconnections to a new pipeline for the first 9 kilometres (i.e. MCWAP De-bottlenecking – see **Figure 24**) is being considered to overcome the interim capacity constraints whilst the full Phase 1 is being constructed.

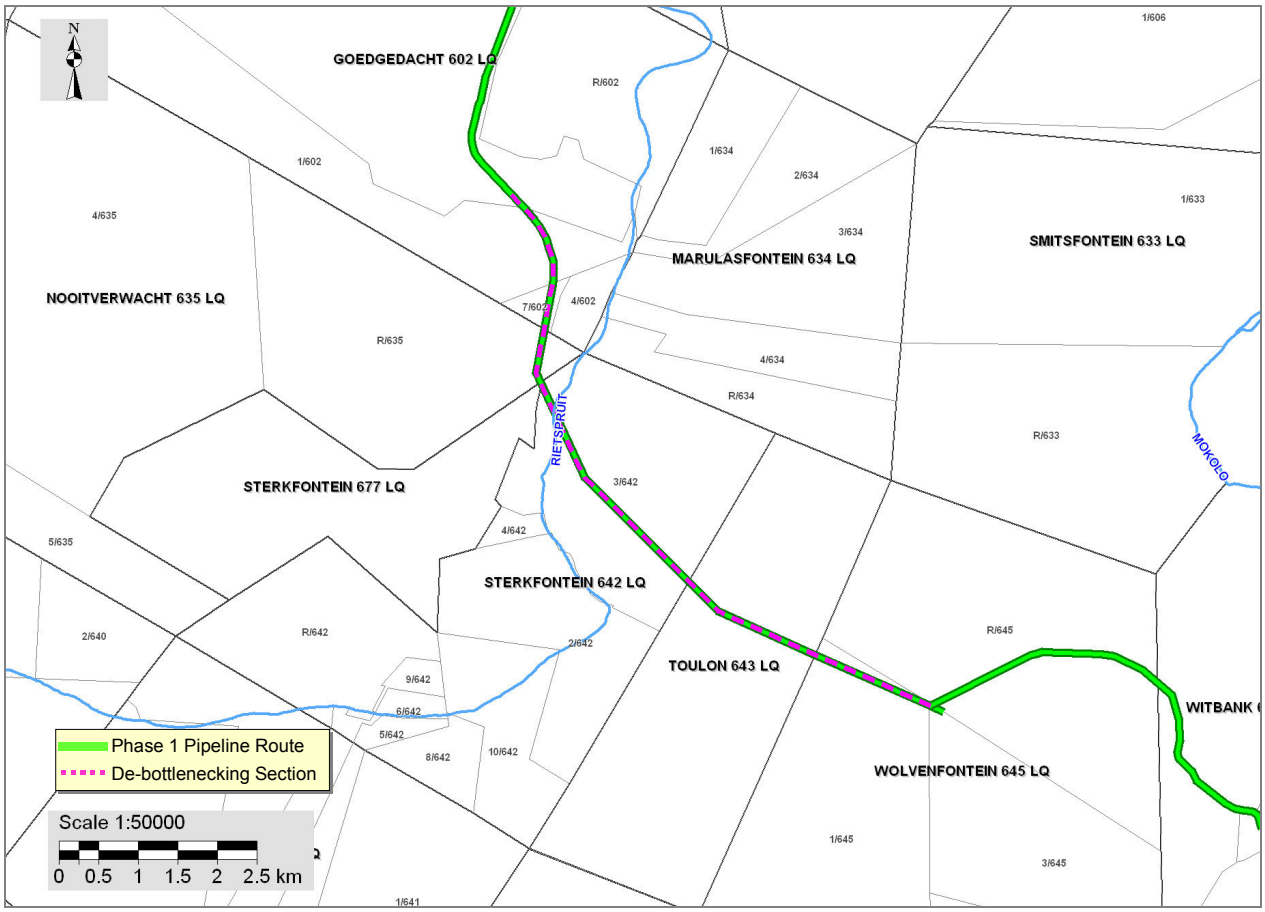



**Figure 24: De-bottlenecking section**

The intention of the de-bottlenecking of the existing Exxaro pipeline is to improve the hydraulic gradient at Rietspruitnek, where the existing pipeline passes over a ridge

(approximately 16.5km from the Wolvenfontein balancing dam). By utilising the existing pump station at Mokolo Dam water can then be delivered at a rate higher than the capacity of the existing pipeline.

A separate environmental assessment, in the form of a Basic Assessment (DEA ref. no. 12/12/20/1467), was conducted for the abovementioned de-bottlenecking project. Authorisation for the de-bottlenecking project was granted by DEA on 24 February 2010.

## 6.12 Institutional Arrangements

The information contained in this section was extracted from Institutional Arrangements and River Management (DWAF, 2009a), which forms part of the MCWAP feasibility study.

Presently the main parties to the MCWAP are the owner, DWA, and the Trans-Caledon Tunnel Authority (TCTA) as their Implementing Agent, and the main users, being Eskom, Exxaro, Sasol and the Municipality of Lephalale. Other interested and affected parties are the existing users supplied from the Mokolo Dam and the existing users supplied from the Crocodile River (West) downstream of the Vaalkop, Roodekopjes and Klipvoor dams. These users rely on releases from these dams and accruals from the catchments downstream of the dams.

The total MCWAP will be managed and operated by a suitable and representative authority, with the duty to implement the policies, functions and responsibilities associated with this scheme to supply water to the users in the area.

Three distinctly different functions must be performed by the Authority, namely:

- Management of the river flows in the Crocodile River (West); (part of Phase 2)
- Abstracting water from the Mokolo Dam (Phase 1) and the Crocodile River (West) at Vlieëpoort and managing its supply and distribution to the users supplied by the MCWAP; and
- Operating and maintaining the MCWAP infrastructure.

Exxaro currently operate and maintain the existing raw water supply to the mine, Matimba Power Station and the Lephalale town. The intention is that Exxaro continue to do so also until DWA is in position to perform the function with the implementation of Phase 1.

# 7 PROFILE OF THE RECEIVING ENVIRONMENT

Aerial perspectives of the proposed MCWAP Phase 1 pipeline routes are shown below.

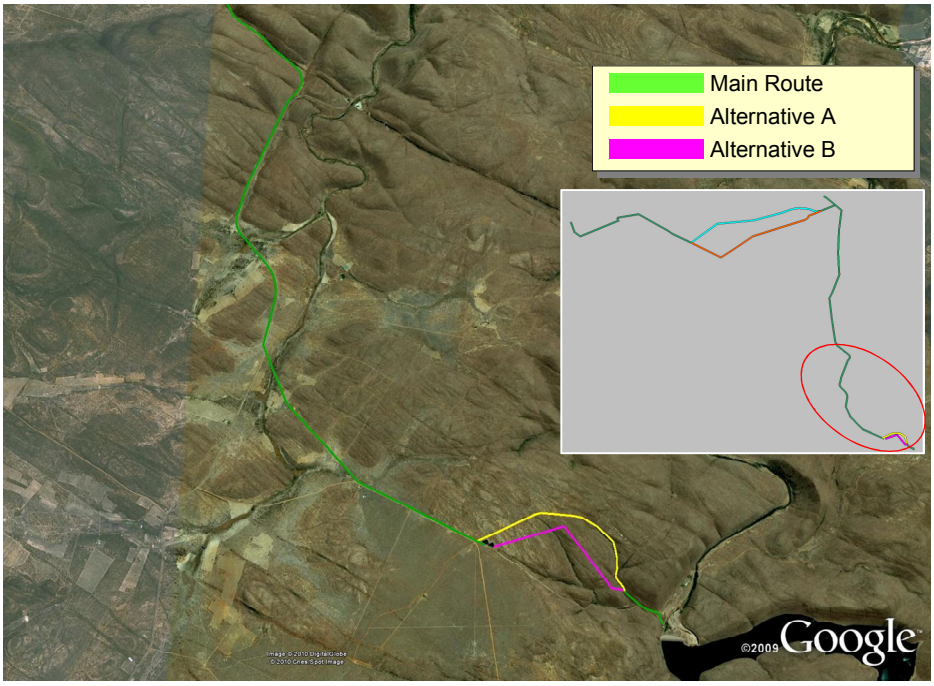



**Figure 25: Aerial view of the first section of the pipeline route, from Mokolo Dam**

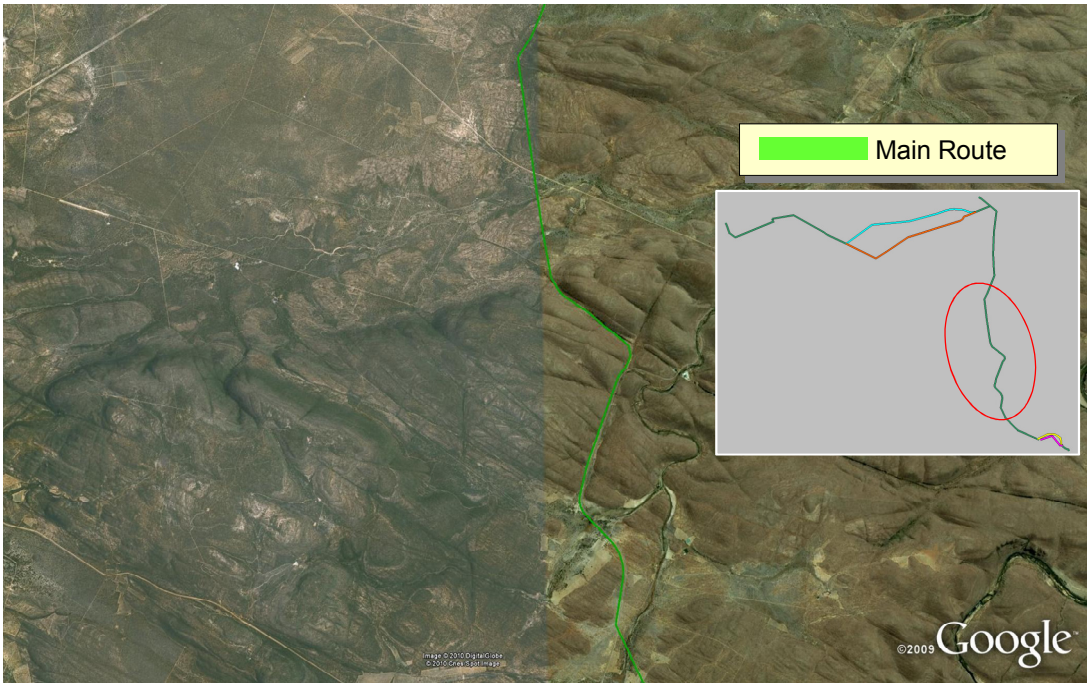



**Figure 26: Aerial view of the second section of the pipeline route**

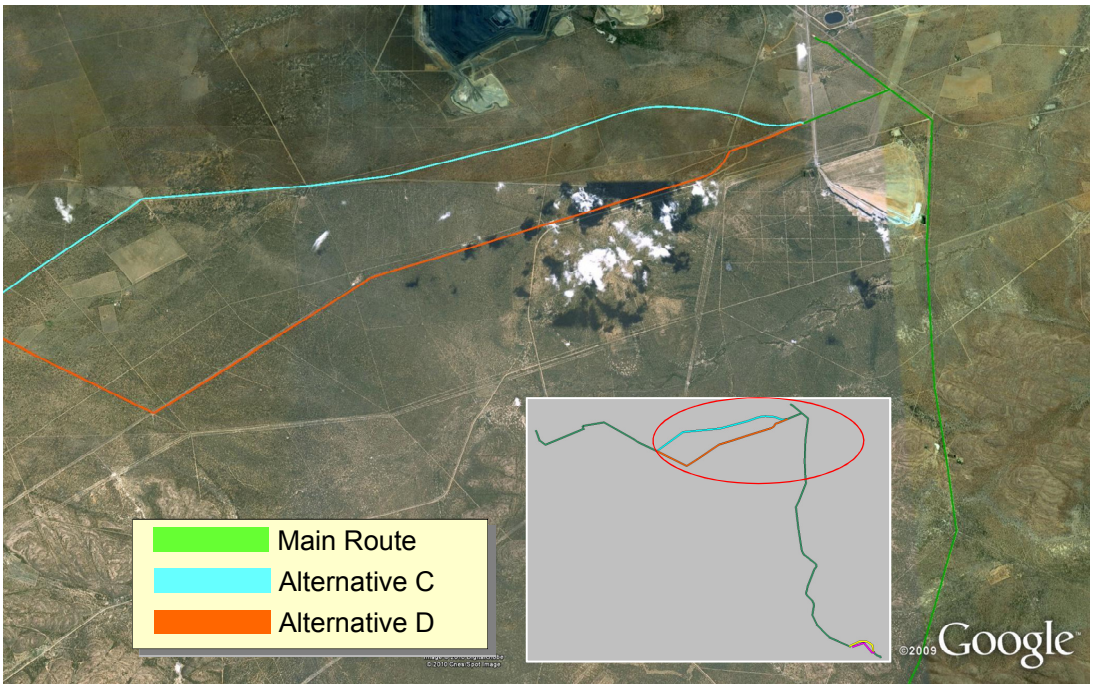



**Figure 27: Aerial view of the third section of the pipeline route**

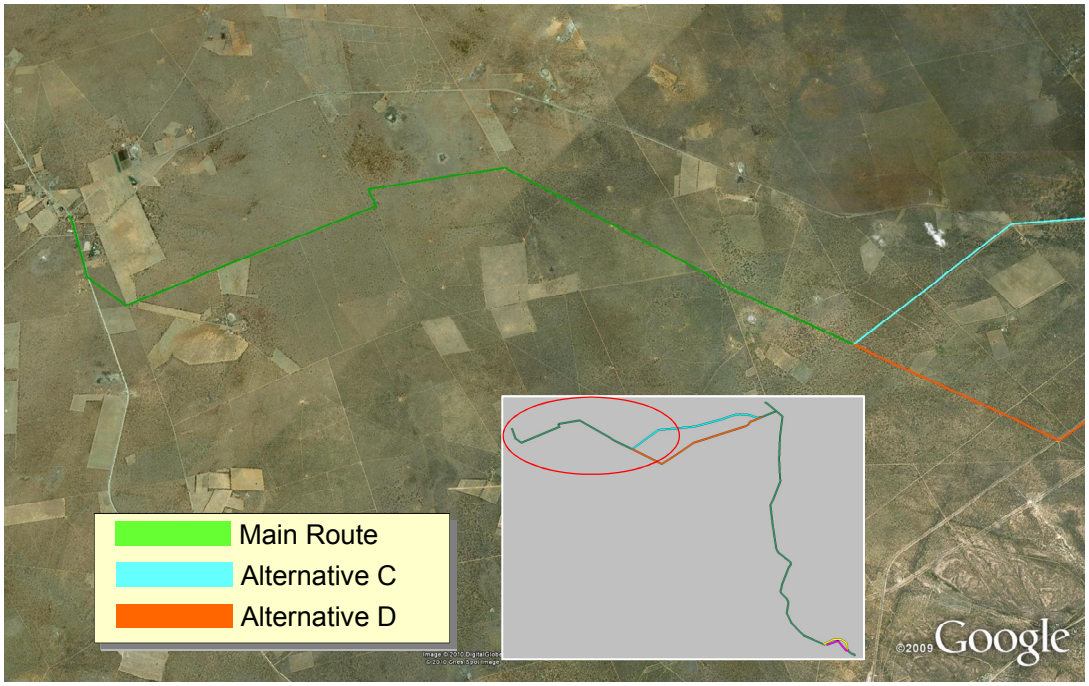



**Figure 28 Aerial view of the fourth section of the pipeline route**

To minimise impacts, the proposed route attempts to remain alongside existing development footprints (e.g. farm boundaries) and linear-type infrastructure where the environment is regarded as less sensitive, such as:

- Pipelines (i.e. existing Exxaro Pipeline from the Wolvenfontein balancing dam to Zeeland WTW),
- Roads,
- Railway lines,
- Transmission lines; and
- Industrial corridors.

A 200m corridor (i.e. 100m on either side of the centre line) was adopted as the study area, which allows for possible deviations (deemed technically feasible) from the proposed alignment within this corridor based on on-ground constraints and sensitive features.

The sub-sections below provide a general description of the status quo of the receiving environment in the project area, and also provide local and site-specific discussions on those environmental features investigated by the respective specialists. However, the reader is referred to **Section 8** for more elaborate explanations of the specialist studies and their findings. This allows for an appreciation of sensitive environmental features and possible receptors of the effects of the proposed project. The potential impacts to the receiving environment are discussed further in **Section 10**.

## 7.1 Climate

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. The potential impact of drastic changes in the regional climate has not been recorded and can only be estimated.

Information on climatic conditions contained in the sub-sections to follow was obtained from the South African Weather Service for the weather station in Lephalale.

### *7.1.1 Temperature*

Average daily maximum and minimum temperatures for Lephalale for the last ten years are tabulated below. The region is characterised by moderate fluctuations in seasonal temperature, with a high of 36.6°C and a low of 2.7°C.

**Table 11: Average Daily Maximum Temperature (°C) for station [0674341 8] - Lephalale**

| Year | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999 | 31.7 | 33.0 | 31.5 | 30.1 | 26.8 | 24.7 | 23.7 | 27.1 | 28.0 | 30.4 | 31.7 | * |
| 2000 | 29.9 | 32.4 | 28.1 | 26.0 | 24.3 | 22.7 | 22.9 | 26.6 | 29.7 | 31.5 | 31.5 | 33.4 |
| 2001 | 34.8 | 30.9 | 29.8 | 28.2 | 26.4 | 24.5 | 23.2 | 28.2 | 30.0 | 30.3 | 27.7 | 31.3 |
| 2002 | 34.7 | 34.0 | 33.9 | 31.0 | 27.7 | 23.1 | 25.1 | 27.7 | 29.3 | 32.5 | 34.7 | 35.1 |
| 2003 | 36.6 | 36.4 | 35.0 | 32.2 | 27.7 | 22.9 | 24.5 | 26.5 | 30.8 | 32.7 | 33.5 | 35.3 |
| 2004 | 32.6 | 30.5 | 28.1 | 27.7 | 25.9 | 23.1 | 23.7 | 28.1 | 29.5 | 32.2 | 35.0 | 31.3 |
| 2005 | 33.6 | 34.7 | 32.1 | 28.7 | 28.0 | 26.3 | 24.9 | 28.4 | 32.4 | 33.4 | 32.8 | 30.5 |
| 2006 | 31.1 | 30.9 | 27.2 | 27.6 | 24.5 | 23.9 | 25.3 | 25.2 | 29.4 | 33.0 | 31.9 | 34.1 |
| 2007 | 32.6 | 35.3 | 33.2 | 28.5 | 26.1 | 24.0 | 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 | * | * | * | * | * | * | * |

** No data available at time of request*

**Table 12: Average Daily Minimum Temperature (°C) for station [0674341 8] - Lephalale**

| Year | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999 | 20.0 | 19.5 | 18.9 | 15.0 | 11.3 | 6.3 | 7.3 | 9.0 | 12.6 | 15.2 | 19.6 | * |
| 2000 | 19.4 | 21.0 | 19.1 | 14.6 | 8.1 | 8.8 | 4.7 | 7.8 | 13.3 | 16.9 | 17.9 | 19.5 |
| 2001 | 20.0 | 20.0 | 18.3 | 15.3 | 9.5 | 6.5 | 6.0 | 10.4 | 13.5 | 16.1 | 17.5 | 20.1 |
| 2002 | 21.2 | 20.6 | 19.1 | 15.5 | 10.0 | 7.1 | 4.2 | 11.6 | 12.9 | 17.9 | 19.2 | 22.2 |
| 2003 | 22.4 | 23.3 | 19.9 | 16.6 | 10.4 | 9.4 | 5.6 | 8.4 | 13.5 | 17.9 | 20.7 | 21.3 |
| 2004 | 21.2 | 20.0 | 19.3 | 15.6 | 10.1 | 6.4 | 3.7 | 9.1 | 11.8 | 16.7 | 20.2 | 19.8 |
| 2005 | 21.1 | 20.4 | 18.3 | 15.9 | 10.7 | 7.6 | 5.4 | 11.5 | 14.4 | 17.4 | 19.4 | 18.3 |
| 2006 | 20.3 | 20.0 | 17.2 | 13.1 | 6.9 | 5.4 | 5.7 | 7.1 | 11.5 | 17.1 | 18.1 | 19.8 |
| 2007 | 18.6 | 19.0 | 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 | 12.0 | 17.6 | 19.3 | 19.9 |
| 2009 | 20.5 | 19.3 | 17.0 | 12.3 | 9.8 | * | * | * | * | * | * | * |

** No data available at time of request*

### *7.1.2 Precipitation*

The monthly rainfall for Lephalale for the last ten years is tabulated below. The area is classified as semi-arid and precipitation occurs mainly in the summer, with the maximum rainfall experienced during November - March. The mean annual precipitation ranges between 350 and 400mm.

**Table 13: Monthly Rainfall (mm) for station [0674341 8] - Lephalale**

| Year | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999 | 24.4 | 57 | 32 | 12 | 20 | 0 | 0.6 | 0 | 1.6 | 21.2 | 90.6 | * | **259.4** |
| 2000 | 86 | 64.4 | 104.8 | 102.4 | 9.4 | 9 | 0.2 | 0 | 0.2 | 0 | 25.8 | 62.6 | **464.8** |
| 2001 | 21.4 | 74.4 | 16.8 | 11.2 | 7.2 | 21.4 | 0 | 0.2 | 0.2 | 18.2 | 142 | 104.6 | **417.6** |
| 2002 | 26 | 9 | 8.6 | 107.2 | 43 | 5.6 | 0.8 | 0.6 | 3 | 47 | 0.4 | 57.2 | **308.4** |
| 2003 | 83.6 | 31 | 9.2 | 0.4 | 0 | 22.8 | 0 | 0 | 1.6 | 21 | 20.2 | 48 | **237.8** |
| 2004 | 98.4 | 94.8 | 121.4 | 41 | 9 | 0 | 0 | 0 | 0 | 9 | 14.4 | 107.4 | **495.4** |
| 2005 | 9.8 | 17.4 | 3.2 | 35.2 | 0 | 0 | 0 | 0 | 0 | 0 | 73.4 | 42.4 | **181.4** |
| 2006 | 143.6 | 68.8 | 52.2 | 12.4 | 11 | 0 | 0 | 2 | 1.6 | 3.2 | 42 | 81.4 | **418.2** |
| 2007 | 11.8 | 24.2 | 47.4 | 36.6 | 0 | 0.2 | 1.4 | 0 | 30.2 | 90.2 | 113.4 | 74.6 | **430** |
| 2008 | 142.4 | 0 | 60.8 | 1.2 | 11 | 0 | 1 | 0 | 0 | 15.2 | 166.2 | 80.8 | **478.6** |
| 2009 | 116.8 | 62 | 69.8 | 0.6 | 4.8 | * | * | * | * | * | * | * | ** |
| **Average** | **69.5** | **45.7** | **47.8** | **32.7** | **10.5** | **5.9** | **0.4** | **0.3** | **3.8** | **22.5** | **68.8** | **73.2** | **369.2** |

** No data available at time of request*

### *7.1.3 Wind*

Refer to **Figure 29** for the wind rose at the Lephalale weather station. The prevailing wind direction over a 10-year period (1998 – 2009) is east-northeast.

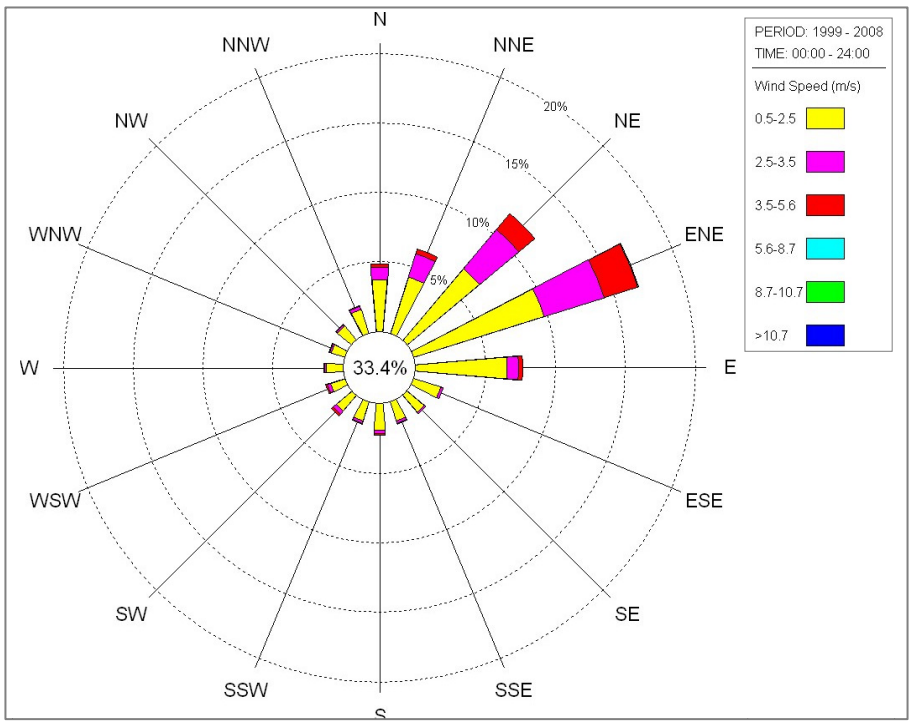



**Figure 29: Wind rose for the Lephalale weather station**

## 7.2 Topography

The terrain morphology consists mainly of table lands along the first section of the pipeline route from Mokolo Dam, in the south-eastern part of the MCWAP Phase 1 project area. From there, the terrain transforms to plains for the last section of the transfer line and for the entire route along the delivery line. This area comprises flat and undulating topography.

The most noteworthy topographical feature includes the ridge where the pipeline route traverses Rietspruitnek, at the point where the pipeline exits the Mokolo River valley (see **Figures 30** and **31**).

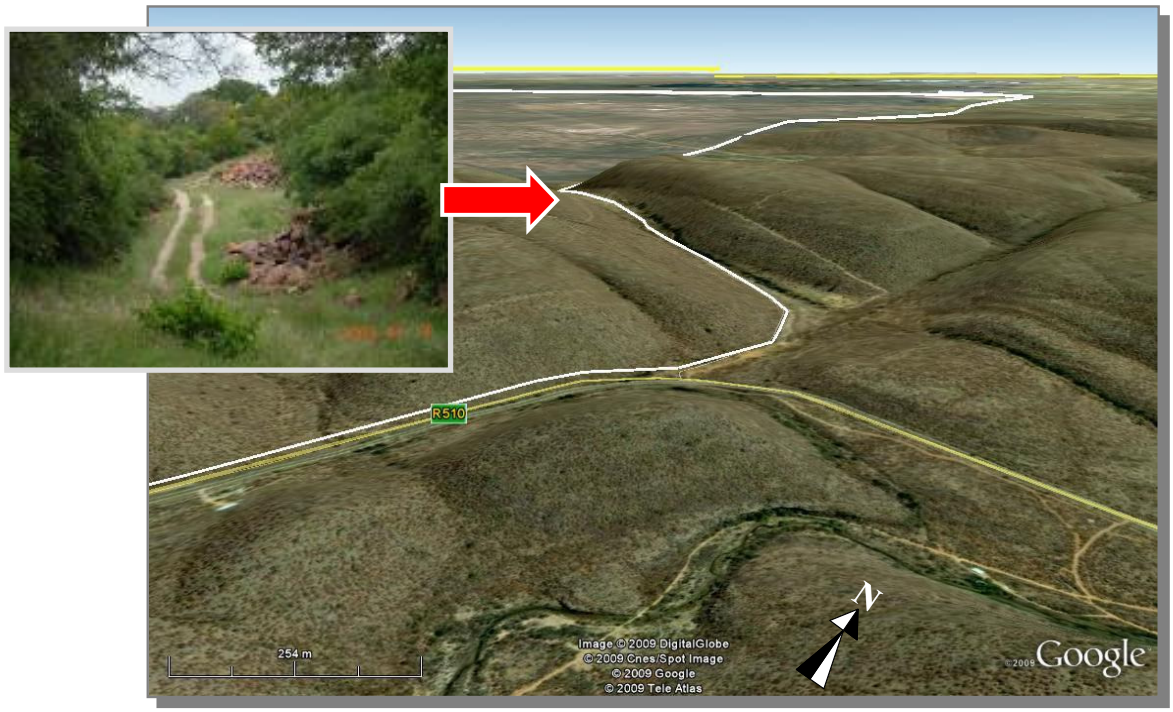



**Figure 30: North-westerly view of Rietspruitnek**

Topographical features like ridges are not preferred for the pipeline route or associated structures due to the influence to the hydraulic gradient and the prevention of impacts to environmental features such as aesthetics, soil (erosion), and biodiversity (usually high on ridges). However, two steep areas are traversed by the route, namely along the initial section from Mokolo Dam and at Rietspruitnek (see **Figure 29**).

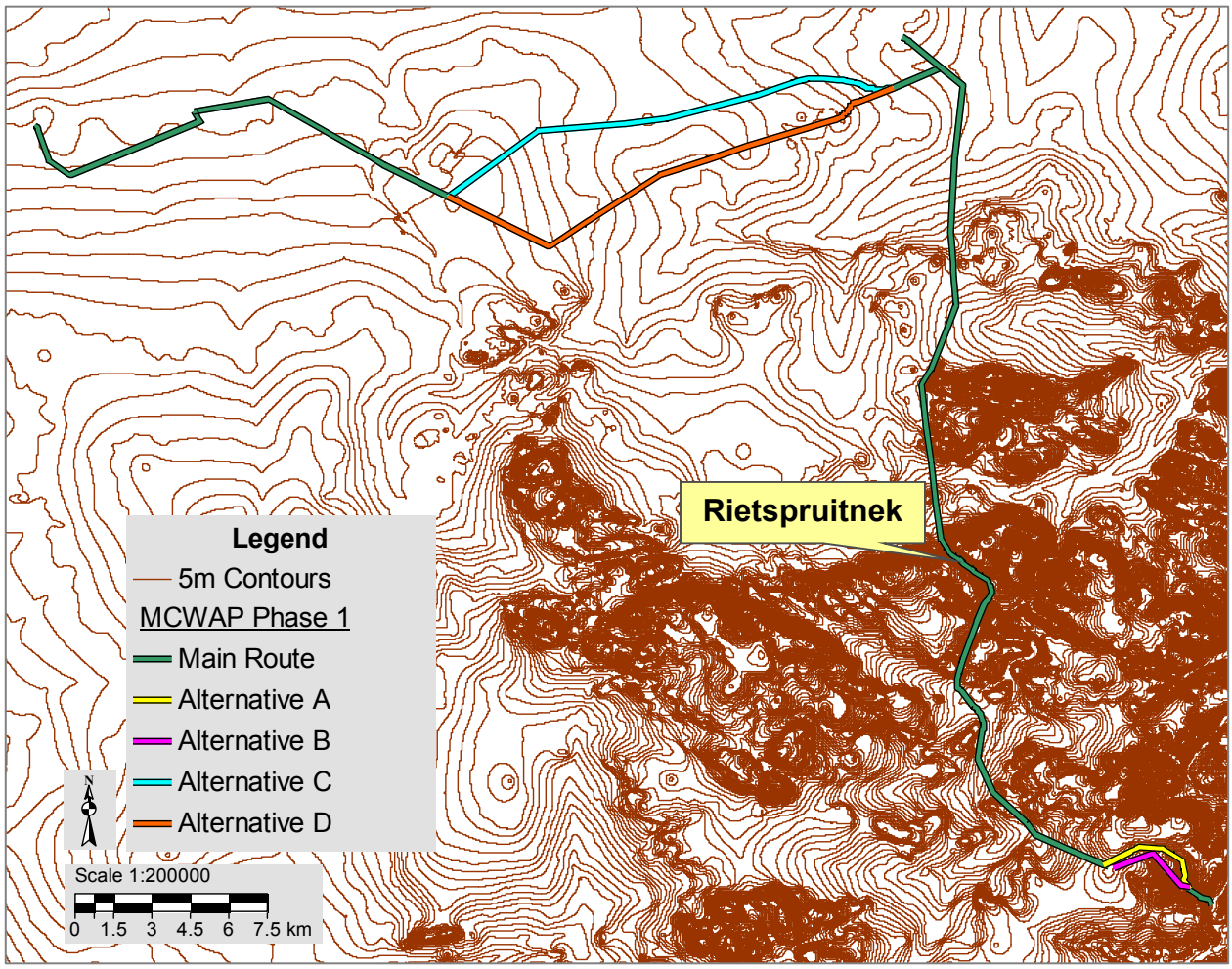



**Figure 31: Steep terrain along route**

## 7.3 Surface Water

### *7.3.1 Watercourses*

**Figure 32** shows the main watercourses in the project area.

MCWAP Phase 1 falls within the Limpopo Water Management Area (WMA), which represents part of the South African portion of the Limpopo Basin which is also shared by Botswana, Zimbabwe and Mozambique.

The pipeline route is situated in the Mokolo River catchment (quaternary catchments A42G, A42H and A42J) and Limpopo River catchment (quaternary catchment A41E).

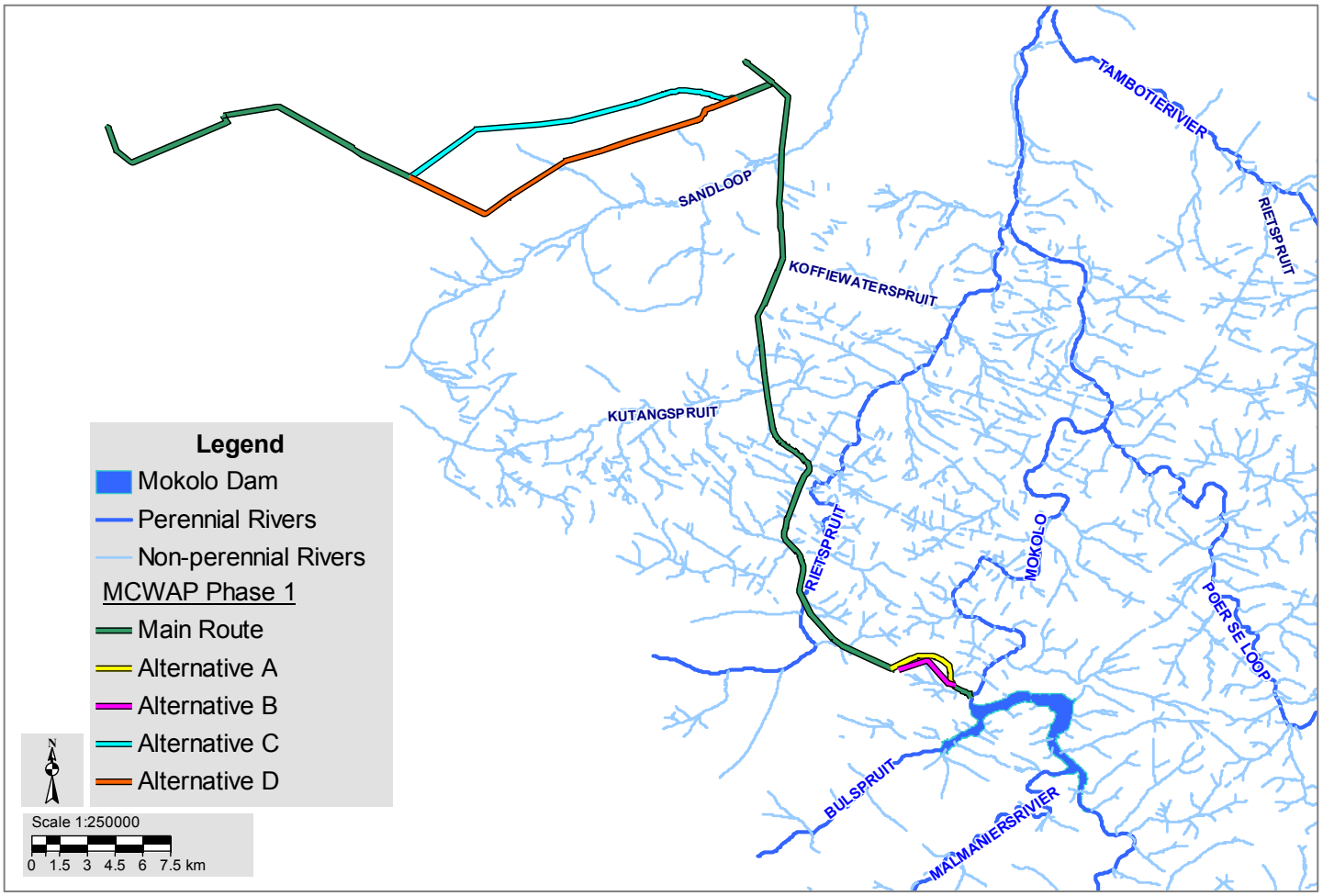



**Figure 32: Main surface water resources in the project area**

The Mokolo River (also known as the Mogol or Mogolo River) rise in the western part of the Waterberg (between 1200 and 1600 metres above mean sea level). It originates in a flattish, open area with numerous koppies and flows through a steep gorge emerging above the town of Vaalwater. Here the river flows through a relatively flat area until it enters the Mokolo Dam. From there, it flows through another gorge before entering the Limpopo Plain, near the junction with the Rietspruit. From this point, the Mokolo River flows through flat sandy areas until it reaches the Limpopo River (River Health Programme, 2006).

**Figure 33: Northern view of Mokolo River downstream of the Mokolo Dam**

The main tributaries joining the Mokolo River downstream of the Mokolo Dam are: Rietspruit, Poer se Loop, and Tamboti River. The Mokolo River is a major tributary of the Limpopo River and commands a total catchment area of over 8 000 $km^2$ with a total natural mean annual runoff (MAR) of almost 300 $Mm^3/a$. The towns of Lephalale and Vaalwater are situated in the Mokolo Catchment. Agriculture (irrigation) is the major water user in the catchment.

The watercourse crossings along the proposed pipeline routes are presented in the table to follow.

**Table 14: Watercourse Crossings**

| Watercourse | Habitat description | Alternative Route | Property detail |
|---|---|---|---|
| Tributary of the Sandloop | Drainage line | D | Vergulde Helm 316LQ |
| Main stem of the Sandloop | Drainage line | Main Route | Boundary - Wellington 519LQ and Worcester 520LQ |
| Tributaries - Sandloop | Drainage line | Main Route | Boundary - Wellington 519LQ and Worcester 520LQ |
| | Drainage line | Main Route | Boundary - Wellington 519LQ and Worcester 520LQ |
| Main stem - Kutangspruit | Drainage line | Main Route | Fourieskloof 557LQ |
| Tributaries - Kutangspruit | Drainage line | Main Route | Goedehoop 552LQ |
| | Drainage line | Main Route | Goedehoop 552LQ |
| | Wetland | Main Route | Fancy 556LQ |
| Tributaries - Rietspruit | Drainage line | Main Route | Fancy 556LQ |
| | Drainage line | Main Route | Fancy 556LQ |
| | Drainage line | Main Route | Fancy 556LQ |
| | Drainage line | Main Route | Goedgedacht 602LQ |
| | Drainage line | Main Route | Goedgedacht 602LQ |
| | Drainage line | Main Route | Goedgedacht 602LQ |
| | Drainage line / Wetland | Main Route | Goedgedacht 602LQ |
| Main stem - Rietspruit | Drainage line / Wetland | Main Route (De-bottlenecking section) | Sterkfontein 642LQ |
| Tributaries - Rietspruit | Drainage line / Wetland | Main Route (De-bottlenecking section) | Toulon 643LQ |
| | Drainage line | Main Route | Wolvenfontein 645LQ |
| Tributaries - Mokolo River | Drainage line | A | Wolvenfontein 645LQ |
| | Drainage line | A | Wolvenfontein 645LQ |
| | Drainage line | B | Wolvenfontein 645LQ |
| | Drainage line | B | Wolvenfontein 645LQ |
| | Drainage line | A | Witbank 647LQ |
| | Drainage line | A | Witbank 647LQ |

Refer to **Section 8.2** for a synopsis of the Wetlands and Watercourse Crossings Survey for MCWAP Phase 1 (Enviross CC, 2010) and the de-bottlenecking section (Enviross, 2009), as contained in **Appendix H2**. The study categorised the watercourse crossings according to the habitat unit that they were associated with, which included the following:

- **Drainage lines:**

  The majority of the drainage lines are channels that carry surface water runoff during rainfall events and do not represent any established aquatic or wetland systems. Where the proposed pipeline alignment follows alongside a roadway, the majority of these drainage channels occur as culvert drains that merely allow for free drainage within the road reserve and do not represent ecologically sensitive habitats.

- **Perennial streams:**

  The only perennial stream crossed by the route is the Rietspruit complex within the southern area of the proposed pipeline alignment. However, a mountain stream (tributary of Mokolo River) on the Farm Witbank 647LQ that flows for the majority of the year supports an ecologically significant kloof habitat unit downstream.

- **Pan wetlands:**

  Only one pan wetland was identified that could potentially be impacted by the Main Route on the Farm Zandbult 300LQ. Upon closer inspection, it was found that the boundaries of this wetland occur a distance from the proposed pipeline route and will therefore not be impacted if the present proposed pipeline route is followed.

- **Wetlands:**

  Along the de-bottlenecking section, the following wetland crossings occur:

  - Toulon 643LQ – tributary of Rietspruit;
  - Sterkfontein 642LQ – main stem of Rietspruit; and
  - Goedgedacht 602L – tributary of Rietspruit.

  The Main Route for MCWAP Phase 1 traverses wetlands on the Farms Goedgedacht 602L (tributary of Rietspruit) and Fancy 556LQ (tributary of Kutangspruit).

### *7.3.2 Impoundments*

The Mokolo Dam (formerly known as the Hans Strijdom Dam) is the largest dam in the catchment, and was commissioned in 1980 for the purpose of supplying water to the nearby Grootegeluk coal mine, Matimba dry-cooled power station, the towns of Lephalale and Onverwacht, Marapong township and an irrigation scheme located downstream of the dam. The dam has a long term firm yield of 39.1 $Mm^3/a$ at 99.5% assurance of supply of which 10.4 $Mm^3/a$ is allocated for irrigation (DWAF, 2008a) at the normal assurance associated with the assurance of irrigation water.

**Figure 34: South-eastern view of the Mokolo Dam spillway**

Raw Water is conveyed from Mokolo Dam via an existing Exxaro Raw Water pipeline to the Zeeland WTW. The purification plant is operated and maintained by Exxaro's Grootegeluk Mine and provides potable water through a separate potable water pipeline to the Grootegeluk Mine and the Lephalale Municipality. Raw water is transported via the existing Exxaro raw water pipeline to the Lephalale Municipality, Onverwacht and the Grootegeluk mine (Digby Wells & Associates, 2009) and the Matimba Power Station. As discussed in **Section 6.4.4**, the proposed MCWAP Phase 1 pipeline follows the same alignment of the Exxaro pipeline from the Wolvenfontein balancing dams to the Zeeland WTW. This MCWAP Phase 1 deals with the extension of supply of raw water from Mokolo Dam.

### *7.3.3 Pans and Wetlands*

**Figure 35** indicates the location of wetlands and non-perennial pans along the pipeline route, as identified on a desktop level through an appraisal of the topographical map and the National Wetlands Map II of the South African National Biodiversity Institute (SANBI), which was extracted from the National Land Cover 2000 dataset.

Refer to **Section 8.2** for a synopsis of the Wetlands and Watercourse Crossings Survey for MCWAP Phase 1 (Enviross CC, 2010) and the de-bottlenecking section (Enviross, 2009), as contained in **Appendix H2**. The wetlands situated along the Main Route (excluding the de-bottlenecking section) are discussed further, based on the specialist's findings. The wetland on the Farm Fancy 556LQ is part of an unchannelled valley-bottomed wetland that formed part of the feeder headwaters of the nearby Kutangspruit. It is not regarded as an ecologically sensitive wetland, however, excavation through the wetland should be undertaken in an ecologically sensitive manner. On the Farm Goedgedacht 602LQ the two converging streams that flow from the west form part of the Rietspruit and join this river within close proximity to the R510. The slow-flowing water and high degree of vegetation cover has allowed for a system that supports an exceptionally high diversity and density of various frog species. This also is attributed to the good water quality of the system. Crossing the watercourse at the existing Exxaro pipeline crossing point would minimise the impacts to this system.

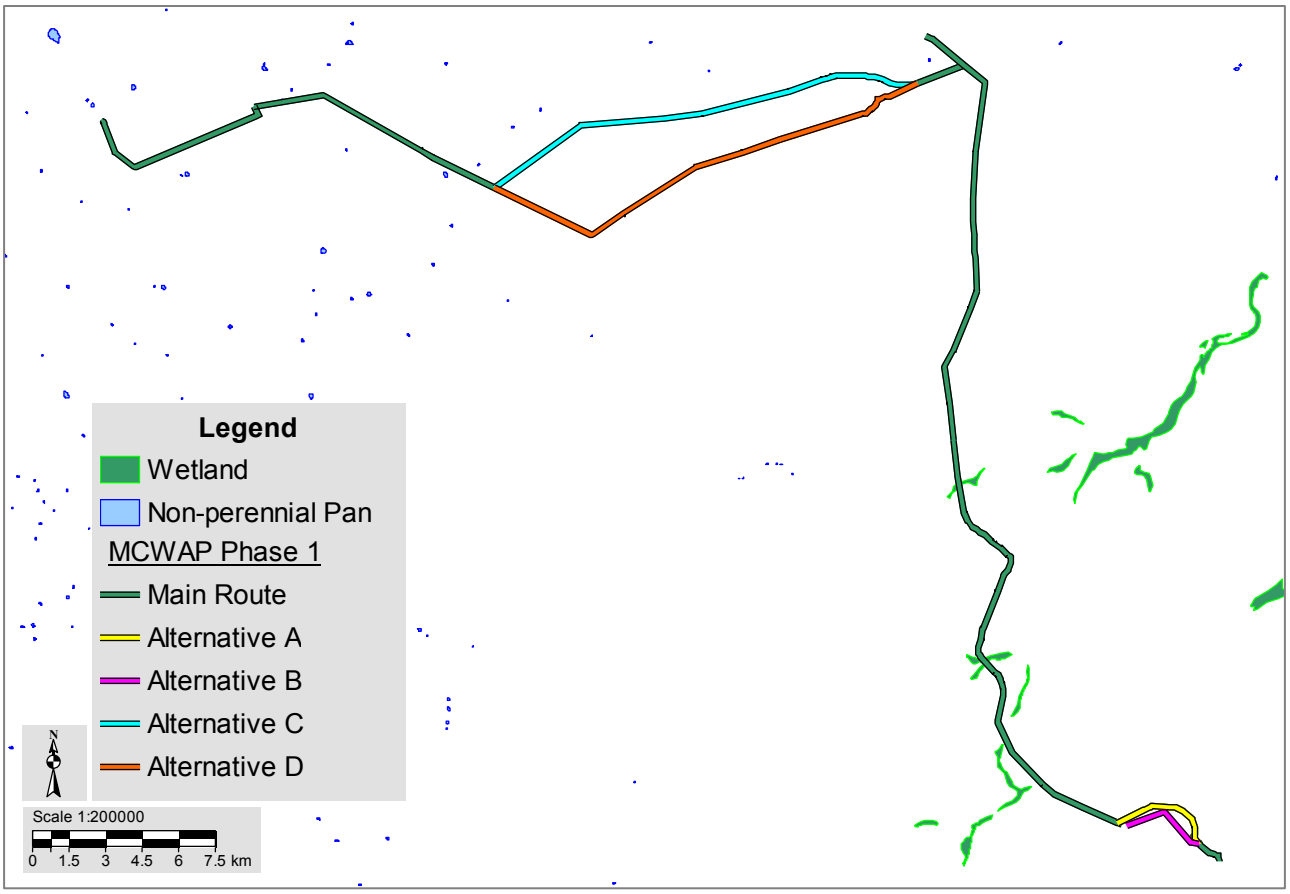



**Figure 35: Locations of wetlands and non-perennial pans along pipeline route**

### *7.3.4 Water Users*

In order to obtain estimates of the current and future water resources capability of the Mokolo River system, DWA Directorate: National Water Resource Planning commissioned the Updating the Hydrology and Yield Analysis in the Mokolo River Catchment (DWAF, 2008d). The study included the following two components:

- Updating the Hydrology and Yield Analysis in the Mokolo River Catchment: Yield Analysis study; and
- Updating the Hydrology and Yield Analysis in the Mokolo River Catchment: Planning Analysis study. This component included a planning analysis with the main objective of developing a detailed Water Resources Planning Model configuration of the entire Mokolo River system.

The main objective of the Yield Analysis study was to estimate the water resources supply capability of the Mokolo River system with a greater level of confidence for a variety of situations. The Mokolo Dam yield analysis results for the scenario with most reliable representation of the current-day situation are summarised in **Table 15** below. The Historic Firm Yield (HFY) and the Long-term stochastic yields at the various Recurrence Intervals (RI) are illustrated.

**Table 15: Mokolo Dam Yield Analysis Results (DWAF, 2008d)**

| HFY | | Yield ($Mm^3/a$), at indicated RI (assurance of supply shown in brackets) | | | |
|---|---|---|---|---|---|
| *($Mm^3/a$)* | *RI (years)* | *1:200 (99.5%)* | *1:100 (99%)* | *1:50 (98%)* | *1:20 (95%)* |
| *38.7* | *1:224* | *39.1* | *44.6* | *50.7* | *66.8* |

The HFY of the Mokolo Dam is 38.7 $Mm^3/a$ and occurs at a high recurrence interval of 1:224 years. The 1:200 year RI yield available from the Mokolo Dam under current day conditions is 39.1 $Mm^3/a$ and was accepted for further planning purposes. This is considerably higher than the total allocation made so far from Mokolo Dam of 28.6 $Mm^3/a$ (DWAF, 2008d).

| Box 2: | River Management System |
|---|---|

As part of the new development the current system of river management and abstraction control will need to be upgraded. The river management and operating rules that has been applied over many years in other catchments such as the Vaal system and the Crocodile River (East) and Komati River system will need to be evaluated and components of it applied to a system for the Crocodile River. This will also be to the benefit of the existing users.

The operating rules and river management system will need to be developed and implemented with the active participation and leadership of the Irrigation Board and Agri-Forum. This is specifically relevant for Phase 2.

### *7.3.5 Ecological Status*

The Intermediate Reserve Determination study for the Mokolo River Catchment (DWAF, 2007) is currently being finalised. As part of the Intermediate Reserve Determination, the ecological consequences (i.e. driver and biota responses) to a range of operational scenarios (i.e. flow scenarios other than the present which could be implemented in future) are predicted (DWA, 2010). The primary objective of the study is to implement a Resource Directed Measures (RDM) assessment yielding results at an intermediate level of confidence for the Mokolo sub-catchment, taking into account water resource management aspects.

| Box 3: | The "Reserve" |
|---|---|

The **Reserve** is central to water resource management and enjoys priority of use according to the National Water Act (No. 36 of 1998) (NWA). 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.

The intended users of the MCWAP water will need to apply for a water use authorisation, in terms of Section 21 of the NWA. The water use authorisation process will duly consider the determination and implementation of the Reserve, according to Section 16-18 of the NWA.

According to the River Health Programme (2006), the status of the major rivers in the project area, in terms of their Ecostatus and Ecological Importance and Sensitivity (EIS), are as follows:

- Mokolo (downstream of Mokolo Dam) – Ecostatus = fair; EIS = moderate; and
- Rietspruit – Ecostatus = fair; EIS = moderate.

### *7.3.6 Water Quality*

Water quality in the Mokolo River is considered to be good (River Health Programme, 2006). Contributing factors include the mountainous nature of the upper reaches and the prevalence of game reserves. **Table 16** provides water quality data, as obtained near the spillway at the Mokolo Dam, for the period 1972 – 2009.

**Table 16: Water Quality Data (90th percentile) at Mokolo Dam (23°59'07"S, 27°43'25"E), for 1972 – 2009** ***(source: www.dwaf.gov.za/iwqs/wms/data/a42/a42_90335)***

| Variable | Value (90th Percentile) |
|---|---|
| Conductivity | 10.82 mS/m |
| TDS | 74.6 mg/l |
| pH | 7.71 |
| Calcium | 8.98 mg/l |
| Magnesium | 3.26 mg/l |
| Potassium | 2.63 mg/l |
| Sodium | 7.89 mg/l |
| TAlkalinity | 34.58 mg/l |
| Chloride | 9.15 mg/l |
| Fluoride | 0.25 mg/l |
| Silica | 4.43 mg/l |
| Sulphate | 10.43 mg/l |
| NH4(N) | 0.09 mg/l |
| NO3(N) | 0.21 mg/l |
| PO4(P) | 0.03 mg/l |

According to DWAF (2004), the rapid and uncontrolled growth of informal settlements is a source of concern with regard to the surface and groundwater quality in the Mokolo Catchment. There are approximately 450 informal structures located in informal settlements in Lephalale Town (southeast of the urban core) and Marapong (Lephalale Local Municipality, 2010).

## 7.4 Geology and Soil

A general description of the geological conditions in the project area is provided below. Refer to the maps contained in **Figures 36** for the discussion to follow.

The majority of the pipeline route is underlain by the Waterberg Group, where the geology consists of quartzite and sandstone. The Karoo Super Group is found in the region of the Zeeland WTW, which consists of sandstone and shale. A small portion of the route is underlain by the Cleremont Formation of the Kransberg Sub-group south-west of the Wolvenfontein balancing dams, consisting of quartzite.

Large coal deposits are found in the area (see **Figure 1**), in the form of the Waterberg coalfield. 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.

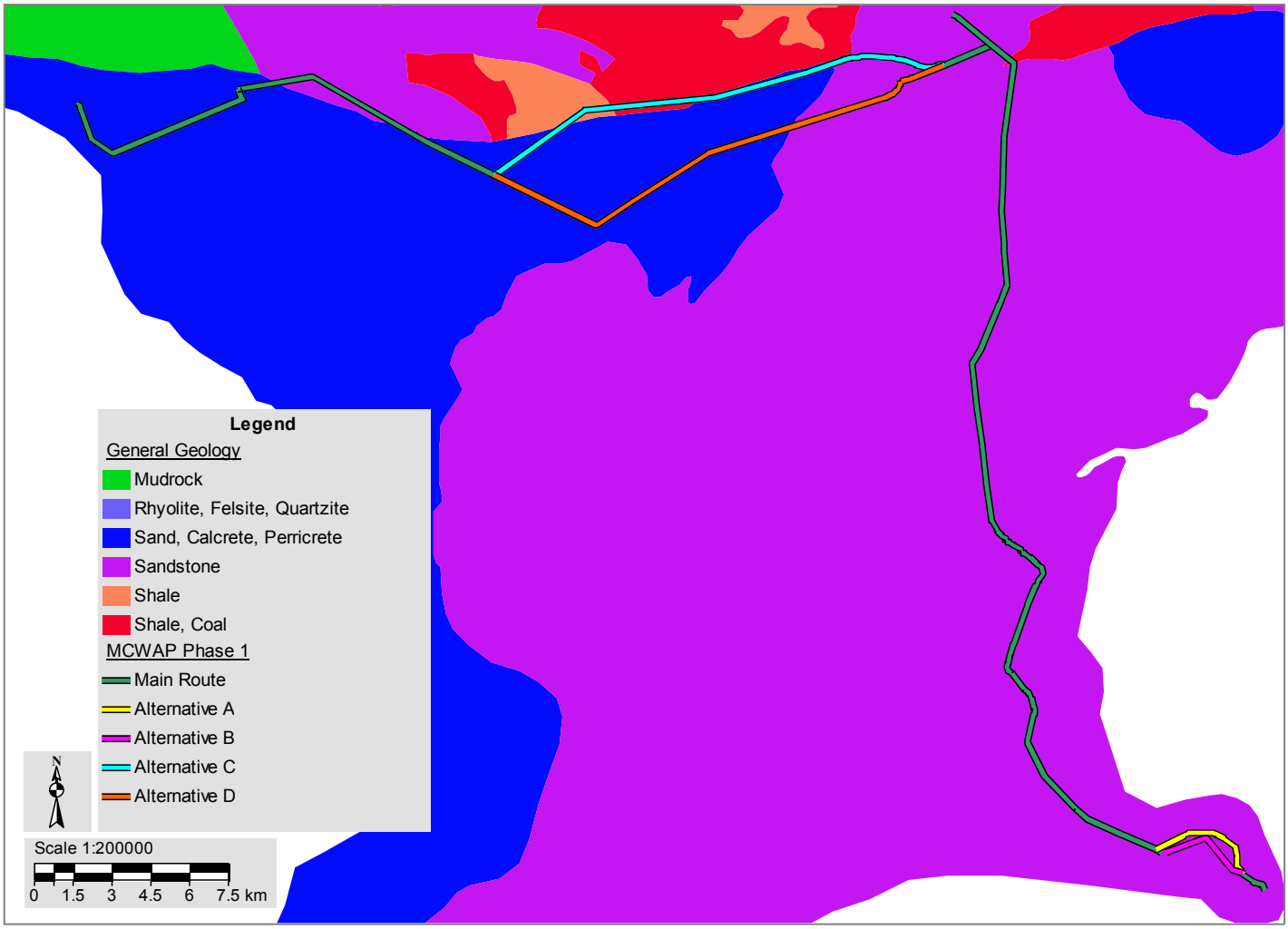



**Figure 36: General geology of the project area**

Refer to **Section 6.7.5** for an overview of the locations of the proposed borrow pits. The majority of spoil (i.e. excess rock and soil) will be used to rehabilitate the areas where material will be mined from the approved borrow pits.

Key geotechnical considerations for the project, as obtained from DWA (2008a), include:

- Rock occurs at shallow depths (generally less than 1 m) at the position where the construction of the new Mokolo Dam pump station is proposed and the structure will be founded entirely on rock.
- **Rising Main from Mokolo Dam to Wolvenfontein Reservoir -**
  Excavation will be almost exclusively in rock and bedding and soft backfill will have to be hauled into this part of the route. Extensive blasting will be necessary and care will have to be exercised to avoid damage from flyrock. The blasted rock will bulk significantly and the excess material will be spoiled in an environmentally acceptable manner.
- **Gravity Main from Wolvenfontein Reservoir to Matimba -**
  This section of the route exhibits far more favourable geotechnical conditions, with much less rock present and adequate sources of bedding and soft backfill material available. In the north excavation depths are expected to be of the order of 2m or more.
- No significant constraints are anticipated on the pipeline route extending westwards from the Matimba Manifold towards Steenbokpan. Soft material should be readily available and haul distances should be reasonable.

Where geotechnical constraints are encountered along the final pipeline alignment, suitable engineering solutions will be identified to improve sub-surface conditions for the laying of the pipe.

## 7.5 Geohydrology

According to the Water Resources Report (DWAF, 2008d), a primary aquifer occurs in the Lephalala River alluvium. The basin of the Lephalala River consists of coarse-grained alluvial sand with inter-bedded lenses of finer clay/shale material. This aquifer is primarily

used for irrigation and is recharged during the rainy season. This is also significantly recharged from surface flow in the river. The quality of the water in this aquifer is regarded as good with TDS < 500 mg/ℓ. Groundwater in the area, however, occurs mainly in the fractured secondary aquifers located in the rocks of the Waterberg Group and the Karoo Supergroup.

Groundwater is the main source of water supply to rural communities and is also used widely for irrigation purposes in the Limpopo WMA. The groundwater use in the Mokolo catchment is 11 $Mm^3/a$ (DWAF, 2004).

Current studies are being done by DWA as well as the Water Research Commission (WRC) on the potential of the groundwater in the project area. Although the results of these studies are not yet available, preliminary indications are that water can be abstracted from a deep aquifer (150m to 300m deep). The yield is expected to be between 2 and 3 $Mm^3/a$, which will be insufficient to be utilised as an alternate resource in the long-term water requirement of the area (DWAF, 2008d), but can be utilised as an additional resource or contingency during drought conditions.

As mentioned, the Intermediate Reserve Determination study for the Mokolo River Catchment (DWAF, 2007) is currently being undertaken.

## 7.6 Flora

### *7.6.1 Terrestrial*

The project area is situated within the Savanna Biome and Central Bushveld Bioregion. According to Low & Rebelo (1996), a “biome” is a broad ecological unit representing major life zones of large natural areas, and in South Africa these are defined mainly by vegetation structure and climate. The Savanna Biome is characterised by a grassy ground layer and a distinct upper layer of woody plants.

As shown in **Figure 37**, the delivery line and northern section of the transfer line extends over the Limpopo Sweet Bushveld. A small section of the delivery line crosses Western

Sandy Bushveld. The southern portion of the transfer line is located in Waterberg Mountain Bushveld and Central Sandy Bushveld.

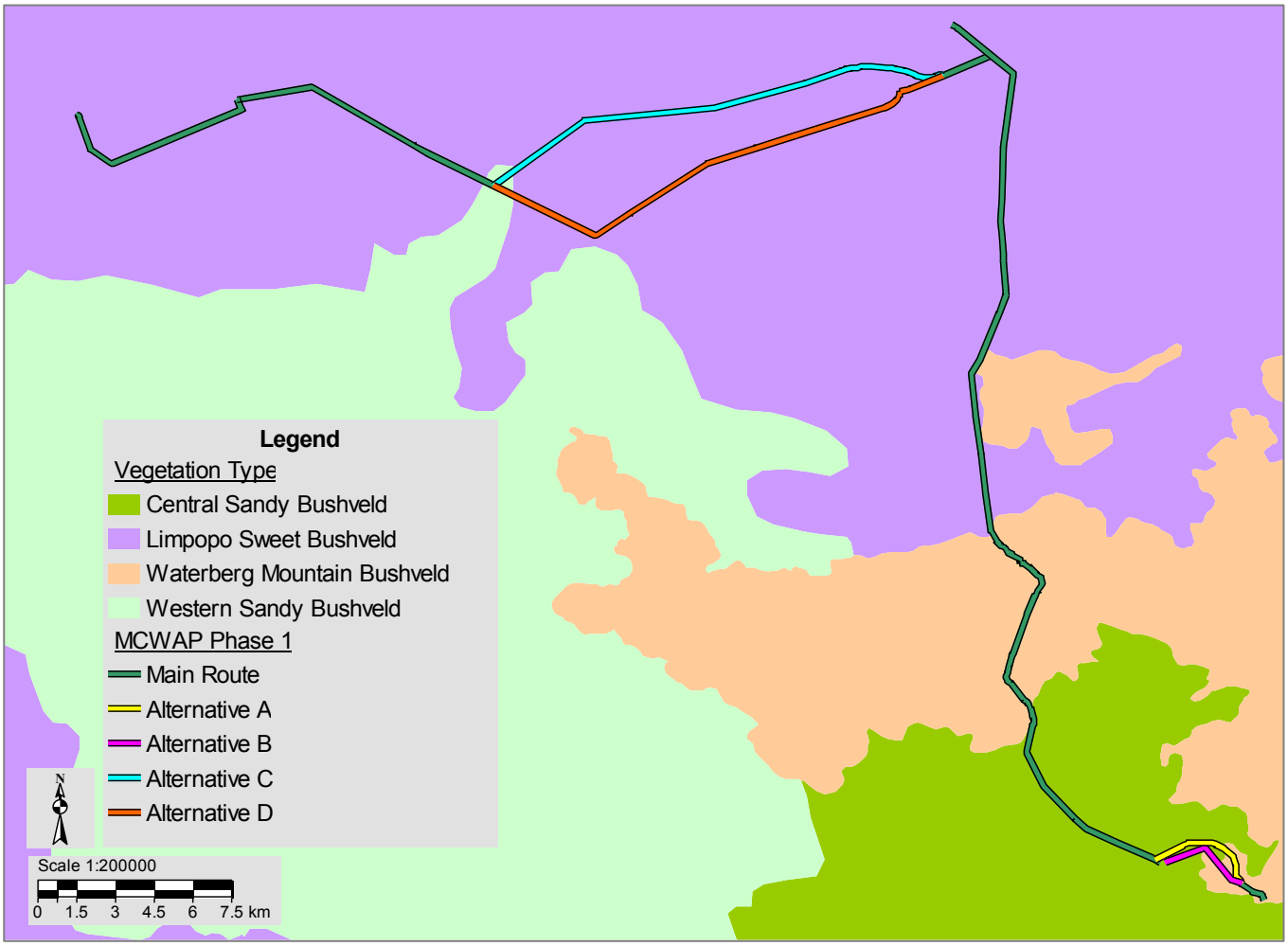



**Figure 37: Vegetation types along pipeline route**

Mucina & Rutherford (2006) explain the abovementioned vegetation types as follows:

- The **Limpopo Sweet Bushveld** (see **Figure 38**) occurs mainly on plains and sometimes undulating or irregular topographical area. The veld type is characterised by short open woodland with previously disturbed areas dominated by thickets of *Acacia erubescens*, *Acacia Mellifera* and *Dichrostachys cinerea* that are almost impenetrable. The veld type has no endemic taxa and is considered least threatened. Although only about 1% is statutorily conserved the abundance of game farms in the area adds to the low transformation figure of about 5%.

**Figure 38: Typical vegetation associated with Limpopo Sweet Bushveld alongside route**

- The **Waterberg Mountain Bushveld** (see **Figure 39**) generally occurs on rugged mountains with vegetation ranging from *Faurea seligna – Protea Caffra* bushveld on the higher slopes through broad leaved deciduous bushveld on rocky mid- and footslopes to *Burkea Africana – Terminalia sericea* savannah in the lower lying valleys as well as on deeper sands on the plateau. The grass layer is moderately developed or well developed. Endemic taxa to this veld type include tall shrub *Grewia rogersii, Pachystigma triflorum* and herb *Oxygonum dregeanum*. This veld type is regarded as least threatened with about 9% statutorily conserved. Only about 3% of the veld type is transformed.

**Figure 39: Typical vegetation associated with Waterberg Mountain Bushveld alongside route**

- The **Central Sandy Bushveld** (see **Figure 40**) exist in low undulating areas, sometimes between mountains, and sandy plains and catenas supporting tall, deciduous *Terminalia sericea* and *Burkea africana* woodland on deep sandy soil and low, broadleaved Combretum woodland on shallow, rocky or gravely soil. The most important taxa, endemic to this region are *Mosdenia leptostachys* and *Oxygonum dregeanum*. The veld type in general is classified a vulnerable and poorly protected with only approximately 4.5 % conserved. Approximately 24% of the veld type is transformed, including 19% agriculture and 5% urban and built up areas.

**Figure 40: Typical vegetation associated Central Sandy Bushveld alongside route**

- The **Western Sandy Bushveld** vegetation type varies from tall open woodland to low woodland with broad-leaved as well as microphylous tree species being dominant. Dominant species include *Acacia erubences* on the flatter areas, *Combretum apiculatum* on shallow gravely soils and *Terminalia sericea* on deep sandy areas. This vegetation type does not have any endemic species and is about 4% transformed.

Refer to **Section 8.1.1** for a synopsis of the Flora Assessment for MCWAP Phase 1 (Galago Environmental, 2010), as contained in **Appendix H1**. From this study an inventory of the plant species recorded in the study area is provided. Of the 201 plant species recorded on the pipeline route, 12 species were reported to have medicinal

properties. The diversity of alien species is low because of the natural condition of the vegetation. No Orange Listed or Red Data species were found on the study site. The study found that the vegetation along the Phase 1 route, outside the existing Exxaro pipe reserve, has a high conservation priority. Most of the areas adjacent to the pipeline zone are primary natural vegetation; consequently ample connectivity with natural vegetation exists. Protected trees occurring in the study area are *Acacia erioloba, Adansonia digitata, Boscia albitrunca, Combretum imberbe* and *Sclerocarya birrea* subsp. *africana.*

### *7.6.2 Riparian*

According to the River Health Programme (2006), the status of the riparian vegetation for the Mokolo River (downstream of Mokolo Dam) is fair and for the Rietspruit it is good. Dominant riparian species along the Mokolo River include the river bushwillow (*Combretum erythrophylum*), water berries (*Syzygium spp*.) and the sweet thorn (*Acacia karroo)*. Alien species encountered in the riparian area include the rattlebox (*Sesbania punicea)* and the syringa (*Melia azedarach)*.

The River Health Programme (2006) identified small populations of the highly invasive alien weed parrots feather (*Myriophyllum aquaticum*) in pools below Mokolo Dam, as well as within the dam itself.

## 7.7 Fauna

### *7.7.1 Terrestrial*

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. 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.

The riverine areas (see **Figure 41**) and ridges in the area are regarded as significant in terms of the habitat that they provide to fauna. Riparian zones also serves as important corridors to allow for animal migration.

**Figure 41: Dense riparian zone**

Refer to **Section 8.1** for a synopsis of the Mammal, Avifauna and Herpetofauna Habitat Assessment for MCWAP Phase 1 (Galago Environmental, 2010), as contained in **Appendix H1**. Key findings from these assessments follow:

- **Mammals:**
  - From a mammal habitat perspective, all four major habitats are present along the pipeline route, i.e. terrestrial, arboreal, moisture-dependent and rupiculous.
  - The ecological repair of the proposed development site is presently ecologically disturbed as result of the past installation of the existing Exxaro pipeline.
  - Most of the species of the resident diversity are common and widespread, although several rare and/or endangered species were recorded (observed or deduced to occur at least on some farms along the development site, or to be occasional visitors). Ten "Data Deficient", eight "Near Threatened", four "Vulnerable", two "Rare" and one "Endangered" species were listed.
- **Avifauna:**
  - Of the 337 bird species recorded for the 2327CB, 2327DA and 2327DC quarter degree grid cell, 314 (93.1%) are likely to occur on the proposed route and 100 (31.8%) of these bird species were actually observed on the study site.
  - The biodiversity indices indicate that the largest bird diversity is likely to occur within the river and riparian vegetation habitat system, followed by the woodland habitat and the cultivated fields and fallow lands.
  - Sensitive areas for the five Red Data species include the Rietspruit (Half-collared Kingfisher and White-backed Night-Heron) and Mokolo River

downstream of Mokolo Dam (African Finfoot, Yellow-billed Stork and Black Stork).

- **Herpetofauna:**
  - The herpetofauna mainly consists of widespread, common Bushveld species with slight variation due to the presence of sandy substrate, stony to rocky terrain, water, bush and trees. However, since the pipeline is proposed to run parallel to existing linear infrastructure along which the natural vegetation and fauna has been altered, the potential damage to the current herpetofauna is considered to be relatively low.

### *7.7.2 Aquatic*

It should be noted that sand mining is taking place in the lower sections of the Mokolo River around Lephalale, with associated impacts to the structure and function of the river and the overall aquatic health. According to the River Health Programme (RHP) (2006), the sand mining appears to be uncontrolled and needs to be more carefully regulated to minimise the negative impacts on the river system.

According to the RHP (2006), the status of the aquatic fauna (i.e. fish and macro-invertebrates) for the Mokolo River (downstream of Mokolo Dam) and Rietspruit is fair. The Mokolo Dam has a large population of two alien fish species, namely the largemouth bass (*Micropterus salmoides*) and the common carp (*Cyprinus carpio*).

**Table 17** contains a list of all the fish species historically recorded in the Mokolo catchments.

**Table 17: All fish species historically recorded in the Mokolo catchment (RHP, 2008)**

| Species | English Common Name |
|---|---|
| Amphilius uranoscopus | Common mountain catfish |
| Anguilla bengalensis labiata | African mottled eel |
| Anguilla mossambica | Longfin eel |
| Aplocheilichthys johnstoni | Johnston's topminnow |
| Barbus afrohamiltoni | Hamilton's barb |

| Species | English Common Name |
|---|---|
| Barbus annectens | Broadstriped barb |
| Barbus bifrenatus | Hyphen barb |
| Barbus brevipinnis | Shortfin barb |
| Barbus eutaenia | Orangefin barb |
| Barbus lineomaculatus | Line-spotted barb |
| Barbus marequensis | Largescale yellowfish |
| Barbus paludinosus | Straightfin barb |
| Barbus radiatus | Beira 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 |
| Petrocephalus wesselsi | Churchill |
| Pseudocrenilabrus philander | Southern mouthbrooder |
| Schilbe intermedius | Silver catfish |
| Synodontis zambezensis | Brown squeaker |
| Tilapia rendalli | Redbreast tilapia |
| Tilapia sparrmanii | Banded tilapia |

Indicator fish species of the Mokolo Catchment include the following (RHP, 2006):

- ***Red data species -***

  The only red data fish currently listed for the Mokolo Catchment is the shortfin barb (*Barbus brevipinnis*);

- ***Flow-dependant species -***

  In the Mokolo River, only three species of fish require permanent flow for all stages of their life cycle and all occur in the critical reaches of riffles and rapids, namely the common mountain catfish (*Amphilius uranoscopus*), the orangefin barb (*Barbus eutaenia*) and the shortspine suckermouth (*Chiloglanis pretoriae*).

- ***Migratory species***

  Two species of eel, the longfin eel and the african mottled eel (*Anguilla mossambica* and *Anguilla bengalensis labiata*) are known to have been widespread in the Mokolo Catchment but are now very scarce.

- ***Economically important indigenous species***

  All of the fish of the Mokolo River provide a recognised nutritional benefit to local communities and some have value for recreational fisherman. However, largescale yellowfish (*Labeobarbus marequensis*) as with all other yellowfish, is rapidly becoming recognised as a desirable sporting fish.

The Reserve for the Mokolo Catchment will include management objectives for *inter alia* the fish biodiversity of the Mokolo River.

## 7.8 Socio-Economic Aspects

Refer to **Section 8.5** for a synopsis of the Economic Impact Assessment (Conningarth, 2010), as contained in **Appendix H5**. This section contains an extract from this study regarding the study area's socio-economic environment.

### *7.8.1 Abbreviated Socio-Economic Profile*

The socio-economic profile of the Lephalale Local Municipality is provided in the table to follow.

**Table 18: Socio-economic profile of Lephalale Local Municipality (Conningarth, 2010)**

| Aspect | Categories | Number | % |
|---|---|---|---|
| Population | 2001 | 96 104 | |
| | 2004 | 97 640 | |
| | 2006 | 98 678 | |
| | 2010 | 100 787 | |
| | Annual % growth | 0.53% | |
| Citizenship | South Africa | 94 337 | 98% |
| | SADC Countries | 1 691 | 2% |

| Aspect | Categories | Number | % |
|---|---|---|---|
| Annual household income | No income | 5 081 | 18% |
| | R1 - R4 800 | 5 977 | 21% |
| | R4 801 - R 9 600 | 6 945 | 25% |
| | R9 601 - R 19 200 | 3 721 | 13% |
| | R19 201 - R 38 400 | 2 592 | 9% |
| | R38 401 - R 76 800 | 2 101 | 7% |
| | R76 801 - R153 600 | 1 136 | 4% |
| | R153601-R307200 | 478 | 2% |
| | R307201-R614400 | 126 | 0% |
| | R614401-R1228800 | 52 | 0% |
| | R1228801-R2457600 | 45 | 0% |
| | R2 457 601 , more | 17 | 0% |
| | Not Applicable | 30 | 0% |
| Employment status | Employed | 28 673 | 49% |
| | Unemployed | 5 273 | 9% |
| | Not Economically Active | 25 039 | 42% |
| Work type | Paid employee | 26 021 | 44% |
| | Paid family worker | 724 | 1% |
| | Self-employed | 1 239 | 2% |
| | Employer | 579 | 1% |
| | Unpaid worker | 110 | 0% |
| | Not applicable | 30 314 | 51% |
| Industry | Agric relate work | 9 488 | 33% |
| | Mining, Quarrying | 1 724 | 6% |
| | Manufacturing | 1 180 | 4% |
| | Electricity/gas/water | 735 | 3% |
| | Construction | 1 015 | 4% |
| | Wholesale/Retail | 2 367 | 8% |
| | Transport/Communication | 613 | 2% |
| | Business Services | 906 | 3% |
| | Community Services | 3 252 | 11% |
| | Private Household | 5 713 | 20% |
| | Undetermined | 1 677 | 6% |
| Spatial data | Area (square km) | 19 601.41 | |
| | Density | 5.14 | |

The 2010 population of the Lephalale Local Municipality is 100 787 with an anticipated growth of 0.53%, if the development does not take place. The annual household income of the majority of the people is between R4 801 - R 9 600 per annum which comprises 25% of the population and 5 081 which is 18%, have no income. The employment status reflects that 49% (28 673) are employed, 9% (5 273) are unemployed and 42% (25 039) are not economically active. The majority of the people employed in industry are employed in agriculturally related work.

The 2010 population of the Seleka Tribal Areas is 28 217 with an anticipated growth of 0.53%. The annual household income of the majority of the people is between R4 801 - R 9 600 per annum which comprises 27% of the population and 1 791 which is 24%, have no income. The employment status reflects that 48% (7 531) are employed, 9% (1 396) are unemployed and 43% (6 697) are not economically active. The majority of the people employed in industry are employed in agriculturally related work.

The 2010 population of Lephalale Town is 1 838 with an anticipated growth of 0.53% if the anticipated development projects do not materialise. The annual household income of the majority of the people is between R38 401 - R 76 800 per annum which comprises 24% of the population and 76 which is 8%, have no income. The employment status reflects that 71% (1 048) are employed, 5% (74) are unemployed and 24% (3 560) are not economically active. The majority of the people employed in industry are employed in the electric, gas and water sector.

Refer to **Figure 42**, which reflects the structure of Lephalale's local economy. The Lephalale Local Municipality is mainly a mining and industrial town. Its economy is dominated by electricity generation which currently contributes approximately 67% of the local gross domestic product with the trade and accommodation, mining and services sectors at 4%, 7% and 10% respectively. Due to the possible Sasol petro-chemical development the manufacturing sector will grow significantly. However, as far as the other economic sectors (excluding electricity and Sasol) are concerned, the growth will only occur as a result of their dependency on these anchor projects, namely electricity

and petro-chemicals. The more employment is created by the anchor projects, the larger the demand for trade, financial and business services will be (Conningarth, 2010).

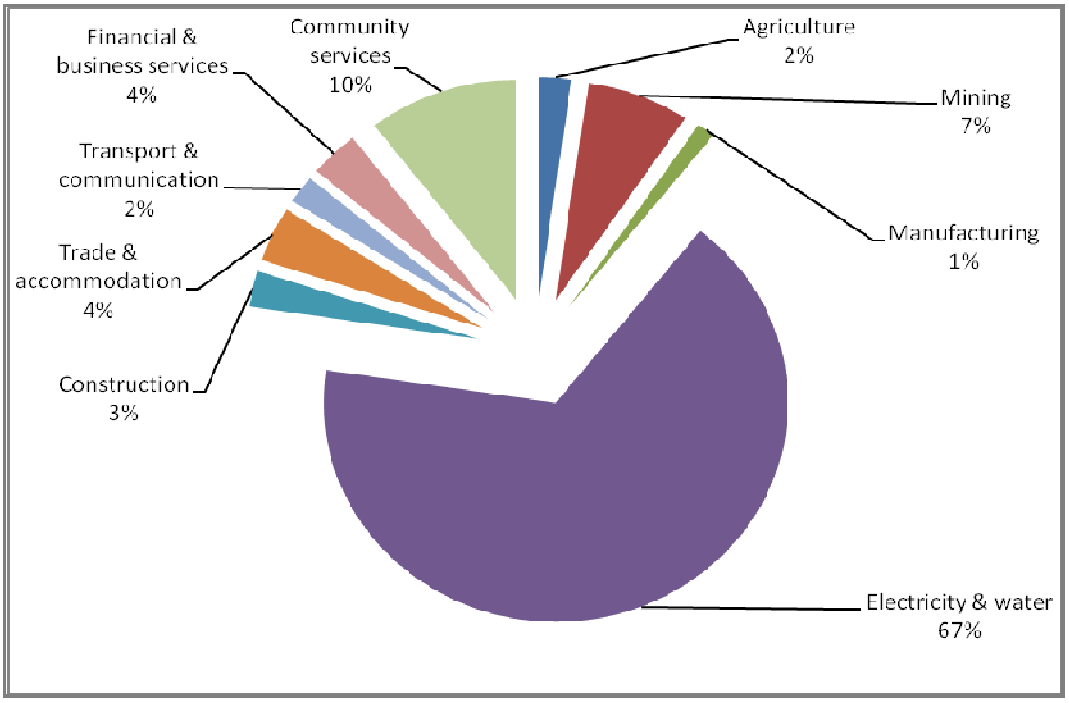



**Figure 42: Present Economic Activity in Lephalale (Conningarth, 2010)**

### *7.8.2 Expected Investments in Lephalale Area*

As mentioned, there are a number of planned and anticipated consequential developments in the Lephalale Municipality associated with the rich coal reserves in the Waterberg coal field. These developments include (amongst others) the development of additional power stations by Eskom, the potential development of coal to liquid facilities by Sasol and the associated growth in mining activities and residential development. According to Conningarth (2010), the economic impacts that could realistically be expected from these large capital investment projects in the mining, electricity generation and petro chemical sectors, will have a significant effect on Lephalale in the foreseeable future. An overview of these major investments, as extracted from Conningarth (2010), follows.

- **Power Generation:**
  - Matimba and Medupi -

  The existing Matimba power station is designed to generate 4 000 MW and is the largest direct dry-cooled power station in the world. Coal is supplied to Matimba by means of a conveyer belt system from the Grootegeluk mine. Eskom has already started constructing another new power station, namely Medupi. This power station is slightly bigger than Matimba and produces 4 800 MW. For purposes of reducing pollution, Medupi is equipped with the new Flue Gas Desulpherisation technology, whereas Matimba uses older technology. Important to note is that the Medupi mine's new technology carbon cleaning process uses much more water than the process used by Matimba.

  - Future -

  Additional to Matimba and Medupi three new Eskom power stations CF3, CF4 and CF5 are planned for the future as well as a further two by independent power producers envisaged by the private sector. According to available information these power stations will be slightly bigger than Medupi, but will use the same technology as Medupi.

- **Coal–to-Liquid Fuel Plants:**

  The Lephalale area was selected by Sasol to access the vast coal reserves in the Waterberg coal fields for its Maphuta coal-to-liquid fuel projects. According to information obtained the construction of two new Sasol coal-to-liquid fuel plants, Mafutha 1 and 2, are envisaged in the project area.

- **Mining:**

  Exxaro's Grootegeluk Colliery is currently the only commercial coal mining operation in the Waterberg Basin.

  - Current -

  At present annual production of Grootegeluk coal mine is 15.3 Mt/a. It is the largest open cast coal mine of its kind in the world. The mine is now being expanded to supply the new Medupi power station with coal.

  - Future -

Without the Matimba and other power stations to consume the high-ash coal, the Grootegeluk coal mine and envisaged other possible mines will not be economically viable. The low grade Waterberg coal with its high ash content and low yields is a significant stumbling block to further development from coal, other than power generation and coal-to-liquid fuel plants.

### *7.8.3 Projected Population Growth for Lephalale Municipality*

The graph below indicates the expected resultant population growth in the Lephalale Municipality if the anticipated development materialises (as projected).

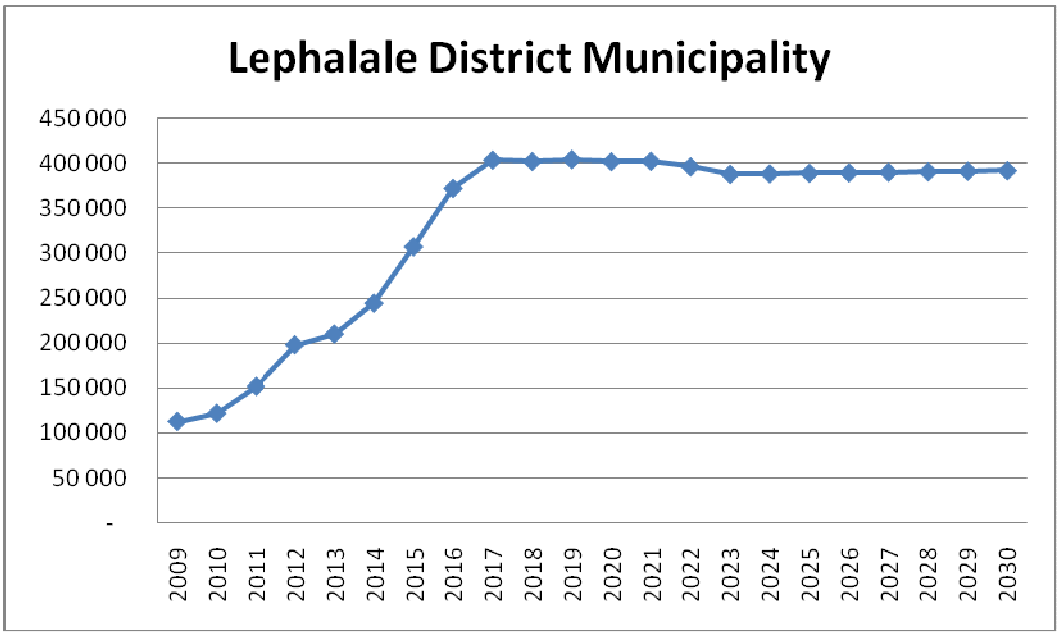



**Figure 43: Projected Population Growth for the Lephalale Municipality (Conningarth, 2010)**

From the preceding graph it is evident that a huge population growth is expected for Lephalale district. Currently the population is in the order of 110 000, including present construction workers, and will increase fourfold to just under 400 000 in a space of 20 years. This would put huge demands on the delivering of services by the municipality and as already stated this should be red flagged as a priority attention by the relevant government organisations involved.

## 7.9 Planning & Land Use

The population of Lephalale can be grouped according to the geographic area, with the majority residing in rural villages within the Lephalala River catchment, the urban population found in the Lephalale/Onverwacht/Marapong town between the Mokolo River and the coal mine, and the farming community living dispersed over the municipal area. This project serves the urban population and the industries that is / will be developed on farm land. It does not serve or affect the rural areas.

According to the SDF (Lephalale Local Municipality, 2006), the prevalent spatial pattern in the Lephalale Municipality can be attributed to historic policies and development initiatives, economic potential of land, land ownership and management, culture and topography. The proposed development in Lephalale is shown in the map contained in **Appendix I**, which forms part of the latest SDF that is still in draft format.

Most of the pipeline route passes privately owned land, which is mainly used for agricultural purposes comprising a mixture of cultivated lands, livestock farms and game farms, with the latter constituting the dominant land use type.

From the Mokolo Dam the proposed route predominantly follows the existing Exxaro pipeline until the Matimba off take, with sections of the route also running adjacent to other infrastructure such as roads and a powerline. Along the link to Steenbokpan, the pipeline again attempts to remain alongside existing infrastructure (i.e. roads and railway line) for large sections of the alternative routes.

A construction servitude (typically 40 m wide) will temporarily be required during the construction phase of the project. The permanent servitude will be dependent on future upgrading requirements, but will also typically be 40m wide. The existing servitude for the Exxaro pipeline will need to be widened to make provision for the MCWAP Phase 1 pipeline. The negotiations with the landowners for the registration of the servitude will be undertaken by TCTA, and the land rights acquisition strategy will adhere to all statutory requirements.

Services coordination and wayleave approvals will be undertaken with the relevant custodians of the infrastructure, which includes *inter alia* Eskom, Spoornet (apply for permission to use rail access road during construction and for future maintenance access to the pipeline and confirm future upgrade/electrification planning for the rail), National Roads Agency (apply for a concession to use road reserve as temporary construction servitude where pipeline is located parallel, and apply for access to pipeline servitude from road reserve), Limpopo Roads and Lephalale Municipality.

Permanent access along the pipeline servitude will be required after construction. An access road parallel to the pipeline will be provided within this servitude. Pipeline markers (concrete posts) will be installed at changes in direction and at regular intervals along the 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. Certain landowners have also requested that the servitude be fenced off. The restrictions associated with the utilisation of the servitude and the requirements of the landowners will be discussed during the necessary negotiations between TCTA and the directly affected landowners.

In Steenbokpan, the pipeline route travels through an area that belongs to the Phumolong Community Trust. A meeting was held with representatives from this trust, and it was confirmed that dwellings would not be affected by the pipeline, and that the area was used for grazing purposes.

## 7.10 Agricultural Potential

According to the Agricultural Geo-Referenced Information System (AGIS), the study area has a low agricultural potential. In general the Lephalale area is regarded as arid. Irrigation is hence limited to the Mokolo River area. A large portion of the project area consists of sandy soils, which drain rapidly due to poor water retention capability, and are thus associated with low agricultural potential.

The majority of the project area is characterised by game farms, with grazing land encountered along the gravity line (mostly in the Steenbokpan region).

Loss of agricultural land in the development footprint (i.e. extent of servitude) is not considered to be a significant impact at this stage, as the route predominantly remains alongside existing linear infrastructure. Agricultural activities will also be permitted within the servitude, under certain restrictions.

## 7.11 Air Quality

The air quality in the project area can be regarded as good, based on the non-obtrusive land use types (i.e. game farms) encountered within the vicinity of the pipeline route. Obvious sources of air quality pollution in the region include the following:

- Emissions from Matimba power station (stacks) and its associated ash dump (see **Figure 44**);
- Grootegeluk coal mining operations;
- Urban-related emissions from the town of Lephalale;
- Dust from agricultural lands, bare areas and use of dirt roads;
- Tailpipe emissions from vehicles travelling along the road network;
- Burning of mine waste dumps, as a result of spontaneous combustion (Golder Associates, 2009);
- Burning of wood and lower grade coal for household purposes in areas without electricity; and

- Veld fires.

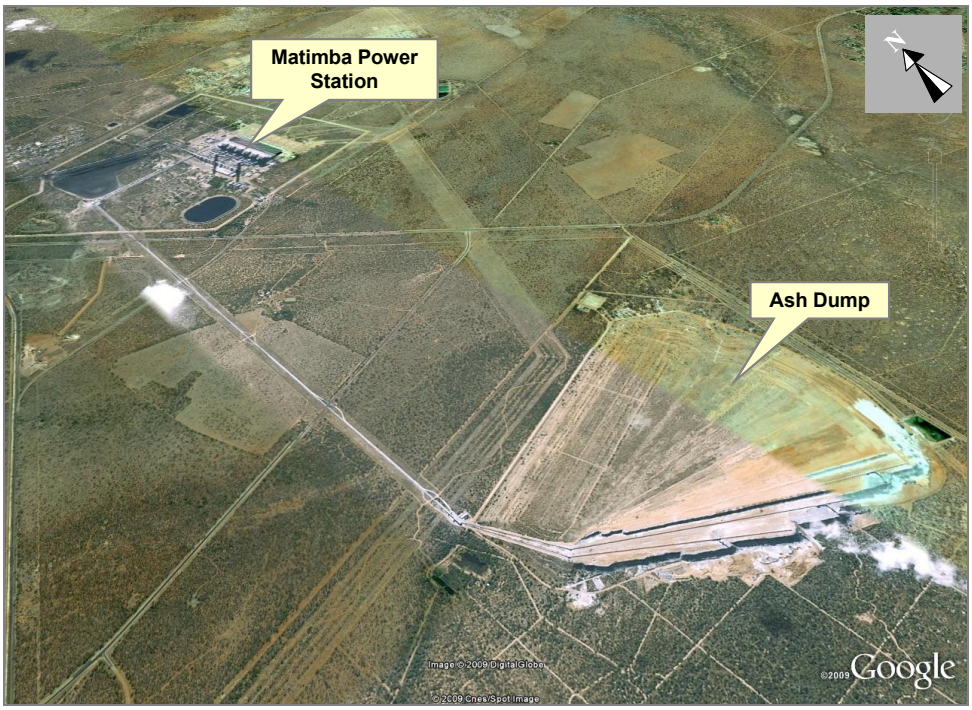



**Figure 44: North-eastern view of Matimba Power Station and ash dump**

No specialist air quality study was undertaken for MCWAP Phase 1, as it is not deemed necessary for the type of activities associated with this project. Mitigation measures are included in the Environmental Management Plan (EMP) to ensure that the air quality impacts during the construction phase (e.g. dust from use of dirt roads) are suitably managed.

## 7.12 Noise

Noise in the region emanates primarily from the following sources:

- Mining operations at the Grootegeluk Mine;
- Operations at the Matimba power station and ash dump;
- Farming operations (e.g. use of farming equipment);
- Vehicles on the road network; and
- Trains utilising the coal haul railway line.

The ridges in the south-eastern part of the route serve as noise attenuation features, although the ambient noise levels are insignificant on the surrounding area.

Noise that emanates from construction activities will be addressed through targeted best practices for noise management in the EMP. For the operational phase, measures will be implemented to attenuate noise from the new pump station at Mokolo Dam in order to remain within regulated standards. The pump station will be situated in the valley and the noise level from this pump station is not expected to be significant.

## 7.13 Archaeological and Cultural Features

The Waterberg is rich in cultural heritage, boasting a World Heritage Site. 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 brought cattle to the region. Later people left the first Stone Age artifacts recovered in northern South Africa. Starting about the year 1300 AD, Nguni settlers arrived with new technologies, emanating from the Iron Age.

A Phase 1 Heritage Impact Assessment, in accordance with the South African Heritage Resources Act (No. 25 of 1999), was conducted. Refer to **Section 8.4** for a synopsis of the Heritage Impact Assessment for MCWAP Phase 1 (Marais-Botes, 2010), as contained in **Appendix H4**. Along the Main Route alternative, identified heritage resources included a cemetery and farmhouse on the Farm Goedgedacht 602LQ, informal graves on the Farm Sterkfontein 642LQ, Hennie de Lange's Kafee Theunispan and Steenbokpan Bosveld Drankwinkel.

In order to reduce the impact to the environment, the pipeline route was selected to follow existing linear infrastructure. The potential for heritage resources along the existing Exxaro pipeline and other linear infrastructure is anticipated to be minimal due to the previous disturbances that would have been caused during the construction of this infrastructure.

## 7.14 Infrastructure and Services

### *7.14.1 Water*

**Lephalale Local Municipality**

According to Lephalale Local Municipality (2006), a very high percentage of communities in Limpopo Province are still below 50% of RDP standards in terms of water supply. In the Waterberg District Municipality, about 235 688 of people do not have access to water at least 98% of the time. On the other hand about 130 000 people still have to walk more than 200m to fetch water from the nearby water sources.

In Lephalale Municipality, one-third of households do not have access to water in the dwelling or yard, but have to make use of community standpipes. In Marapong, this figure is somewhat lower (15% of households make use of community standpipes), more than half of households have a tap in the yard, and one-third of households have access to water inside their dwelling. In Ward 3 and the town Lephalale, approximately 75% of households have access to water inside their dwelling, while 20% have a tap in the yard. The remainder makes use of community standpipes (Lephalale Local Municipality, 2006).

MCWAP Phase 1 proposes infrastructure for the bulk conveyance of water to the intended end users of bulk raw water in the greater Lephalale area. These users will need to provide their own storage and treatment facilities and delivery systems for the supplied raw water.

### *7.14.2 Sanitation*

In Lephalale Municipality, 20% of households have no access to sanitation services, 50% make use of pit latrines, while 30% have flush toilets. In Marapong and the town of Lephalale, virtually all households have flush toilets. In Ward 3, 85% of households have flush toilets, 5% make use of pit latrines, and slightly less than 10% have no access to sanitation services (Lephalale Local Municipality, 2006).

Sewage discharged from the Ellisras/Onverwacht area is treated at the Paarl Sewage Treatment Works. According to the Lephalale Local Municipality (2010), the Treatment

Works can currently treat 3, 25 Ml sewage per day and presently it has no spare capacity. The process to upgrade the works by 6 Ml per day had been initiated at the time of preparation of this report.

Suitable sanitation is to be provided on the construction site and at all areas where persons will be accommodated during the construction phase. Measures to ensure the provision of adequate sanitation must consider the possibility that the Paarl Sewage Treatment Works may not have been upgraded at the time of construction, where the necessary authorisation will be required for a portable sewage treatment works.

## 7.15 Transportation

The major transportation network in the region is shown in **Figure 45**.

The N1 and N11 national roads run well to the east of the project area. Provincial roads in Lephalale, which serve as links between Thabazimbi, Vaalwater, Ellisras and Mokopane include (Lephalale Local Municipality, 2007):

- 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.

Lephalale is also serviced with a north/south railway line, which transports coal from Grootgeluk Mine. An airport is situated in Lephalale and is maintained by the South African National Defence Force (SANDF) (Lephalale Local Municipality, 2007).

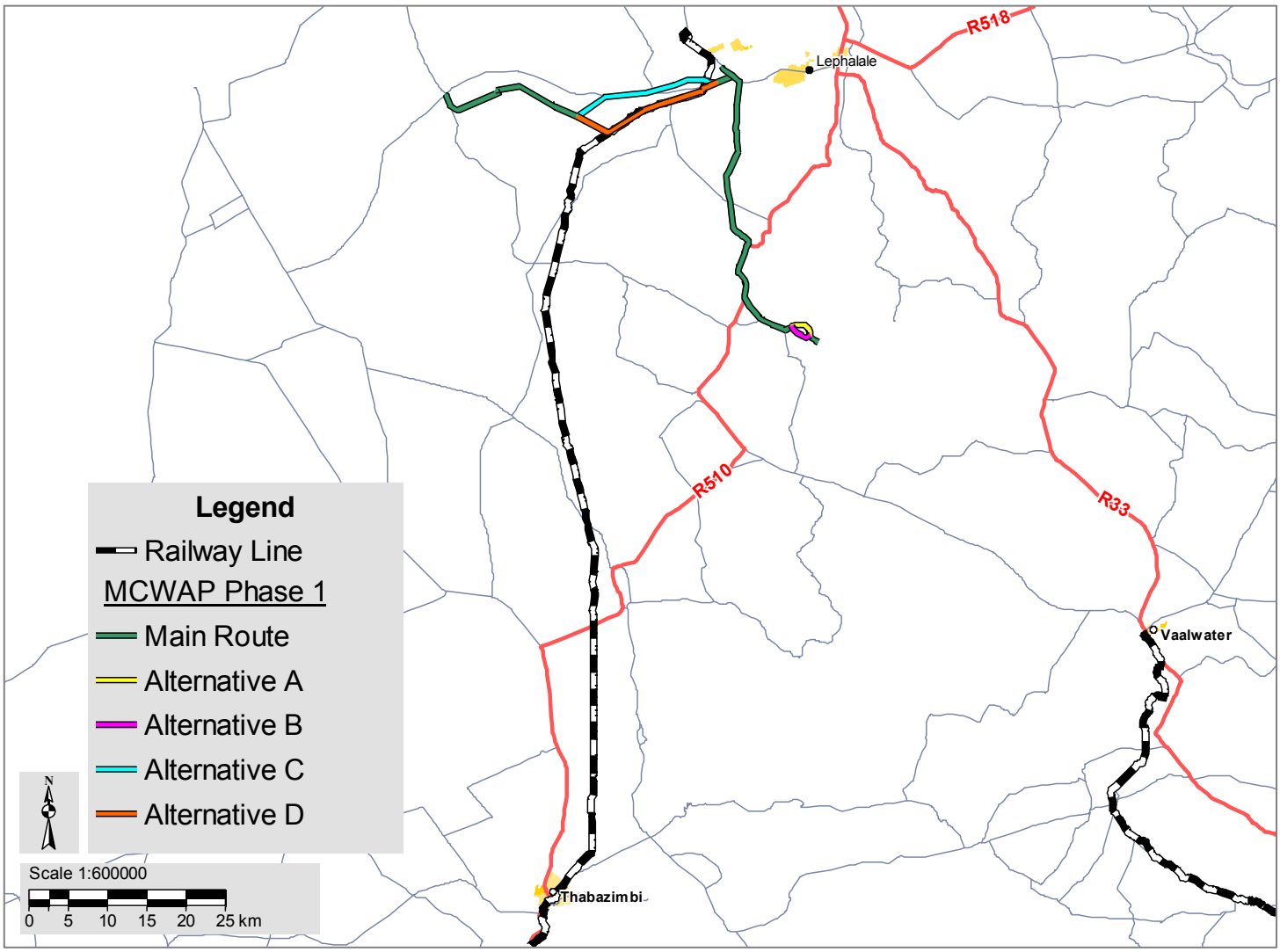



**Figure 45: Major Transportation Network in Region**

The proposed gravity main from Wolvenfontein balancing dams to Matimba take-off travels alongside the R510 (see **Figure 46**) for a distance of 6.8km (±). From Matimba, Alternative C follows the new Steenbokpan tar road that runs north of Medupi Power Station (south of coalfield). The pipeline also follows lower order roads for a large portion of the route. The alignment adjacent to existing linear infrastructure was

**Figure 46: North-westerly view of route along R510**

a decisive factor during the route selection process, as these sections were deemed to be environmentally less sensitive.

Care must be taken to minimise disturbance to the access road to Mokolo Dam, which serves as the only means to access the pump station at the dam.

Refer to **Section 8.3** for a synopsis of the Traffic Management Plan (Inroads, 2010), as contained in **Appendix H3**.

### *7.15.1 Electricity*

Electricity is largely generated and distributed by ESKOM. Sources of electricity and energy include:

- Grid electricity from Matimba power station, in Lephalale;
- Non-grid electricity (petrol and diesel generators); and
- Alternative sources of energy (e.g. batteries, paraffin, coal, wood, candles, gas)

In the municipality, the percentage of households using electricity for lighting = 68.2%, cooking = 35.1% and heating = 40.6 (Census 2001 - Statistics South Africa, 2008).

A new bulk power supply line as well as a new substation will be required to feed the new pump station at Mokolo Dam and to upgrade the supply to other users in the area. The environmental authorisation for the aforementioned infrastructure will be undertaken by Eskom.

## 7.16 Visual Quality

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 ridges along the south-eastern part of the pipeline route.

The aesthetic quality of the immediate area flanking the proposed route is partly degraded due to the existence of infrastructure such as roads, railway lines and the Exxaro pipeline.

Figure 47: Waterbody beside hill, on the Farm Fancy 556LQ

Refer to **Section 8.7** for a synopsis of the Visual Impact Assessment (VIA) for MCWAP Phase 1 (Axis Landscape Architecture, 2010), as contained in **Appendix H7**. The study focussed on two areas, namely the area covered by the alternative corridors from the Mokolo Dam towards the Wolvenfontein balancing dams and the proposed footprint of the BPR at Rietspruitnek. The VIA did not consider the remainder of the project area, as the pipeline will be underground, it follows existing linear infrastructure, and mitigation measures to manage impacts to the aesthetic quality as well as rehabilitation measures for the affected area are included the EMP.

## 7.17 Tourism

Tourism is a key economic sector within Lephalale as well as the Limpopo Province. An abundance of tourism activities are available in Lephalale, including hunting, bird watching, fishing, horse riding, hiking, etc.

The main tourism attractions in Lephapale include the following (Lephalale Local Municipality, 2007):

- A sporting centre (Lephalale town);
- An events venue (Lephalale town);
- Game watching -
    - D'Nyala Nature Reserve;
    - Ferroland Private Game Reserve;
    - Mokolo Dam Nature Reserve and adjoining areas;
    - Lapalala Wilderness and adjoining areas;

- Marakele National Park, Welgevonden Game Reserve and adjoining areas; and
- Wonderkop Reserve and adjoining areas.

There has been a large-scale shift from cattle farming to ecotourism-based land use and hunting in the Lephalale area, with numerous lodges, chalets and other forms of bush-accommodation also available.

The Mokolo Dam basin and surrounding land was proclaimed as a provincial nature reserve in 1993, and covers an area of 4 600Ha (including the dam surface area). The dam is characterised by dense wooded mountains and surrounding cliffs. The mountains mainly comprise of sandstone. The reserve plays an important role in providing outdoor recreation, including both land and water orientated activities.

The Mokolo Dam lies within the core area within the Waterberg Biosphere Reserve (see **Figure 48**). 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 Programme. Biosphere Reserves are protected areas and they promote and demonstrate a balanced relationship between people and nature. The Waterberg Biosphere Reserve stretches from Marakele National Park in the south west to Wonderkop nature reserve in the north east the small town of Vaalwater borders on the reserve.

No national game parks are directly affected by the MCWAP Phase 1 infrastructure. Indirect impacts to game reserves from the project include the following:

- Visual impacts from construction along roads (e.g. R510);
- Use of surrounding road network by construction and delivery vehicles, which are also used by visitors to the reserves.

With the Mokolo Dam basin situated in the core zone of the Waterberg Biosphere, provision will need to be made in the EMP for any specific requirements and conditions from the Waterberg Biosphere Reserve Management Committee and UNESCO.

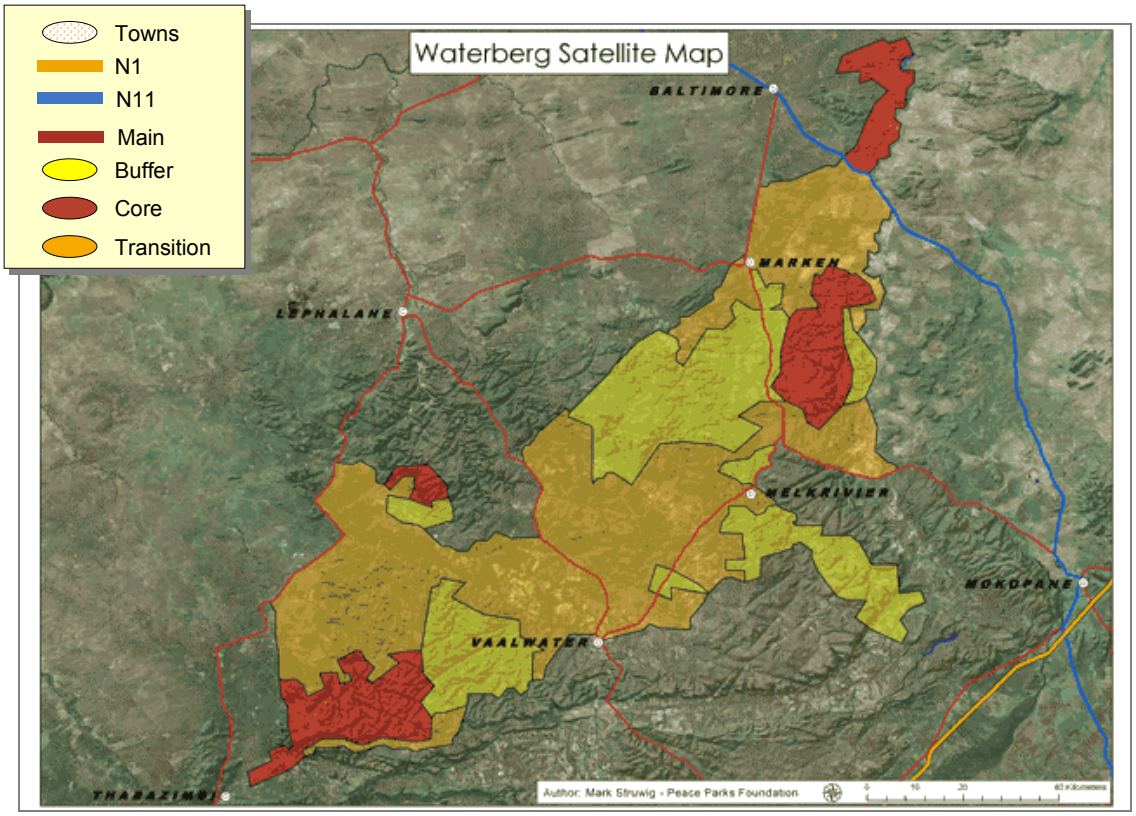



**Figure 48: Waterberg Biosphere Reserve (*source: www.waterbergbiosphere.org*)**

Through public participation, the chairmen of the Waterberg Biosphere Reserve and Waterberg Nature Conservancy were notified about the proposed project.

# 8 SUMMARY OF SPECIALIST STUDIES

A crucial element of the Plan of Study for the EIA prepared during the Scoping phase was to provide the Terms of Reference for the requisite specialist studies triggered during Scoping. 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 necessary specialist studies triggered by the findings of the MCWAP Phase 1 Scoping process, aimed at addressing the identified key issues and compliance with legal obligations, include:

- Ecological Study – Terrestrial;
- Ecological Study – Aquatic;
- Traffic Management Plan;
- Heritage Impact Assessment;
- Socio-Economic Study;
- Social Impact Assessment; and
- Visual Impact Assessment.

For the inclusion of the findings of the specialist studies into the EIA report, the following guideline was used: *Guideline for the review of specialist input in EIA processes* (Keatimilwe & Ashton, 2005). Key considerations included:

- Ensuring that the specialists have adequately addressed I&APs' issues;
- 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.

The specialist studies were used to complete the description of the receiving environment (**Section 7**) in a more detailed and site-specific manner. Section **9** provides a comparative analysis of the alternative MCWAP Phase 1 alignments, which includes evaluations by the respective specialists and **Section 10** discusses the potential impacts

to the environmental features, taking into consideration the findings and recommendations of the specialists.

A synopsis of each specialist study follows below.

## 8.1 Ecological Study – Terrestrial

Details of the nominated specialist follow:

| Specialist | | | | |
|---|---|---|---|---|
| **Organisation:** | Galago Environmental | | | |
| **Name:** | Vanessa Marais | Dr. J.V. Van Greuning | Dr. I.L. Rautenbach | Mr. W.D. Haacke |
| **Discipline:** | • Coordinator<br>• Environmental Impacts | Flora | • Mammalogy<br>• zoological review | Herpetology |
| **Qualifications:** | BL Landscape Architecture | Pri. Sci. Nat: D.Sc | Pri.Sci. Nat Ph.D, T.H.E.D. | Pri. Sci. Nat: M.Sc |
| **No. of years experience:** | 16 | 40 | 45 | 50 |

### *8.1.1 Flora*

This section provides a synopsis of the Flora Assessment for MCWAP Phase 1, as undertaken by Galago Environmental (2010), which is contained in **Appendix H1**.

An inventory of the plant species recorded in the study area is provided. Of the 201 plant species recorded on the pipeline route, 12 species were reported to have medicinal properties. The diversity of alien species is low because of the natural condition of the vegetation. No Orange Listed or Red Data species were found on the study site.

An overview of the vegetation types follows:

- **Limpopo Sweet Bushveld -** Except for the zone running through the town of Steenbokpan and the developed areas near Lephalale, the vegetation along the pipeline route can be regarded as sensitive and has a high conservation value. The occurrence of protected trees such as *Sclerocarya birrea* is of importance. Two baobab trees occur near Medupi, in proximity to alignment Alternative C.

- **Waterberg Mountain Bushveld** - The zone along the existing pipeline is already transformed; therefore it is not sensitive.
- **Central Sandy Bushveld** - The vegetation along this intended pipe route is natural primary savannah and regarded ecologically sensitive. The rare species *Euphorbia waterbergensis* and *Euphorbia tortirama* were reported to occur in this area but were not found.

Although the vegetation map of Mucina and Rutherford (2006) also shows a very small section of Western Sandy Bushveld along the pipeline route, refining the vegetation through detailed surveys could not distinguish between Western Sandy Bushveld and Limpopo Sweet Bushveld and the area was therefore classified as Limpopo Sweet Bushveld.

In general, the vegetation along the Phase 1 route, outside the existing Exxaro pipe reserve, has a high conservation priority. Most of the areas adjacent to the pipeline zone are primary natural vegetation; consequently ample connectivity with natural vegetation exists. Protected trees occurring in the study area are *Acacia erioloba, Adansonia digitata, Boscia albitrunca, Combretum imberbe* and *Sclerocarya birrea* subsp. *africana.*

In terms of the pipeline route options, Alternatives B (prevents impacts to two sensitive *Euphorbia* species in the kloofs from falling rocks and disturbance to sensitive fauna species within the Waterberg Biosphere) and C (south of the new road around the Medupi power station in the already degraded area) are preferred.

### *8.1.2 Mammalogy*

This section provides a synopsis of the Mammal Habitat Assessment for MCWAP Phase 1, as undertaken by Galago Environmental (2010), which is contained in **Appendix H1**.

Criteria used to gauge the probability of occurrence of mammals on the study site included known distribution range, habitat preference and the qualitative and quantitative presence of suitable habitat.

From a mammal habitat perspective, all four major habitats are present along the pipeline route, i.e. terrestrial, arboreal, moisture-dependent and rupiculous. The latter is restricted to the servitude route passing through the Waterberg outlier between the Mokolo Dam and Lephalele.

The ecological repair of all four major mammal habitat types immediately adjacent to the proposed development site vary from good to pristine. It should be emphasized that the ecological repair of the existing Exxaro pipeline reserve is presently ecologically disturbed as a result of the past installation of the existing pipe line, consisting mostly of the disturbed grassland as well as main roads or access roads.

The mammal richness of the area is inordinately high. This can be ascribed to the extensive area through which the pipeline will traverse, the ecological complexity of the area, and the aggressive conservation measures applied on game-fenced farms with proper management.

An inventory of the mammals which were observed or deduced to occur at least on some farms along the development site, or to be occasional visitors, is provided. Most of the species of the resident diversity are common and widespread, although several rare and/or endangered species were recorded. Ten “Data Deficient”, eight “Near Threatened”, four “Vulnerable”, two “Rare” and one “Endangered” species were listed.

It is most likely that adjacent to the existing route an additional narrow strip of natural bushveld will be used for the new pipeline and converted into grassland eventually supporting pioneer vegetation; but this is preferable to an independent route through pristine veld.

In terms of the pipeline route options, Alternatives B (as opposed to Alternative A which may cause large quantities of rocks and debris to roll down the slopes during excavation and blasting) and C (south of the new road around the Medupi power station in the already degraded area) are preferred.

### *8.1.3 Avifauna*

This section provides a synopsis of the Avifauna Habitat Assessment for MCWAP Phase 1, as undertaken by Galago Environmental (2010), which is contained in **Appendix H1**.

Criteria used to assess the probability of occurrence of Red Data and other bird species on the study site included known distribution range, habitat preference and the presence of suitable habitat on site, including the presence of food.

Within the vegetation types found along the proposed pipeline route, three major bird habitat systems were identified, namely:

1. **River and riparian vegetation -**
   The Mokolo River and Rietspruit are sensitive habitats for bird species that depend on them for food, water and breeding purposes. The dominant vegetation within the riparian zone includes/consists of large *Acacia* and broadleaved trees, which grow taller due to the availability of water when compared to trees further away from the river. This riparian vegetation will favour bird species typically associated with a bushveld habitat. These include a great variety of arboreal passerines.
2. **Broadleaved woodland and Rocky ridges -**
   The longest stretch of the proposed pipeline route will run through and along areas with woodland habitat, which varies between broadleaved woodland, mixed *Acacia* and broadleaved woodland, *Acacia*-dominated woodland, and open woodland with small scattered *Acacia* trees. The bird species within this habitat generally include a great variety of arboreal passerines as well as arboreal non-passerines. 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.
3. **Cultivated fields and pastures -**
   The proposed pipeline route will run past areas that consist of recovering cultivated fields, now overgrown by grasses and encroached by small thorn trees, resembling arid thornveld.

An inventory of the avifauna anticipated to occur in the study area is provided. Of the 337 bird species recorded for the 2327CB, 2327DA and 2327DC quarter degree grid cell, 314 (93.1%) are likely to occur on the proposed route and 100 (31.8%) of these bird species were actually observed on the study site.

The biodiversity indices indicate that the largest bird diversity is likely to occur within the river and riparian vegetation habitat system, followed by the woodland habitat and the cultivated fields and fallow lands.

A total of 18 Red Data bird species have been recorded within the 2327CB, 2327DA and 2327DC quarter degree grid cell. One, the Red-billed Oxpecker, was observed on and surrounding the study site during the time of the survey. The Half-collared Kingfisher, Kori Bustard, African Finfoot, Black-winged Pratincole, Cape Vulture, Tawny Eagle and Martial Eagle indicate a high reporting rate for one or more of the quarter degree grid cell, White-backed Vulture, Secretarybird, Lesser Flamingo and Yellow-billed Stork indicate a medium reporting rate, Lappet-faced Vulture, Bateleur, White-backed Night Heron, Greater Flamingo and Black Stork a low reporting rate and Marabou Stork and Red-billed Oxpecker a very low reporting rate.

Sensitive areas for the five Red Data species include:

- Mokolo River and Rietspruit – Half-collared Kingfisher and White-backed Night-Heron (refer to **Figure 49**); and
- Mokolo River (downstream of Mokolo Dam) – African Finfoot, Yellow-billed Stork and Black Stork.

Apart from the river and riparian vegetation, the proposed pipeline route will only have a negative impact during the construction phase where it will cut through the woodland habitat system areas and, in many sections, follow an existing pipeline. After the pipeline is covered and rehabilitated correctly, the bird species mostly depending on grassland habitat will return to the area. Bird species that depend on woodland habitat will overfly the pipeline section which is rehabilitated to grassland.

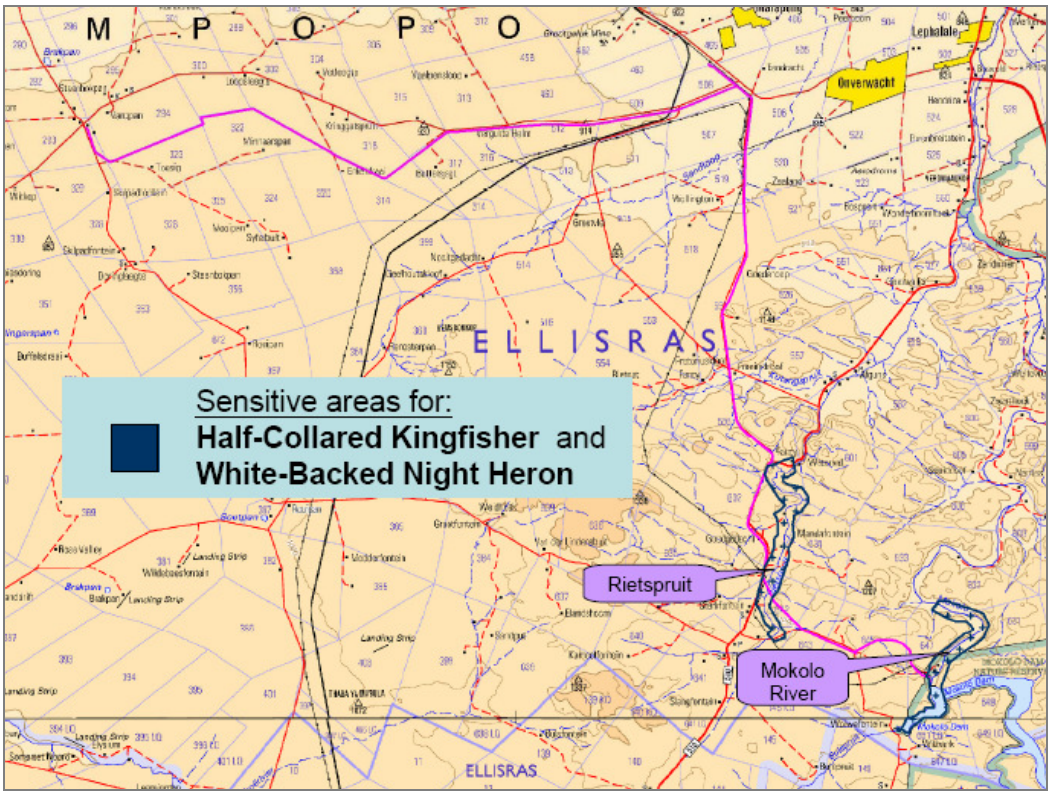



**Figure 49: Map of avifauna sensitivity (Galago Environmental, 2010)**

In terms of the pipeline route options, Alternatives B and C (south of the new road around the Medupi power station) are preferred.

### *8.1.4 Herpetology*

This section provides a synopsis of the Herpetofauna Habitat Assessment for MCWAP Phase 1, as undertaken by Galago Environmental (2010), which is contained in **Appendix H1**.

As the majority of reptiles and amphibians are secretive, nocturnal and/or poikilothermic or seasonal, distributional ranges and the presence of suitable habitats were used to deduce the presence or absence of these species based on authoritative tomes, scientific literature, field guides, atlases and databases.

An inventory of the reptiles and amphibians that could occur on the site is provided. In general, the habitat types through which the proposed pipelines are to be constructed are very 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, bush and trees. However, since the pipeline is proposed to run parallel to existing power and pipelines, or road servitudes along which the natural vegetation and fauna has been altered, the potential damage to the current herpetofauna is considered to be relatively low. As these strips are narrow, re-colonisation by suitable species will take place in the altered habitat.

The presence of crocodiles in the Mokolo Dam as well as the river below the dam wall was reported. Each larger pool is reported to have a large, resident, territorial individual. Crocodiles are a protected species and the abstraction of water from the dam and river must therefore ensure that enough water is released for the ecological Reserve to ensure the continued existence of the crocodiles.

In terms of the pipeline route options, Alternatives B and C (south of the new road around the Medupi power station) are preferred.

## 8.2 Ecological Study – Aquatic

This section provides a synopsis of the Wetlands and Watercourse Crossings Survey for MCWAP Phase 1, as undertaken by Enviross (2010), which is contained in **Appendix H2**.

Details of the nominated specialist follow:

| Specialist | |
|---|---|
| **Organisation:** | Enviross Environmental Impact Studies CC |
| **Name:** | Mathew James Ross |
| **Qualifications:** | M.Sc – Aquatic Health (UJ).<br>Presently completing a PhD – Aquatic Health (UJ). |
| **No. of years experience:** | 6 |
| **Affiliation (if applicable):** | • South African Society for Aquatic Scientists (SASAqS)<br>• Aquatox Forum (Environmentek, CSIR) |

### *8.2.1 Methods of Investigation*

**Wetlands**

The wetland delineation assessment included review of topographical maps and aerial photographs and an 'on-site' evaluation of the wetland condition and associated vegetation structure condition. This included the general aquatic ecological integrity of the wetland itself as well as the identification of any sensitive biota that are potentially dependant on the wetland (if applicable). The wetland delineation procedure was undertaken in accordance with the following guideline: *A practical field procedure for identification and delineation of wetlands and riparian areas* (DWAF, 2005).

**Watercourse Crossings**

All watercourse crossings for the Phase 1 pipeline that were indicated on the 1:50 000 topographical maps were examined during the field assessment. Observations and site photographs were taken to evaluate the potential overall impacts of the proposed pipeline crossing at each point.

### *8.2.2 Results & Discussions*

The watercourse crossings for the proposed Phase 1 pipeline were categorised according to the habitat unit that they were associated with. These included:

- Drainage lines;
- Perennial and non-perennial streams;
- Pan wetlands; and
- Wetland crossings.

**Drainage lines**

The majority of the water crossings pertaining to Phase 1 of the MCWAP pipeline comprised of drainage lines emanating from nearby hills and mountains. The vast majority of these drainage lines were observed to be merely drainage channels that carried surface water runoff during rainfall events and did not represent any established aquatic or wetland systems. Where the proposed pipeline alignment follows alongside a roadway, the majority of these drainage channels occur as culvert drains that merely

allow for free drainage within the road reserve and do not represent ecologically sensitive habitats.

Impacts emanating from the proposed pipeline crossings at these points will be limited to the potential creation and aggravation of existing soil erosion. Disturbances of the rock and soil layers, together with vegetation stripping will lead to the occurrence of soil erosion and aggravate existing soil erosion potential within the area.

**Perennial and non-perennial streams**

The only perennial streams associated with the Phase 1 pipeline include the Rietspruit complex within the southern area of the proposed pipeline alignment.

There was a mountain stream that was identified on the *Farm Witbank 647LQ* that flows for the majority of the year, only drying up for short periods during the dry season. This is therefore a semi-permanent system and cannot be regarded as a strictly perennial stream. The stream does, however, support an ecologically significant kloof habitat unit downstream that has been reported to incorporate plant species of conservational significance. The preservation of the ecological integrity and functionality of this steam is therefore imperative to conserving the habitat downstream of the proposed crossing site. The proposed crossing point also coincides with an existing powerline servitude and is considered as the ideal crossing point.

**Pan wetlands**

There was only one pan wetland that was identified that could potentially be impacted by the proposed alignment of the Phase 1 pipeline. This was identified on the *Farm Zandbult 300LQ* using the 1:50 000 topographical maps of the area. Upon closer inspection, it was found that the boundaries of this wetland occur a distance from the proposed pipeline route and will therefore not be impacted if the present proposed pipeline route is followed.

**Wetland crossings**

The wetland on the *Farm Fancy 556LQ* (refer to **Figure 50**) was part of an unchannelled valley-bottomed wetland that formed part of the feeder headwaters of the nearby Kutangspruit, which flowed into the Rietspruit located further to the northeast. This was a temporary wetland area that was fed through lateral seepage zones as well as surface water drainage during rainfall events. The outer edges of this wetland were delineated and a 50m conservation buffer designated to it. It was not regarded as an ecologically sensitive wetland; however, excavation through the wetland should be undertaken in an ecologically sensitive manner. Soil erosion, once again, is thought to be the greatest potential impact emanating from the pipeline excavations and incorrect soil reinstatement following the construction phase.

On the Farm Goedgedacht 602LQ (refer to **Figure 51**) the two converging streams that flow from the west form part of the Rietspruit and join this river within close proximity to the R510. The site is located high up in the catchment, and, together with the topography of the area, hillside seepage wetlands were expected to be relatively common. The streams were found to be supplemented by an extensive seepage zone. The position in the catchment meant that these streams and wetlands had retained good water quality. The streams and associated flood zones were generally dominated by reeds (*Phragmites* sp.), sedge and grass species. The channels were generally inundated with vegetation due to the small volume of water within the channel as well as the general lack of floodwaters. The slow-flowing water and high degree of vegetation cover has allowed for a system that supports and exceptionally high diversity and density of various frog species. This also is attributed to the good water quality of the system.

On the Farm Sterkfontein 642LQ (refer to **Figure 52**) the proposed pipeline alignment traverses a dam that has been constructed along the main stem of the Rietspruit. There was a high degree of water lilies (*Nymphaea mexicana*) – an exotic species that could become problematic if allowed to escape into natural watercourses. The Rietspruit was found to have a good Present Ecological State and therefore it is recommended that the

pipeline crossing point be undertaken at a point of the least ecological impact, which would be the existing Exxaro pipeline crossing downstream of the dam wall.

The stream on the Farm Toulon 643LQ (refer to **Figure 53**) are fed by lateral seepage zones (evident by the high inclusion of iron oxide precipitates within the water). These streams have a very small catchment area and therefore do not readily flood during rainfall events. Therefore vegetation is allowed to inundate the watercourse, providing important habitat for (especially) numerous frog species. This section of the proposed pipeline route is a cattle farm and the cattle have had a moderate impact on the ecological integrity of the streams.

**General Conclusions & Recommendations**

The alignment alternative B (on the farms *Witbank 647LQ* and *Wolvenfontein 645LQ*) is considered the best alignment option from an aquatic ecological perspective. It is also recommended that a bridge structure be built to accommodate the river crossing at this point to limit the disturbance of the riverbed as far as possible. If the aforementioned recommendations are not technically feasible, certain environmental objectives are provided in terms of erosion protection, reinstatement of the watercourse's structure and pollution prevention.

The persistence of the wetlands within the area is reliant on the retention of the correct soil layers. Excavations and the subsequent disturbances of the natural soil stratification will affect the natural hydrology of the wetlands and therefore impact on the overall ecological integrity of these wetlands. Correct reinstatement of these soil layers is therefore absolutely imperative to retention of the wetland ecosystem functionality.

General mitigation measures which are applicable to all wetland areas are provided.

The study did not allocate preference between Alternatives C and D from an aquatic conservation perspective.

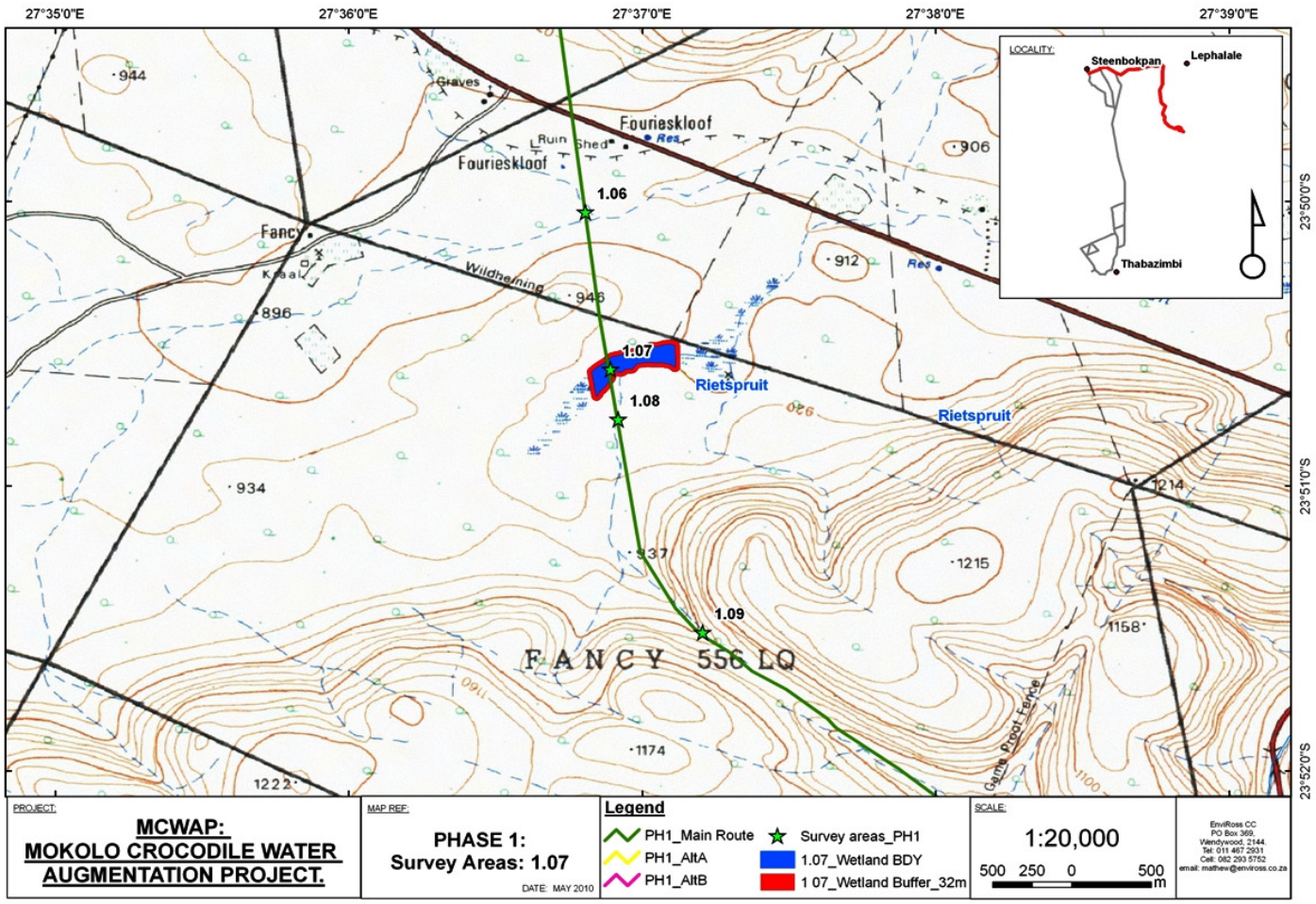



**Figure 50: Extent of wetlands, associated buffer zone and interaction with the proposed pipeline alignment route - Fancy 556LQ (Enviross, 2010)**

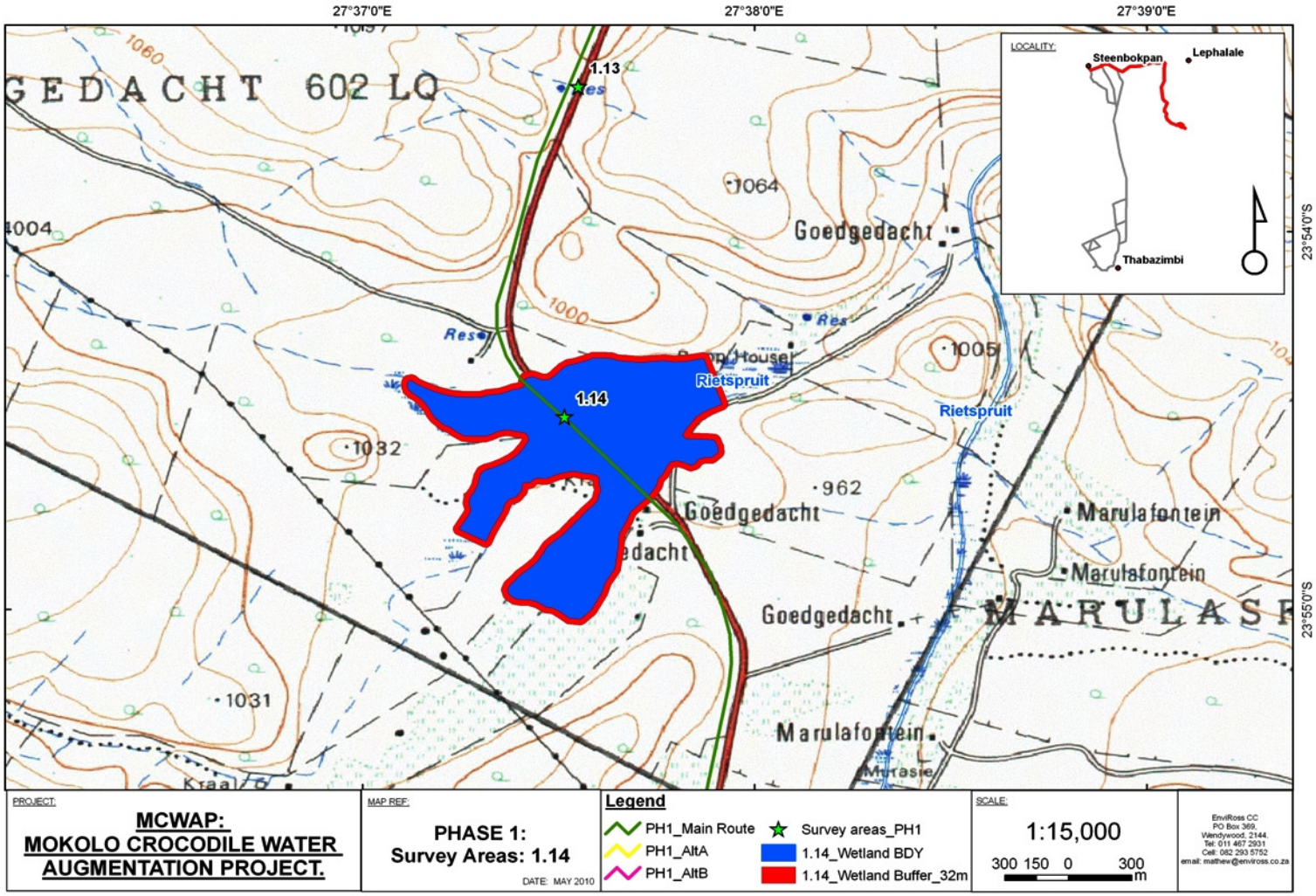



**Figure 51: Extent of wetland and associated buffer zone - Goedgedacht 602LQ (Enviross, 2009)**

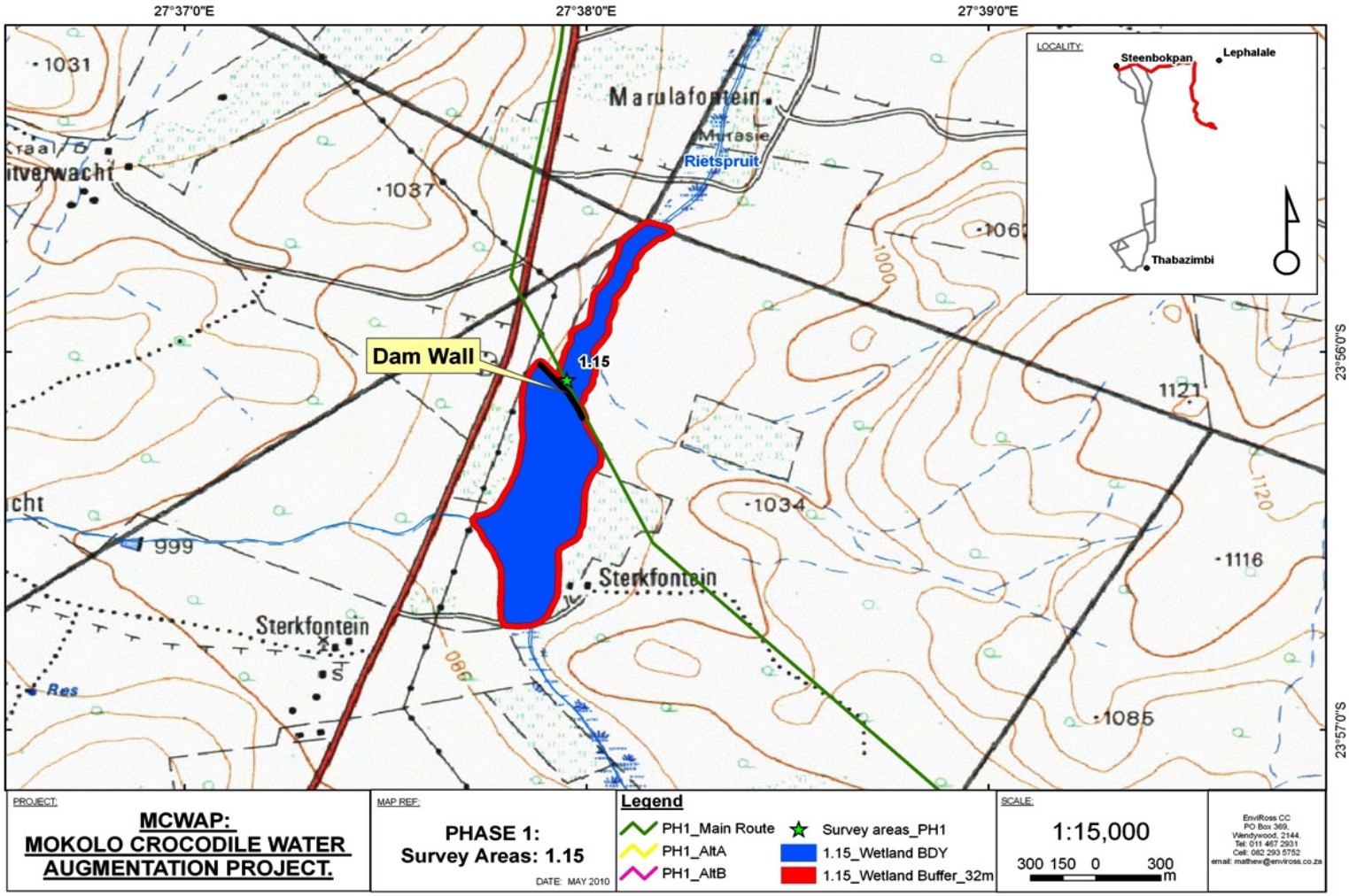



**Figure 52: Extent of the wetland and associated buffer zone - Sterkfontein 642LQ (Enviross, 2009)**

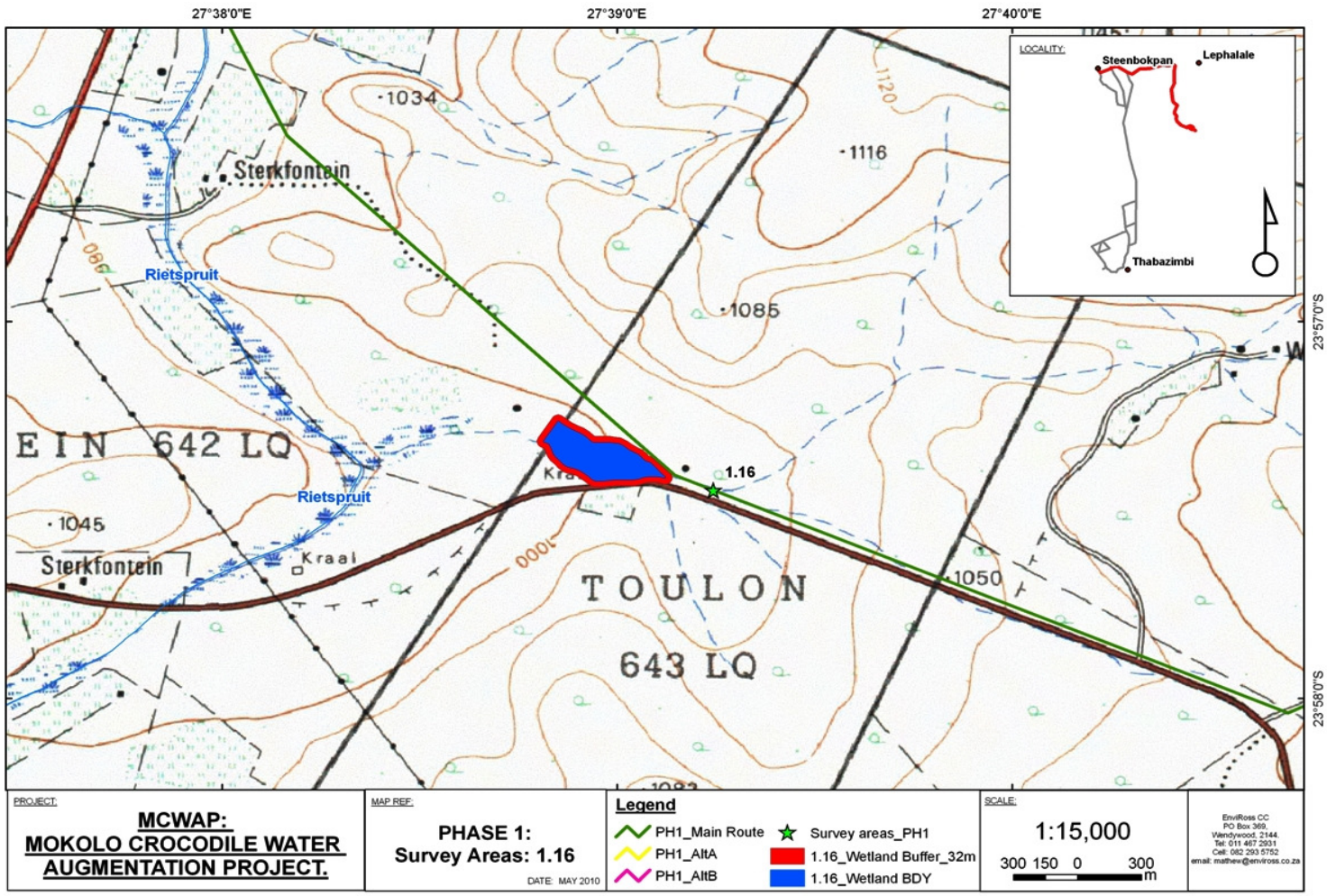



**Figure 53: Extent of the wetland and associated buffer zone - Toulon 643LQ (Enviross, 2009)**

## 8.3 Traffic Management Plan

This section provides a synopsis of the Traffic Management Plan for MCWAP Phase 1 (Kitso Engineers, 2010), as contained in **Appendix H3**.

Note that Kitso Engineers replaced Inroads Consulting, which is reflected in the Amended Plan of Study for MCWAP Phase 1 EIA (**Appendix A**) as the nominated specialist for the Traffic Management Plan.

Details of the nominated specialist follow:

| Specialist | |
|---|---|
| **Organisation:** | Kitso Engineers |
| **Name:** | Pule Khudunyane |
| **Qualifications:** | B.Sc. (Hons) Applied Science (Transportation Planning) |
| **No. of years experience:** | 7 years |
| **Affiliation (if applicable):** | • Engineering Council of South Africa<br>• South African Institution of Civil Engineering |

The alignment along existing road infrastructure was an influential factor in the route selection process, as these sections would be less environmentally sensitive due to the environment already being disturbed. This proposed route alignment therefore enjoys good accessibility from the existing road network.

Best practices in the high-level Traffic Management Plan include the following:

- **Warning Area**

  This is the area of the construction works that is used to alert motorists of impending temporary conditions that will require particular care. A stepped reduction in speed will inevitably be required within this area. This stepped reduction should occur to 20 km/hr decrements and in reasonable intervals (minimum 200 metres), until the speed for which the traffic control is designed is indicated. This final speed limit should be repeated at least once as good practice.

  The length of the advance warning area should relate directly to measured approach speeds, and a reasonable distance must be allowed for speed reduction. In situations

of high traffic volumes, a generous length will be required as more time is needed to take in the sign message and to react accordingly. The advance warning area will become longer in the event of a combination of higher approach speeds and high traffic volumes.

- **Transition Area**

  This is the area in which the motorist is required to take an action. This action can be in instances where the is a shift of position on the roadway without a reduction in the number of lanes (diversion), merge of two lanes into one (lane drop), crossing of the central median (crossover), or entering a detour that is completely separate from the construction works.

  The transition area must be clearly demarcated using delineator plates and should confirm to the layout, if any, depicted on the guidance signs preceding it. In more complex roadworks, these should be broken down into a number of standard transition areas. Care should be taken that no signing for subsequent transition conditions is included within a specific transition area.

  The length of a transition area will depend on the approach speed of traffic and the amount of shift in alignment involved by the transition.

- **Stabilising Area**

  The purpose of a stabilising area is to allow traffic flow to stabilise after negotiating a transition area, and before reaching another change of condition. In the instance of where more than one transition area is required to achieve the final traffic configuration, the signing of subsequent transitions should be located within the stabilising area(s).The stabilising area is normally defined by delineator plates.

- **Buffer Zone**

  The buffer zone is the limiting form of a stabilising area. It is normally used between a transition area and the actual work area. In a situation involving more than one transition area the buffer zone will occur after the transition area closest to the work area. The buffer zone can be relatively short, but should be a minimum of 50 metres.

The principal function of a buffer zone is to separate the traffic from the workers at the site in the interests of worker safety. The provision of a longitudinal buffer zone, together with a lateral buffer zone, should be considered as fundamental to effective worker safety.

- **Work Area**

  The work area can be adequately defined by delineators in the less complex conditions. However, where there is a risk to traffic or workers for vehicles entering the work area, temporary barriers of a standard sufficient to prevent vehicle penetration should be put in place.

  In the event that traffic is relocated well away from the work area, in cases such as detours, then little action is required along the length of the work area other than to protect the workers and construction vehicles.

  In the event of detours resulting in two-way traffic flow, special attention should be given to the definition of the line separating the two traffic flows. Under normal conditions, the normal treatment should involve the marking of a temporary dividing or no overtaking line where appropriate. This line can be supplemented with temporary road studs where applicable.

  If the detour running parallel to the work area uses asymmetrical lane configurations, then drivers should continuously be reminded of these conditions by using appropriate lane arrangement signs. If this condition exists for a considerable distance, these signs should be repeated at regular intervals with the addition of a distance plate indicating the remaining extent of the condition.

- **Termination Area**

  This area involves the return of traffic to normal flow conditions. For simple cases, a relatively short taper or delineator signs will suffice. In more complex situations, a reverse crossover may be required. This should follow the same principles given for such conditions at the commencement of the construction works.

## 8.4 Heritage Impact Assessment

This section provides a synopsis of the Heritage Impact Assessment for MCWAP Phase 1 (Marais-Botes, 2010), as contained in **Appendix H4**.

Details of the nominated specialist follow:

| Specialist | |
|---|---|
| **Name:** | Leonie Marais-Botes |
| **Qualifications:** | BA Hons (Cultural History) (UP)<br>Post Grad Dip in Museum Science (UP)<br>Post Grad Dip in Heritage (Wlts) |
| **No. of years experience:** | 15 |
| **Affiliation (if applicable):** | N/A |

In order to establish heritage significance the following method was employed:

- Investigation of primary resources (archival information);
- Investigation of secondary resources (literature and maps);
- Physical evidence (site investigation); and
- Determining heritage significance.

The main types and ranges of heritage resources that were identified in the study area include:

- Ruins that were identified from the Surveyor General's 1 : 50 000 topographical maps;
- Family cemetery;
- Unmarked graves; and
- Heritage structures.

Along the Main Route alternative, identified heritage resources included a cemetery and farmhouse on the Farm Goedgedacht 602LQ, informal graves on the Farm Sterkfontein 642LQ, Hennie de Lange's Kafee Theunispan and Steenbokpan Bosveld Drankwinkel (refer to **Figure 54**).

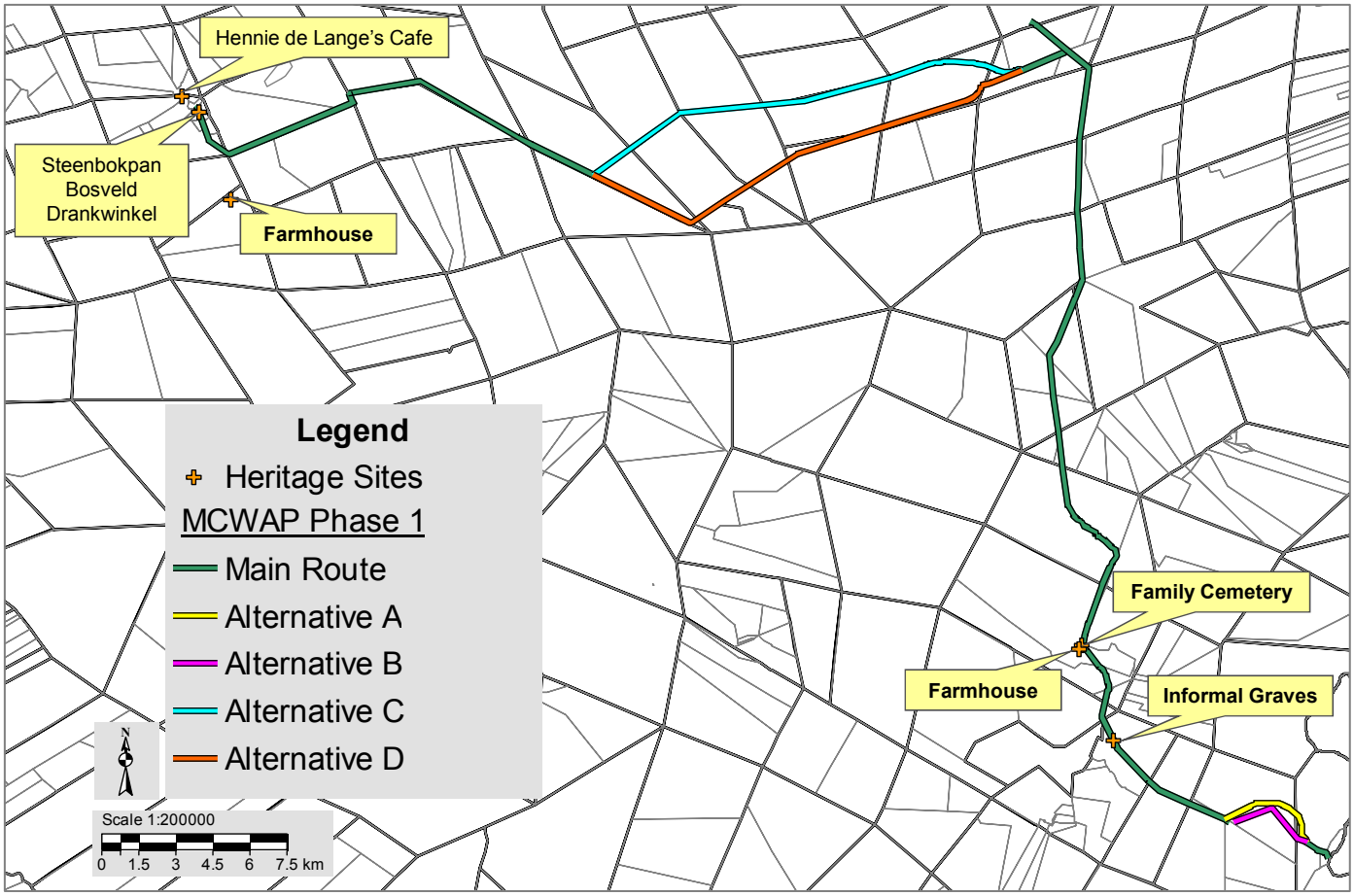



**Figure 54: Map of Heritage Resources along route**

## 8.5 Economic Study

This section provides a synopsis of the Economic Impact Assessment (Conningarth, 2010), as contained in **Appendix H5**, from a MCWAP Phase 1 perspective.

Details of the nominated specialist follow:

| Specialist | |
|---|---|
| **Organisation:** | Conningarth Economists |
| **Name:** | William Mullins |
| **Qualifications:** | B. Sc [UED] (Free State University) |
| **No. of years experience:** | 10 |
| **Affiliation (if applicable):** | N/A |

### *8.5.1 Background*

The study by Conningarth is to determine the specific local and regional economic and socio-economic impacts of MCWAP. The study is restricted to the Mokolo River and the main stem of the Crocodile River (West) downstream of the Hartebeespoort Dam, but includes the possible influence on the urban development around the dam and the expected impact of population growth trends in the catchment area on water inflows to the dam.

The study has two distinct approaches; one being the integrated part of the EIA as mentioned above. A further dimension of the study is the determination of the justification of the regional location and the macro-economic impact of the proposed new developments in the areas involved. The water augmentation infrastructure is a critical cost element of the total development.

The specific EIA concerns the augmentation from the Mokolo Dam and the Crocodile River (West), which in effect not only entails the construction of a number of pipelines and weirs, but also the secondary impacts that this water infrastructure will have on the area such as impact on irrigation, game farming and tourism.

The economic impacts that could reasonably be expected from these developments, the several large capital investment projects in the mining, electricity generation and coal-to-liquid industries foreseen in and around Lephalale, will have a significant if not dramatic effect on Lephalale in the foreseeable future. Lephalale will probably become the next energy hub of Southern Africa. All these possibilities could change the composition of the region permanently from a rural bushveld area into a very large town.

### *8.5.2 Major Regional and Local Economic Impacts*

The primary objective of this macro-economic study has been to measure the nature and magnitude of the economic and socio-economic impacts that will result from the total development project. The macro-economic impacts emanating from the project have proven to be quite significant. The following is a brief summary of the most important

macro-economic aggregates that have been impacted upon by the total development project.

The essence of the national, regional and local results for the year 2009 can be summarised as follows:

- The impact of the total development project on the GDP of South Africa will amount to a positive contribution of R80.2 billion in current prices and for Limpopo an amount of R41.0 billion in current prices.
- On an annual basis, the total development project could sustain 525 690 employment opportunities nationally and locally in the Lephalale area.
- The total positive impact on national household income amounts to R52.8 billion of which 16% is earmarked for the lower-income households. Similarly in the Limpopo region the impact on households amounts to R22.9 billion of which R6.8 billion is allocated to low-income households. The impact on the low income households come through the linkages that the total development project has with other sectors of the economy i.e. agriculture, textiles, clothing, etc. through the buying of materials and the payment of salaries in the system as a whole.

It is very important that the impact of the total development project on the South African economy be reviewed periodically because external conditions can change rapidly. For instance, global economic developments impacted negatively on the South African economy in 2009.

### *8.5.3 Mitigation Measures to Support the Lephalale Local Municipality*

The Lephalale Local Municipality is mainly a mining and industrial town. Its economy is dominated by electricity generation which currently contributes approximately 67% to the GDP.

The demand for infrastructure, financial planning, governance capacity and institutionalisation of legally enabling processes are vast and deserves priority status in the impacted area should this proposed electricity and infrastructural development

materialise. The Lephalale Local Municipality will have to act as a facilitator and catalyst for the envisaged developments in its vicinity.

The total economy of Lephalale Local Municipality will probably quadruple and it is estimated that the current population will grow from 100 000 to over 400 000. It is important to understand that the need for service delivery (water, sanitation, electricity, etc.) by the municipality will have to grow accordingly.

The extent to which the large investment envisaged can take place with the local communities living in harmony and functioning in an appropriate and efficient way will, to a large extent depend on the effectiveness of the Lephalale Local Municipality. It is important that additional priority be given to the extension of the capacity of the municipality. This will be a function of the Department of Provincial and Local Government (DPLG), the Limpopo Province and Government Developmental Agencies such as the Development Bank of Southern Africa (DBSA).

As mitigation measure it is proposed that a task team under the guidance of DPLG and supported by the government structures involved, be appointed. The objective of the task team should be to assist, guide and provide the necessary funding to the Lephalale Local Municipality to ensure that the necessary municipal services be put in place to ensure that the new infrastructural development proceeds effectively and efficiently. It is important to note that in national interest, the power generation should be developed efficiently and timeously, to meet the electricity needs of the national economy.

### *8.5.4 Rationale for Water Augmentation in the Waterberg Region*

**Current Water Situation in the Waterberg Region**

The Waterberg region is part of the Bushveld which can be classified as a hot and an arid region. Due to the irrigation that currently exist in the region, which stems from the climate conducive to agriculture production and its current mining development, based on the vast mineral deposits present, the current water availability and water use in the Waterberg region is relatively in balance. This argument also applies to the broader

Bushveld region of which it forms part and from which an argument can be put forward as to where its future water allocations can be drawn from.

**Water Demand for the Development**

The major projects envisaged for the Waterberg region include the four additional power stations by Eskom, the petro chemical project of Sasol, the Exxaro coal mines which will feed Eskom and the investment in water development which will be financed mainly by DWA.

The economic impacts that could reasonably be expected due to the several large capital investment projects in the mining, electricity generation and coal-to-liquid industries foreseen in and around Lephalale, will have a significant if not dramatic effect on Lephalale in the foreseeable future.

The demand for water will increase drastically by 2024 due to the above mentioned projects. The current use of water will increase nearly tenfold by 2031. As already indicated, the current supply of water from the Waterberg region as well as the surrounding bushveld area will not be able to accommodate this massive water demand.

The additional water supply infrastructure as proposed is therefore seen as an absolute necessity for this project. The proposed water infrastructure can be summarised as follows:

- The present Mokolo-Matimba water transfer will be doubled to 39.1 million $m^3$ from the Mokolo Dam as Phase 1 of the water augmentation scheme.
- The shortfall of 158 million $m^3$ will be augmented as Phase 2 from the Crocodile River (West) catchment.

### *8.5.5 Sectoral Impacts/Externalities due to the Water Development*

The huge water demand, the limited availability of water in the area as well as the fact that available water is not in close proximity to the project development, requires that water be prioritised and be sourced from regions afar. The consequence of this is the

secondary impacts that arise on current and future water users, inside and outside the Waterberg region. The impacts are on irrigation, game farming and livestock.

**Irrigation**

The irrigation cost impacts result from the possible reduced water supply to farms within the Mokolo River catchment affected by the implementation of the water transfer system. The construction phase will not impact on the water supply to the irrigation farmers downstream of the Mokolo Dam if, however, during the operational phase the augmentation out of the Crocodile River (West) is not in place, the farmers could lose water to the supply to Medupi. It could either be permanent or for a year or two.

As mitigation measures for the impact on irrigation the following is proposed:

- That a proper river management and control plan should be compiled and implemented by DWA, to ensure proper coordination and effective water usage. One of the outcomes must be the management of the available storage capacity for maximum efficiency.
- That the final decisions on mitigation of the impact on irrigation be made only after the completion of the Crocodile (West) Reconciliation Study, when the final results are available on the availability of water.
- The rightful irrigators' water entitlements should be timeously determined and communicated to the user farmers.

**Game Farming, Associated Eco-Tourism and Cattle Farming**

The impact of the water augmentations projects, both the construction and operational phases will have a low impact on game farming and related activities if properly managed. In the area directly affected by the development it is foreseen that although the breeding of game and game farming will continue, the farmers could temporally lose the additional income from eco-tourism during the construction phase only.

The impact of the water augmentations projects, both the construction and operational phases will have a very low impact on cattle farming, if properly managed.

The following general mitigation measures are proposed for game farming, associated eco-tourism and cattle farming:

- Coordination between game farmers and inspection and maintenance staff of the pipeline is essential. A part of the contract with the pipeline constructors is that, before construction commences, a consulting forum be established with representation of all the impacted stakeholders and that regular monthly meetings be held to oversee and address all issues of importance, throughout the construction period.
- The entire industrial sites properly and effectively fenced. The responsible developers and authorities are to ensure that this is complied with.

**Business Tourism**

Both the water augmentation and future developments will be beneficial for the business tourist activities, the impact will be high and permanent. As this is a private sector activity no mitigation measures are proposed.

**Macro-Economic Impacts**

The Macro-economic impacts (2009 – 2030) on the Lephalale area, including the Mokolo catchment economy, of all identified capital investment on the construction and operation of the augmentation pipelines and the weirs, irrigation, game farming, hunting and tourism are positive impacts in terms of GDP and employment opportunities

## 8.6 Social Impact Assessment

This section provides a synopsis of the Social Impact Assessment (SIA) (Dr Neville Bews & Associates, 2010) for MCWAP Phase 1, as contained in **Appendix H6**.

Details of the nominated specialist follow:

| Specialist | |
|---|---|
| **Organisation:** | Dr. Neville Bews & Associates |
| **Name:** | Neville Bews |
| **Qualifications:** | • BA (Hons) (Unisa)<br>• Henley Post-Graduate certificate in Management (United Kingdom)<br>• MA (cum laude) (RAU)<br>• D. Litt et Phil (RAU) |
| **No. of years experience:** | Over 25 years in Human Resource Management and 10 in Social Impact Assessments |
| **Affiliation (if applicable):** | International Association of Impact Assessors South Africa IAIAsa |

### *8.6.1 Overview*

The SIA employed a multi-faceted methodological technique to scope the base line social environment within which the project will unfold and to identify and assess the likely social impacts of the project across both the construction and operational phases. In this manner the following impacts were identified and assessed in accordance with a recognised impact assessment technique:

- Access issues
- Crime and security
- Disturbance of Cultural, Spiritual and Religious Sites
- Dust and Pollutants
- Economic Effects on a Cumulative Basis
- Fencing
- Fire hazards
- Impact on Farming Operations
- Job Creation
- Noise
- Relocation
- Sense of Place
- Services Infrastructure and Provisions
- SMME opportunities
- STDs, HIV and AIDS Risk

- Social Stability
- Traffic Disruption During Construction and Maintenance
- Do Nothing Alternative

In respect of these impacts, it was found that 3 were positive and 15 were negative and that all of the negative impacts can, to a greater or lesser degree, be mitigated in an effort to reduce their effect. Of the 3 positive impacts one, the economic effect on a cumulative basis, was associated with the operational phase of the project and as such is considered to be of a long-term, and possibly even of a permanent nature. Although this impact is addressed at a more in-depth level in the economic report the social consequences of this impact are also noted in the SIA due to their importance in respect of this project. The remaining 2 positive impacts, job creation and small medium and micro enterprise opportunities, are mainly associated with the construction phase of the project.

Of the fifteen negative impacts, on an overall basis, these too will have a much greater effect during the construction phase of the project. During construction the issues of access across construction sites, the risk of the spread of STDs, HIV and AIDS and impact on farming operations are probably the most significant negative impacts of the project, apart from the do nothing alternative.

Considering the do nothing option, it is quite clear that if nothing is done and if the project does not proceed there are likely to be significant and severe social impacts on a regional and national basis. These impacts are associated with increased risk to the security of water at a regional level and the supply of electricity at a national level. It is important, however, to consider these risks in the light of any uncertainty regarding access to water, that the project may create for communities living downstream of the dam and to balance the regional and national interests against the rights and interests of these affected communities.

## 8.7 Visual Impact Assessment

This section provides a synopsis of the Visual Impact Assessment (VIA) for MCWAP Phase 1 (Axis Landscape Architecture, 2010), as contained in **Appendix H7**.

Details of the nominated specialist follow:

| Specialist | |
|---|---|
| **Organisation:** | Axis Landscape Architecture |
| **Name:** | Gerhard Griesel |
| **Qualifications:** | Masters Degree In Landscape Architecture (University of Pretoria); ML(Prof) |
| **No. of years experience:** | 5 |
| **Affiliation (if applicable):** | Member of the South African Council of Landscape Architects (SACLAP) |

There are two study areas. The one study area entails the area covered by the alternative corridors from the Mokolo Dam rising main towards the Wolvenfontein balancing dams. The second study area is around the Break Pressure Tank at Rietspruitnek on the Farm Fancy 556LQ.

A broad overview of the approach and methodology used in the VIA is provided below:

- The extent of the study area is determined;
- The site is visited to establish a photographic record of the site, views and areas of particular visual quality and or -value;
- The project components and activities are described and assessed as potential elements of visual and landscape impacts;
- The receiving environment is described in terms of its prevailing landscape- and visual character;
- Landscape- and visual receptors that may be affected by the proposed project are identified and described; and
- Mitigation measures are proposed to reduce adverse impacts.

The cleared servitude and built tank will be the most visible and permanent project components. The cleared servitude will create a broad linear line element accentuated by

disturbed soil, rocks on the edges and low growing grassland vegetation within a homogenous bushveld character with medium to high growing vegetation. The BPT will have an industrial character enforced by the concrete appearance and shape of the tank. The cleared servitude emphasizes the linear character of the pipe line and the size and position of the tank will not be easily absorbed in the background when viewed from distances greater than 1 km.

The study area falls within the Waterberg Tourism Region which forms part of the five tourism regions in Limpopo. This region is renowned for exceptional vistas, mountain gorges, clear streams and rolling bushveld hills and rich in indigenous species of plant and animal life.

**Figures 55** to **57** reflect the results of a visibility assessment, carried out using GIS software. The results provide a clear interpretation of the extent of the visual influence and also provide an indication of the land use that can be expected in the affected areas.

Through the integration of different GIS datasets it is possible to identify areas along the alternative corridors and BPT that may cause higher impacts. This is however based in the topography and does not take into account the vegetation. Alternative B's greatest advantage is the vegetation cover that it is afforded along its alignment.

Key findings from the VIA include:

- **Landscape Character Sensitivity**

  The topography around the study areas is typical of the area in general and is strongly rolling. Hills formed by resistant granite with deeply incised drainage lines result in a strongly rolling terrain, often with very steep gradients. The study areas is characterised by game farming, residential development and some agricultural activities. This gives the area its unique value. The surrounding game farming and tourism activities preserve this unique landscape character.

- **Significance of Impacts & Viewer Sensitivity**

  The impacts to the visual receptors are as follows:

  - <u>Residents</u>

The servitude of Alternative A will be highly visible from some vantage points and erven in the Sable Hills Eco Park. Alternative B will only be visible while driving on the local roads at the end of the servitude next to the dam. During the construction phase the severity and visual intrusion of Alternative A will be high due to the exposed soil and enlarged servitude while Alternative B will be moderate due to the screening by the vegetation and topography. The severity during the operational phase will still be high due to the change in vegetation and exposed rocks but can be mitigated to moderate. The severity for Alternative B will be low due to the topography and vegetation that encloses the major part of this alternative.

The surrounding farm residents will experience limited intrusion on their views due to the presence of the proposed servitudes and BPT. It is unpractical to discuss all, but they are recognised as the general population of the study area and are identified as affected visual receptors.

- Tourists

The study area is renowned for its biodiversity and Bushveld landscapes. These characteristics provide the basis for the tourism industry which plays a major role in the economy of the Limpopo Province. The entire study area is considered to have a high tourism potential.

- Motorists

The major route in the study area is the R510 connecting the towns, tourism destinations and farms. The secondary road network in the study area carries a much lower volume of motorists. Many of the roads are gravel roads which are mostly utilized by the local residents. Their duration of views will be temporary and it is expected that the visual intrusion that they will experience will be low.

Mitigation measures are provided to reduce or alleviate the intrusive contrast between the proposed project components and activities, and the receiving landscape to a point where it is acceptable to visual and landscape receptors.

Alternative B is regarded as the preferred alternative. Its alignment along the ridge and dense vegetation is considered to cause the least impact on the landscape character due to the visibility of the landscape. The impact of Alternative B on visual receptors varies between residents, tourists and motorists. Alternative B's great advantage lies in the less significant landscape and visual impact on the residents as compared to the other alternative.

The impact of the BPT is moderately low on the residents, tourists and motorists and the impact can be easily mitigated to low. It is recommended that soil and rock berms be created that are rehabilitated with salvaged plants and trees around the tank to form a visual barrier.

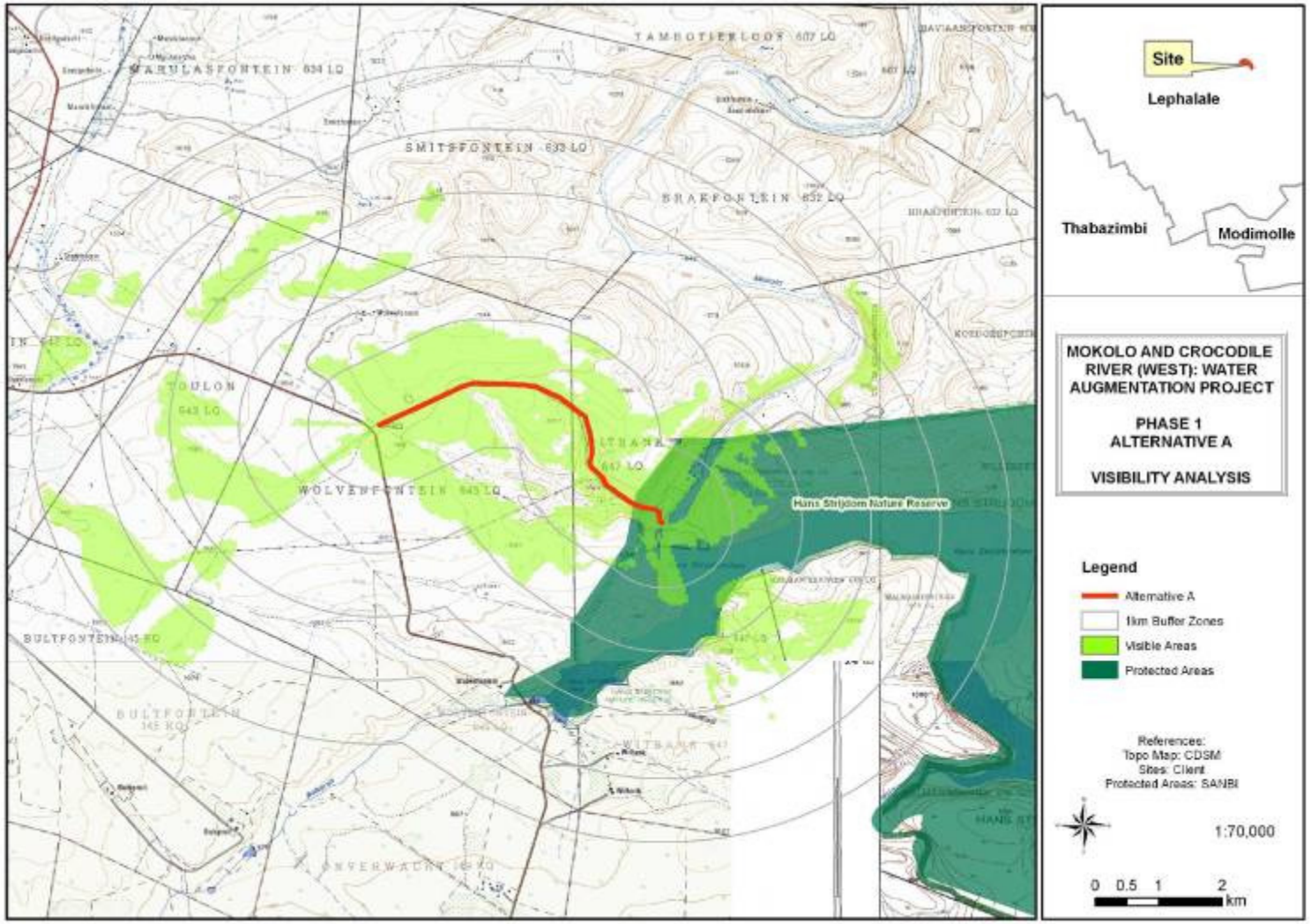



**Figure 55: VIA results for Alternative A (Axis Landscape Architecture, 2010)**

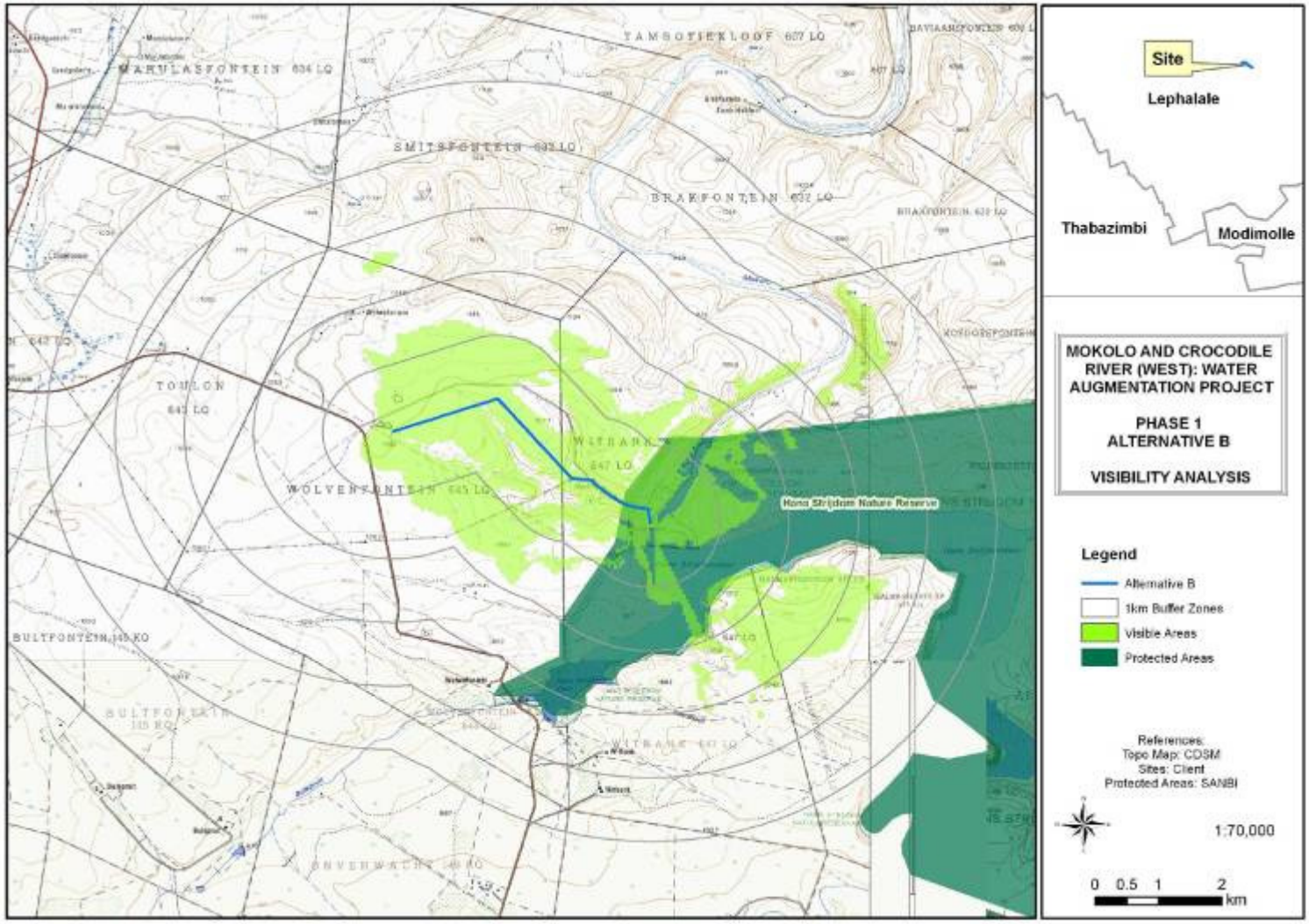



**Figure 56: VIA results for Alternative B (Axis Landscape Architecture, 2010)**

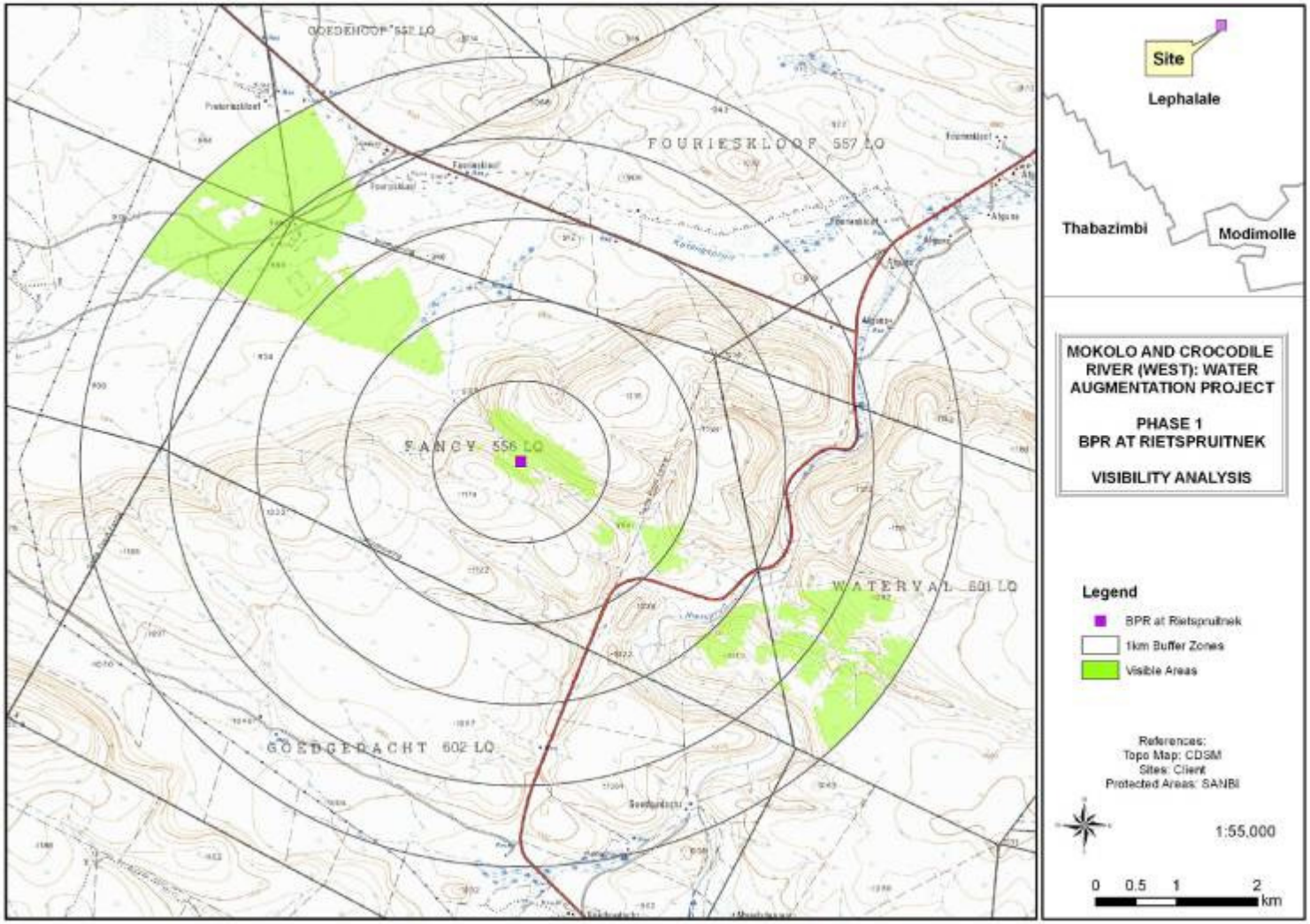



**Figure 57: VIA results for Break Pressure Tank at Rietspruitnek (Axis Landscape Architecture, 2010)**

# 9 ANALYSIS OF ALTERNATIVES

Following environmental screening and the MCWAP Phase 1 Scoping process, the following alignment alternatives were identified (refer to **Figure 58**):

- Rising Main (Mokolo Dam to Wolvenfontein Balancing Dams) –
  - Alternative A; and
  - Alternative B.
- Gravity Line (Matimba Power Station to Steenbokpan) –
  - Alternative C; and
  - Alternative D.

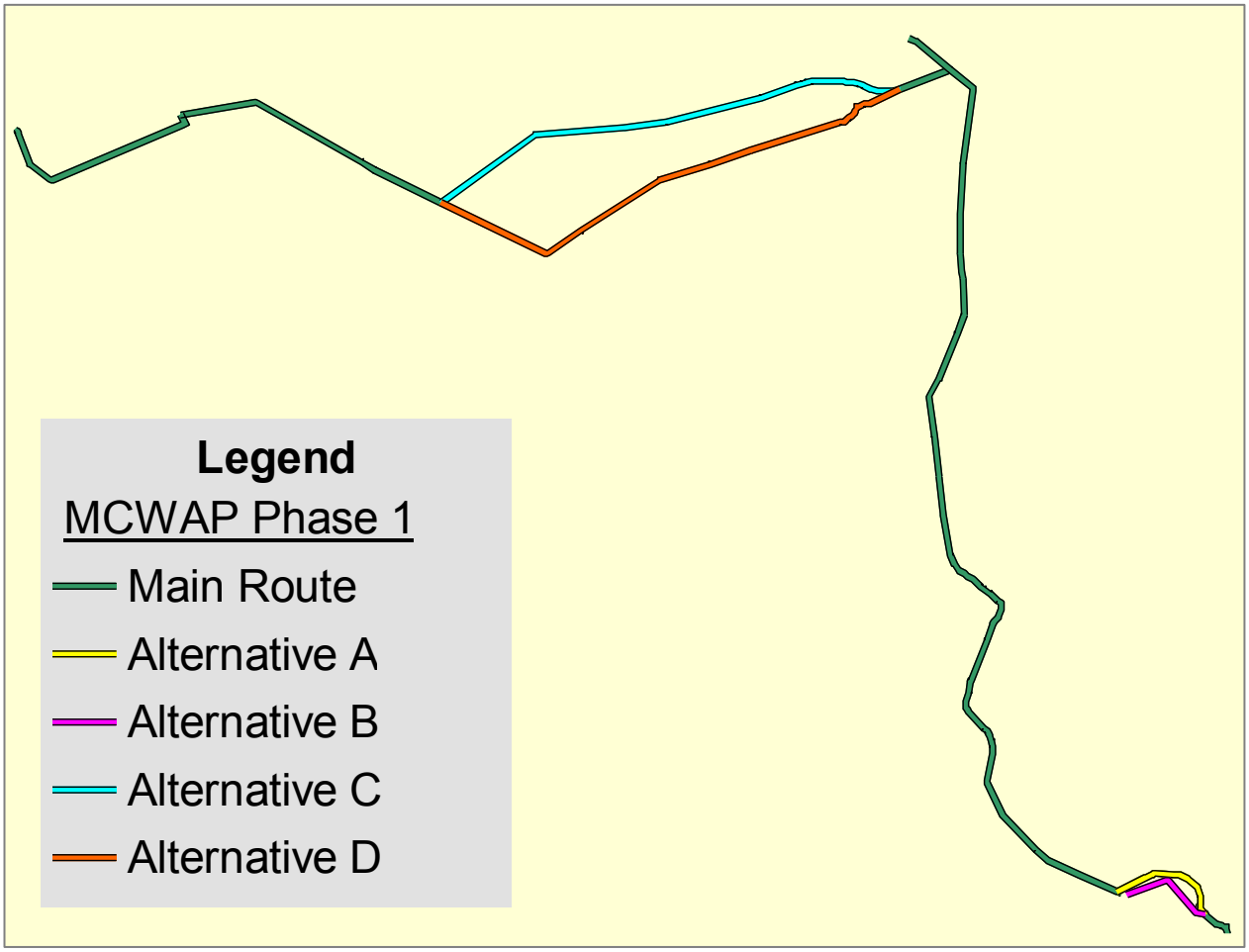



**Figure 58: Layout of MCWA Phase 1 alignment alternatives**

A comparative analysis of the alternative alignment corridors follows, based on the advantages and disadvantages associated with each option. The analysis was completed through technical (i.e. engineering) input and environmental specialists' findings.

**Table 19: Comparative analysis of alternatives for MCWAP Phase 1 rising main alignment**

| | Advantages | Disadvantages |
|---|---|---|
| | **Technical Matterss** | |
| **Alternative A** | ✓ Route is less steep compared to section of Alternative B.<br>✓ Percentage vegetation (large trees 60%) to be removed, but less than Alternative B.<br>✓ Existing access road can be used (only upgraded) | × A slightly longer route.<br>× Total excavation and area to rehabilitation therefore slightly more compared to Alternative B.<br>× Longer length of access road to be upgraded.<br>× Estimated capital cost R8 million more than Alternative B and higher operational cost.<br>× Route argued to have a visual impact on proposed Sable Hills Echo Park.<br>× Access road provides only access to pump station and is also used during fire fighting. Access will be thus be disrupted during construction (blasting).<br>× The need to maintain a safe public access route at all times will be difficult to ensure during the construction stage. |
| **Alternative B** | ✓ Route proposed and preferred by landowner.<br>✓ Shorter route, which is preferable.<br>✓ Estimated capital costs R8 million less than Alternative A.<br>✓ Estimated operational costs are cheaper.<br>✓ Route not in proximity of existing infrastructure and will result in faster construction rate (i.e. does not require controlled blasting).<br>✓ Will create a break in the dense vegetation that can be used for fire management. | × Route alignment very steep in sections.<br>× Poor job conditions for approximately 23% of the route.<br>× Production rate expected to be slightly less than Alternative A.<br>× Percentage vegetation (large trees 70%) to be removed.<br>× Length of access road for maintenance to be constructed substantially longer.<br>× New route will create a further “divide” on eco estate i.e. visual impact. |
| | **Terrestrial Ecology** | |
| **Alternative A** | ✓ The route follows a road and road construction has already disturbed small sections along the route. | × The steep gradient of the surrounding area is host to sensitive plants and fauna habitats.<br>× The sides of this route are very steep and extra cutting next to the road for the pipeline could cause rocks to roll down the slope and destroy red listed plants in the kloof or sensitive fauna habitats. |

| | Advantages | Disadvantages |
|---|---|---|
| **Alternative B** | ✓ Most of the route runs along the ridge summit and not through drainage lines.<br>✓ This route will have minimal impacts on sensitive flora or fauna habitat. | × Blasting and cutting to put the pipeline underground could impact on fauna during the construction phase.<br>× Boulders and materials taken from the trenches could form barriers for movement of fauna if left in the natural veld areas. |
| | **Aquatic Ecology** | |
| **Alternative A** | ✓ Follows an existing roadway. | × Topographical features will require large amount of earth works.<br>× Blasting to accommodate trenching will impact on sensitive kloof habitat unit associated with alignment route. |
| **Alternative B** | ✓ Will impinge less on sensitive mountain streams.<br>✓ Will not impinge on downstream sensitive kloof habitat particular to Alt A.<br>✓ This alternative will occur on a greater amount of flatter topography, thereby decreasing the potential for soil erosion.<br>✓ Much of the proposed alternative follows an existing powerline servitude. | – |
| | **Visual Quality** | |
| **Alternative A** | ✓ By following the access road, the visual impact could be lesser than creating a new scar through the bush | × The servitude of Alternative A will be highly visible from some vantage points and erven in the Sable Hills Eco Park.<br>× During the construction phase the severity and visual intrusion of Alternative A will be high due to the exposed soil and enlarged servitude.<br>× The scar of the existing road will be substantially wider than its current state if the pipeline is to be laid alongside it.<br>× The severity during the operational phase will still be high due to the change in vegetation and exposed rocks but can be mitigated to moderate. |

| | Advantages | Disadvantages |
|---|---|---|
| **Alternative B** | ✓ Alternative B will only be visible while driving on the local roads at the end of the servitude next to the dam.<br>✓ During the construction phase the severity and visual intrusion of Alternative B will be moderate due to the screening of the vegetation and topography.<br>✓ The severity for Alternative B during the operational phase will be low due to the topography and vegetation that encloses the major part of this alternative. | × A new scar will be created through a greenfields area that may be visible from high points and from the air. |
| | **Social Environment** | |
| **Alternative A** | – | × Reduction in property value of certain stands of the Sable Hills Eco Park due to visual impact.<br>× Greater disruption of access to landowner than Alternative B.<br>× The need to maintain a safe public access route at all times will be difficult to ensure during the construction stage. |
| **Alternative B** | ✓ Alternative B identified in consultation with landowner to minimise visual impact to Sable Hills Eco Park. | – |
| | **Traffic** | |
| **Alternative A** | ✓ Existing road – no new access road to be created. | × Greater disruption of access to Mokolo Dam. |
| **Alternative B** | ✓ Substantially less impact to existing access road to Mokolo Dam than Alternative A. | × Majority of route is greenfields, which will require new access road. |

**Table 20: Comparative analysis of alternatives for MCWAP Phase 1 gravity main alignment**

| | Advantages | Disadvantages |
|---|---|---|
| | **Technical Matters** | |
| **Alternative C** | ✓ Follows alignment of new tarred road to Steenbokpan.<br>✓ Route preferred by industrial users. | × Route runs north of fault line; will therefore sterilize a small section of coal reserves. |
| **Alternative D** | ✓ Follow existing infrastructure – railway line and farm boundaries | × Will in future cross other mining infrastructure (pipelines from raw water dam to Medupi) which will be problematic in terms of maintenance and management of servitudes.<br>× Further away from coalfield where water will be used in mining operations i.e. distance to supply point from pipeline and associated cost. |
| | **Terrestrial Ecology** | |
| **Alternative C** | ✓ There are large tracts of land already disturbed by the new road and the construction site of the Medupi Power Station.<br>✓ Most of the route is accessible by the new road and construction site | × There are two Boabab trees that were relocated on this route that the new route will have to avoid, since they cannot be relocated again.<br>× Existing Marula trees on the Farm Kringgatspruit 318 LQ to be avoided, if possible. |
| **Alternative D** | ✓ The route goes mostly along the railway line and existing pipeline route. | × Most of this route traverses pristine vegetation<br>× The area along the railway line and existing pipeline route is already rehabilitated and the pipeline will disturb new sensitive vegetation.<br>× Construction activities along the route will provide access to the area, which could cause poaching and other impacts if not controlled. |
| | **Social Environment** | |
| **Alternative C** | – | – |
| **Alternative D** | – | × Higher quantities of hard rock excavation will be required which means more noise pollution due to anticipated blasting activities. |
| | **Traffic** | |
| **Alternative C** | ✓ Easier access to site. | × Potential disruption of traffic along newly constructed road around Medupi Power Station. |
| **Alternative D** | ✓ Avoidance of newly constructed road around Medupi Power Station. | × Use of railway servitude as access road. |

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*". Based on the comparative analysis, and consensus amongst the specialists, the following alternatives are considered as preferable:

- Rising Main (Mokolo Dam to Wolvenfontein Balancing Dams) – **Alternative B**; and
- Gravity Line (Matimba Power Station to Steenbokpan) – **Alternative C**.

# 10 IMPACT ASSESSMENT

## 10.1 Overview

This section focuses on the pertinent environmental impacts that could potentially be caused by MCWAP Phase 1 during the pre-construction, construction and operation phases of the project.

The impacts to the environmental features are linked to the project activities, which in broad terms include the physical infrastructure (emphasis on construction and operation stages), construction camps, borrow areas and the transferring of water.

Impacts were identified as follows:

- An appraisal of the project description and the receiving environment;
- Impacts associated with listed activities contained in GN No. R386 and R387;
- Issues highlighted by environmental authorities;
- Findings from specialist studies; and
- Comments received during public participation.

### *10.1.1 Impacts associated with Listed Activities*

As mentioned, MCWAP Phase 1 requires authorisation for certain activities listed in the EIA Regulations (2006), which serves as triggers for the environmental assessment process. The impacts associated with the key listed activities follows (note that list is not exhaustive – refer to complete list under **Section 11**).

**Table 21: Impacts associated with the key listed activities**

| GN No. R. 386 of 21 April 2006 | | |
|---|---|---|
| **Listed Activities** | | **Potential Impact Overview** |
| **1(k)** | The construction of facilities or infrastructure, including associated structures or infrastructure, for the bulk transportation of sewage and water, including storm water, in pipelines with -(a) an internal diameter of 0,36 metres or more; or(b) a peak throughput of 120 litres per second or more. | • Impacts associated with the footprint of the physical infrastructure.<br>• Regional and national benefits linked to the transfer of water from Mokolo Dam to end users.<br>• Adverse impacts should the legal entitlement of existing water users be impacted upon. |
| **1(m)** | The construction of facilities or infrastructure, including associated structures or infrastructure, for any purpose in the one in ten year flood line of a river or stream, or within 32 metres from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including - canals; channels; bridges; dams; and weirs. | • Effects to resource quality (i.e. flow, habitat, biota and water quality) of watercourses from pipeline crossings. |
| **4** | The dredging, excavation, infilling, removal or moving of soil, sand or rock exceeding 5 cubic meters from a river, tidal lagoon, tidal river, lake, in-stream dam, floodplain or wetland. | • Effects to resource quality (i.e. flow, habitat, biota and water quality) of watercourses from pipeline crossings. |
| **7** | The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1 000 cubic metres at any one location or site.. | • Pollution of bio-physical environment through poor practices associated with onsite storage of dangerous goods. |
| **15** | The construction of a road that is wider than 4 metres or that has a reserve wider than 6 metres excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 metres long. | • Access roads to the construction site, borrow pits and construction camps. In most cases, access is easily available from existing road network and access road alongside Exxaro pipeline. |
| **GN No. R. 387 of 21 April 2006** | | |
| **Listed Activities** | | **Potential Impact Overview** |
| **1(c)** | The construction of facilities or infrastructure, including associated structures or infrastructure, for the above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of 1 000 cubic metres or more at any one location or site including the storage of one or more dangerous goods, in a tank farm. | • Pollution of bio-physical environment through poor practices associated with onsite storage of dangerous goods. |
| **1(n)** | The construction of facilities or infrastructure, including associated structures or infrastructure, for the transfer of 20 000 cubic metres or more water between water catchments or impoundments per day. | • Beneficial and adverse impacts linked to the transfer of water from Mokolo Dam to end users. |
| **2** | Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more. | • Impacts associated with the overall physical footprint of the project infrastructure (including pipeline, chambers, BPR, pump station). |

The potential impacts linked to the listed activities are addressed in the assessment to follow.

### *10.1.2 Issues raised by Environmental Authorities*

The issues highlighted by environmental authorities during meetings and contained in correspondence received (refer to **Appendix B**) are captured in the table to follow.

**Table 22: Issues raised by Environmental Authorities**

| Authority | Issues Raised | Proposed Resolution |
|---|---|---|
| DEA | Meeting (17 August 2009): | |
| | • Reports needed to clearly describe the need (i.e. motivation) and desirability (i.e. most suitable siting for infrastructure). | Project motivation provided in **Section2** and selection of infrastructure locations discussed in **Section 6**. |
| | • All relevant authorities needed to be regarded as I&APs, and should receive copies of the draft Scoping and EIA Reports. Requested a list of the authorities and representatives who received a copy of the reports. 40-day review period had to be granted for Interested and Affected Parties to review the draft reports. | • Draft reports provided to -<br>o DEA;<br>o DEDET;<br>o DMR;<br>o DWA (Regional Office);<br>o SAHRA;<br>o Department of Agriculture;<br>o Waterberg District Municipality;<br>o Lephalale Local Municipality. |
| | • Any draft reports that undergo substantial amendments need to again be placed in the public domain for 30 days before it is submitted to DEA. | Noted. Not applicable thus far for MCWAP Phase 1. |
| | • Designs needed for all river crossings and wetland delineation to be undertaken. | • Process for watercourse crossings discussed in **Section 6.7.2** and typical drawings contained in **Appendix G**.<br>• Wetland delineation undertaken as part of the Wetlands and Watercourse Crossings Survey for MCWAP Phase 1, conducted by Enviross (2010) (contained in **Appendix H2**). |
| | • Department of Agriculture needs to comment on the Scoping and EIA Reports on the potential impact to crop production and food security | • Draft reports provided to Department of Agriculture.<br>• Impact on crop production and food security addressed in Economic Study. |
| LEDET | Correspondence (08 January 2010): | |
| | • Potential disturbance of the aquifer or contamination of groundwater during construction stage. | • Protection of groundwater during construction stage addressed in EMP. |

| Authority | Issues Raised | Proposed Resolution |
|---|---|---|
| | • Plan for the maintenance of underground pipes to avoid bursting. | • Suitable pipeline coating to ensure resistance to soil stress for clay areas, low current density for cathodic protection and high electrical stress resistance for AC interference.<br>• A schedule of routine maintenance will be compiled to cover all mechanical components including inspection and repair of leaks. |
| | • Clarity is required regarding the decommissioning of the pipeline. | Decommissioning of neither the existing old or new pipeline is envisaged, under suitable maintenance. Since the economics of the retention of the existing Exxaro rising main for the long term has not yet been investigated, it is recommended that it be investigated after the Crocodile River Transfer System becomes operational. Should refurbishment of the existing rising main be warranted, the two pipelines will be interconnected so that both can be used to reduce the overall energy consumption and either used as and when necessary. |
| | • Geotechnical study required to confirm geological stability. | • Detailed geotechnical investigation to be conducted to confirm stability, as part of the design phase.<br>• Key geotechnical considerations from Feasibility study discussed in **Section 7.4**. |
| | • Listed mitigation measures and recommendations pertaining to-<br>○ Monitoring and eradication programme for invasive plant species;<br>○ Rehabilitation with indigenous species;<br>○ Permit requirements for impacts to protected flora species.<br>○ Management of impacts at watercourse crossings;<br>○ Demarcated buffer/flood areas to be regarded as no-go zone;<br>○ Stormwater management;<br>○ Conformance to SAHRA requirements; and<br>○ Restricting activities to demarcated pipeline reserve. | Mitigation measures incorporated into EMP.<br><br>Note that the demarcation of buffer/flood areas as no-go zone would not be possible at the points where the pipeline needs to traverse watercourses. However, mitigation measures are included in the EIA to safeguard the resource quality (i.e. flow, water quality, habitat and biota) at these points. |
| Limpopo Department of Agriculture | <u>Correspondence (07 December 2009):</u> | |
| | • Specialist Geo-hydrological Study required. | No ground water will be utilized in the supply of water to the new users.<br><br>DWA and the WRC study found that there was limited interaction between the shallow alluvium close to the Mokolo River and the deep water geological formations along the Eenzaamheid fault. |

| Authority | Issues Raised | Proposed Resolution |
|---|---|---|
| | • Specialist water quality study (current and expected future) required. | Study not deemed necessary, as the quality of the Crocodile River (MCWAP Phase 2) will be consumptively used by end users and not be mixed with the water from Mokolo Dam. |
| | • Additional security services for personal safety, theft and fires have to be addressed (during construction). | Provision made in EMP for management of security and fires. |

### *10.1.3 Project Activities and Environmental Aspects*

MCWAP Phase 1 includes the following major scheme components:

- High lift pump station;
- Rising main from Mokolo Dam to Wolvenfontein Balancing Dams; and
- Gravity main from Wolvenfontein Balancing Dams to terminal points.

In order to understand the impacts related to the project's components it is necessary to unpack the activities associated with the project life-cycle, as shown below:

**Table 23: Activities associated with MCWAP during project life-cycle**

| Pre-construction |
|---|
| Project Activities |
| • Detailed engineering design |
| • Detailed geotechnical investigations |
| • Geophysical investigations |
| • Survey and mark construction servitude |
| • Survey and map topography for determination of post-construction landscape, rehabilitation and shaping |
| • Survey river cross-sections for post-construction river bank reinstatement |
| • Possible removal of trees within construction servitude |
| • Arrangements with individual landowners and/or land users |
| • Procurement process for Contractors |

| Construction |
|---|
| Project Activities |
| • Environmental awareness creation |
| • Ongoing consultation with affected parties |

| |
|---|
| • Site clearing |
| • Site establishment |
| • Prepare access |
| • Fencing arrangements |
| • Establish construction camps |
| • Storage and handling of material |
| • Construction employment |
| • Diverting utilities |
| • Building |
| • Blasting |
| • Mixing of concrete |
| • Cut and cover activities |
| • Concrete work |
| • Spoil material generation and management |
| • Refuelling |
| • Wastewater management |
| • Create and manage borrow pits |
| • Management of topsoil |
| • Waste management |
| • Management of flora |
| • Management of fauna |
| • River crossings |
| • Managing construction sites |

| **Operation** |
|---|
| Project Activities |
| • Water use from Mokolo Dam |
| • Access arrangements and requirements |
| • Routine maintenance inspections |
| • Pipeline scouring |
| • Repair and maintenance works |
| • Ongoing consultation with directly affected parties |

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment. The following environmental aspects have been identified for MCWAP Phase 1, which are linked to the project activities:

**Table 24: Environmental Aspects associated with MCWAP activities during project life-cycle**

| **Pre-construction** |
|---|
| Environmental Aspects |
| • Construction site planning and layout |
| • Management of geotechnical investigations |

| **Construction** |
|---|
| Environmental Aspects |
| • Environmental awareness creation |
| • Ongoing consultation with affected parties |
| • Site clearing |
| • Site establishment |
| • Management of access |
| • Fencing arrangements |
| • Disruptions to existing services |
| • Management of topsoil |
| • Management of trenching |
| • Management of storage and handling of material |
| • Management of storage and handling of hazardous material |
| • Management of borrow pits and quarries |
| • Management of blasting |
| • Management of workshop and equipment maintenance |
| • Management of labour force |
| • Management of ablution facilities |
| • Management of construction camp and eating areas |
| • Management of waste |
| • Management of water |
| • Management of pollution generation potential |

| |
|---|
| • Management of flora |
| • Management of fauna |
| • Management of watercourses |
| • Management of archaeological and cultural features |
| • Management of reinstatement and rehabilitation |

| **Operation** |
|---|
| Environmental Aspects |
| • Restriction / curtailment of water allocations, under certain conditions |
| • Management of access, routine maintenance and maintenance works |
| • Management of leaks |
| • Management of pipeline scouring |

### *10.1.4 Significant Environmental Impacts*

Environmental impacts are the change to the environment resulting from an environmental aspect, whether desirable or undesirable. Note that it is not the intention of the impact assessment to evaluate all potential environmental impacts associated by the project's environmental aspects, but rather to focus on the potentially **significant** direct and indirect impacts identified during the Scoping phase and any additional issues uncovered during the EIA stage. The significant environmental impacts are listed in **Table 25**.

The EMP aims to comprehensively address the project's impacts to the environment.

The positive impacts and cumulative impacts associated with MCWAP Phase 1 are discussed in **Sections 10.9** and **10.10**, respectively.

**Table 25: Significant environmental impacts associated with MCWAP Phase 1**

| CONSTRUCTION PHASE | |
|---|---|
| **Feature** | **Impact** |
| **Watercourses** | • The pipeline crossings of the Mokolo River (tributary only), Rietspruit (tributary and main stem), Kutangspruit (tributary and main stem) and Sandloop River (tributary and main stem) could lead to the alteration of the structure (i.e. bed and banks), damage to the riparian habitat, lead to increased siltation (water quality deterioration) and adversely affect aquatic biota (e.g. clogging of gills, influence movement). |
| **Soil** | • Erosion on steep slopes.<br>• Loss of topsoil.<br>• Impacts associated with the establishment of borrow pits.<br>• Blasting-related impacts.<br>• Impacts associated with the disposal of large quantity of spoil material. |
| **Geohydrology** | • Disturbance of the aquifer from blasting |
| **Flora** | • Damage to / removal of protected trees and medicinal plants.<br>• Damage to riparian vegetation at river crossings.<br>• Encroachment by exotic species, with subsequent loss of biodiversity. |
| **Fauna** | • Poaching.<br>• Obstruction of movement.<br>• Preventing access to watering points.<br>• Harm from construction activities.<br>• Loss of animals due to improper access control. |
| **Air** | • Impacts associated with the dust from use of dirt roads, transportation of fill and spoil material and from bare areas. |
| **Noise** | • Impacts associated with the noise emanating from construction activities (e.g. vehicle movement, trenching, generators). |
| **Aesthetics** | • Impacts to visual quality of the area through poor housekeeping and construction-related activities. |
| **Safety and Security** | • Impacts associated with trench collapse.<br>• Impacts associated with the uncontrolled access.<br>• Criminal activities associated with construction. |
| **Waste** | • Impacts associated with the use of veld for ablution purposes.<br>• Land, air and water pollution through poor waste management practises. |
| **Construction camp** | • Impacts associated with the siting of construction camp – visually obtrusive, vegetation clearing, poaching, security.<br>• Impacts associated with the improper storage of material. |

| | |
|---|---|
| **Socio-economic aspects** | • Damages to property, including structures, fencing, gates, animals.<br>• Impacts associated with the establishment of temporary construction servitude.<br>• Loss of income (e.g. temporary loss of agricultural land, influence to eco-tourism activities) due to construction-related activities.<br>• Impacts associated with the influx of job seekers.<br>• Use of local labourers and suppliers, as far as possible (positive impact).<br>• Damage to property and risk to residents of the Phumolong Community Trust. |
| **Heritage** | • Damage to heritage resources. |
| **Infrastructure and Services** | • Damage to existing river crossings at the Rietspruit main stem and eastern tributary.<br>• Influence to traffic along roads (particularly R510, access road to Mokolo Dam, and new road around Medupi).<br>• Damage to dirt road to Wolvenfontein through use by heavy vehicles.<br>• Traffic disruptions due to use of R510 and major road network by trucks delivering pipe material. |

| OPERATIONAL PHASE | |
|---|---|
| **Feature** | **Impact** |
| **Watercourses** | • Impacts associated with the de-stabilisation of encased pipeline at river crossing or tie-ins at riverbanks.<br>• Erosion during scouring. |
| **Flora** | • Spreading of exotic vegetation and associated loss of biodiversity. |
| **Fauna** | • Obstruction of movement of aquatic biota at river crossings. |
| **Socio-economic aspects** | • Impacts associated with the potential restriction or curtailment of water use downstream of the Mokolo Dam.<br>• Impacts associated with land use restrictions as a result of registration of permanent servitude / extension of existing Exxaro pipeline servitude. |
| **Aesthetics** | • Visual impacts associated with aboveground infrastructure (i.e. access/valve chambers at approximately 500m intervals along the route; pipeline markers; Break Pressure Tank). |
| **Infrastructure and Services** | • Continual use of maintenance road will lead to erosion and damage to road surface. |
| **Operation & Maintenance** | • Construction-related impacts for any maintenance related work to pipeline infrastructure. |
| **Agricultural Potential** | • Impacts associated with land use restrictions within servitude.<br>• Agro-economical impact.<br>• Possible impacts to food security. |

### *10.1.5 Impact Assessment Methodology*

The impacts and the proposed management thereof are first discussed on a qualitative level and thereafter quantitatively assessed by using the methodology provided below. Where applicable, the impact assessments and significance ratings provided by the respective specialists are included.

For the methodology of the impact assessment, the analysis is conducted on a quantitative basis with regard to the nature, extent, magnitude, duration, probability and significance of the impacts. The following definitions and scoring system 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 / some loss of populations and habitats of non-threatened species.
3- Impact cannot be mitigated / exceeds legal or regulatory standard / increases level of risk to public health / extinction of biological species, loss of genetic diversity, rare or endangered species, critical habitat.

### *10.1.6 Impact Mitigation*

Impacts are to be managed by assigning suitable mitigation measures. According to DEAT (2006), the objectives of mitigation are to:

Find more environmentally sound ways of doing things;

Enhance the environmental benefits of a proposed activity;

Avoid, minimise or remedy negative impacts; and

Ensure that residual negative impacts are within acceptable levels.

Mitigation should strive to abide by the following hierarchy – (1) prevent; (2) reduce; (3) rehabilitate; and/or (4) compensate for the environmental impacts.


**Figure 59: Mitigation Hierarchy**

The proposed mitigation of the impacts includes specific measures identified by the technical team (including engineering solutions) and environmental specialists, stipulations of environmental authorities and environmental best practices. The mitigation measures that follow in the subsequent sections are not intended to be exhaustive, but rather focus on the significant impacts indentified. The Environmental Management Plan (EMP) (refer to **Appendix J**) provides a comprehensive list of mitigation measures, which extends beyond the impacts evaluated in the body of the EIA Report.

| **Box 4:** | **Overview of the EMP** |
|---|---|

The scope of the MCWAP Phase 1 EMP is as follows:

- Establish management objectives during the project life-cycle in order to enhance benefits and minimise adverse environmental impacts;
- Provide targets for management objectives, in terms of desired performance;
- Describe actions required to achieve management objectives;
- Outline institutional structures and roles required to implement the EMP;
- Provide legislative framework;
- Description of requirements for record keeping, reporting, review, auditing and updating of the EMP.

All liability for the implementation of the EMP (as well as the EIA findings and environmental authorisation) lies with the Developer (i.e. DWA) and the implementer (i.e. TCTA).

## 10.2 Watercourses

### *10.2.1 Impact Overview*

For the discussion to follow, watercourses are considered as rivers, streams, natural channels (perennial and seasonal), wetlands and dams.

The Mokolo River (tributary only), Rietspruit (tributary and main stem), Kutangspruit (tributary and main stem) and Sandloop River (tributary and main stem) will be traversed by the proposed pipeline route. This could cause impacts to the "resource quality" of the affected watercourses (i.e. rivers, streams, drainage lines, wetlands, pans), which is defined by the National Water Act (No. 36 of 1998) as the following:

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

Impacts to the resource quality of the affected watercourses (including rivers, streams, natural channels, wetlands) could include:

- Damage to / loss or habitat (both instream and in the riparian zone) within the works area;
- Destabilisation of morphology (i.e. river structure);
- Reduction of water quality through sedimentation and poor construction practices;
- Alteration of the flow regime caused by temporary diversions;
- Reduction in biodiversity of aquatic biota; and
- Wetlands may be susceptible to erosion during the clearing and trenching activities.

The general approach is to position the pipeline structure on stable founding conditions and to protect the pipeline installation against erosion and flood damage. In addition, the crossings of the various watercourses will remain as close as possible to the existing crossing points of the Exxaro pipeline.

During the maintenance of the pipeline 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. During scouring, measures need to be implemented to manage erosion of the structures of the receiving watercourses. Although water quality in the Mokolo River is considered to be good (River Health Programme, 2006), further consideration will need to be given to managing potential impact to the receiving watercourses should the water quality of the water transported in the pipeline pose a risk.

At the time when the EIA Report was prepared, the exact locations of the cathodic protection points were unknown. Similar impacts and mitigations measures will apply for related infrastructure should watercourses possibly be affected.

The Mokolo Dam has a yield of 39,1 Mm3/a at a 99,5% assurance of supply. At a mixed assurance of supply about 44 Mm3/a can allocated. Of this, 10,4 Mm3/a is allocated at a mixed assurance of supply for the stabilisation of irrigation from the Mokolo River downstream of Mokolo Dam. The balance is available to augment the water requirements of the existing and possible new areas such as the Lephalale Municipality, Matimba Power Station, Exxaro's Grootegeluk mine, Medupi Power Station and water for construction purposes

Abstraction from the dam will be undertaken based on operating rules which DWA will develop, which will typically include an allocation to each user based on the dam level at a decided date (currently April) of each year and the level of assurance at which water is allocated to different users. The process is to assess the risk of non-supply based on the dam level and estimated demands on the dam for the year. Restrictions may then be implemented should it be necessary, if it is a period of low flow and low dam level, to ensure supply to the users in accordance to their assurance. This measure is to protect all users.

Mitigation measures (e.g. compensation to affected water users) will not be implemented should the cause of restriction be natural (e.g. drought - a period of reduced runoff). Compensation is only relevant in the case of a temporary or a permanent reallocation of water from irrigation to other users (i.e. the "lease" or procurement of the water allocation).

Temporary or permanent reallocation of water use downstream of Mokolo Dam will impact existing lawful entitlement of water users, which is regarded as a key environmental issue associated with the project, and has been raised by many I&APs (including the Mokolo Irrigation Board) during public participation. The associated potential impacts are considered further under the social and socio-economic environmental features. This will only occur in the situation that the contingency measure is required and will happen with agreed compensation. It is not the intention to utilize this option, but it can be utilised as a contingency measure.

### *10.2.2 Impact Assessment*

| **Environmental Feature** | **1. Flow** |
|---|---|
| **Relevant Alternatives & Activities** | **All alternatives; watercourse crossings; construction camps** |
| **Project life-cycle** | **Construction phase** |

| **Potential Impact** | **Proposed Management Objectives / Mitigation Measures** |
|---|---|
| • Alteration of the flow regime caused by instream and riparian construction activities;<br>• Wetlands may be susceptible to erosion during the clearing and trenching activities. | 1.1. Minimise construction footprint in wetland (e.g. pipeline to traverse watercourses perpendicularly).<br>1.2. The construction works areas should be narrower at watercourse, riparian habitat and wetland buffer crossings, where topsoil and excavated material should be stored outside of these areas.<br>1.3. Manage flow passing through running track to minimise disturbance to flow regime and to prevent erosion.<br>1.4. Prevent possible erosion caused by temporary instream diversion.<br>1.5. Remove diversion following pipeline installation and reinstate and rehabilitate affected works area.<br>1.6. Flow to remain unaltered following construction, except at riverbanks if stabilisation structures are required.<br>1.7. Construction camps to be located 50m from edge of riparian habitat / wetland buffer zone. |

| | **+/- Impacts** | **Extent** | **Magnitude** | **Duration** | **Probability** | **Significance** |
|---|---|---|---|---|---|---|
| **Before Mitigation** | -- | local | medium | short-term | likely | 2 |
| **After Mitigation** | -- | local | low-medium | short-term | moderate | 1 |

| Environmental Feature | 2. River Morphology |
|---|---|
| Relevant Alternatives & Activities | All alternatives; watercourse crossings; maintenance |
| Project life-cycle | Construction & operation phases |

| Potential Impact | Proposed Management Objectives / Mitigation Measures |
|---|---|
| • Destabilisation of morphology (i.e. river structure);<br>• Erosion of watercourse structure during scouring events;<br>• Damage to / loss of habitat (both instream and in the riparian zone) within the works area. | 2.1. Repeat mitigation measures 1.1 – 1.7.<br>2.2. Select most appropriate crossing point based on geotechnical conditions.<br>2.3. Select most appropriate crossing point based on sensitivity of riparian habitat (e.g. protected trees, large trees that afford bank stabilitation) and instream habitat, depending on technical feasibility.<br>2.4. Excavate trench across dry river channel.<br>2.5. Provide concrete bedding as stable foundation for the pipeline.<br>2.6. Ensure proper anchoring of pipeline to prevent flotation.<br>2.7. Encase pipeline with concrete.<br>2.8. Reinstate (shaping) and rehabilitate (indigenous riparian vegetation) affected areas. Install suitable buttressing to prevent future erosion, if required.<br>2.9. Trench walls are to be stabilized using battering, shoring and bracing or similar techniques depending on the stability of the trench sides.<br>2.10. The soil that is removed during the excavations should be stored in the layers in which they were removed. The storage of this soil should also be done in such a manner so as to not smother the vegetation and to allow for a quicker recovery of the affected vegetation. Upon completion of the laying of the pipeline, the soil should be replaced in the trench in the layer order in which they were removed. After filling in the trench, the affected area should be carefully reinstated to avoid channel formation through surface water favouring excavated areas. The bare soil should then be revegetated with species specific to the area.<br>2.11. Measures to be implemented to dissipate energy of water released during scouring events. |

| | +/- Impacts | Extent | Magnitude | Duration | Probability | Significance |
|---|---|---|---|---|---|---|
| Before Mitigation | –- | local | medium | permanent | likely | 2 |
| After Mitigation | –- | local | low-medium | short-term | moderate | 1 |

| Environmental Feature | 3. Water Quality |
|---|---|
| Relevant Alternatives & Activities | All alternatives; watercourse crossings; construction camps; maintenance |
| Project life-cycle | Construction phase & operation phases |

| Potential Impact | Proposed Management Objectives / Mitigation Measures |
|---|---|
| • Contamination of surface water 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).<br>• Possible reduction in water quality of the receiving watercourses due to scouring through sedimentation and poorer quality water transported in the pipeline. | 3.1. Repeat mitigation measures 1.1 – 1.7 and 2.2 – 2.12.<br>3.2. Temporary diversion and other dewatering techniques (e.g. pumping) to maintain a dry works area.<br>3.3. Where necessary, install instream silt traps during construction within the watercourse channel and along the riparian habitat. Instream silt traps are to be maintained and serviced on a regular basis. The style of silt trap will depend on materials used and the water movement patterns. If silt traps are not deemed feasible, other suitable measures need to be taken to limit the suspension of unnaturally high sediment volumes in the stream.<br>3.4. Implement suitable stormwater measures during construction to manage ingress of runoff into watercourses.<br>3.5. Ensure proper storage of material (including fuel, paint) that could cause water pollution. Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand.<br>3.6. Ensure proper waste management and housekeeping.<br>3.7. Reduce sediment loads in water from dewatering operations. All dewatering should be done through temporary sediment traps constructed out of various geo-textiles and hay bales. These are to be serviced regularly and removed when no longer in use. Materials can be re-used.<br>3.8. In all areas where working with flowing water floating booms are to the installed across the stream flow downstream of the works.<br>3.9. Manage impacts to water quality of receiving watercourses due to scouring. |

| | +/- Impacts | Extent | Magnitude | Duration | Probability | Significance |
|---|---|---|---|---|---|---|
| Before Mitigation | –- | local | medium | short-term | likely | 2 |
| After Mitigation | –- | local | low-medium | short-term | moderate | 1 |

| Environmental Feature | 4. Aquatic Biota |
|---|---|
| Relevant Alternatives & Activities | All alternatives; watercourse crossings; maintenance |
| Project life-cycle | Construction phase |

| Potential Impact | Proposed Management Objectives / Mitigation Measures |
|---|---|
| • Clogging of gills from increased silt loads;<br>• Alteration of habitat;<br>• Disturbance to migration patterns;<br>• Poaching / illegal fishing. | 4.1. Repeat mitigation measures 1.1 – 1.7, 2.2 – 2.12 and 3.2 – 3.9.<br>4.2. Temporary diversion to allow for movement of aquatic fauna, as far as possible.<br>4.3. Environmental induction of all construction workers and implementation of disciplinary procedures for non-compliance. |

| | +/- Impacts | Extent | Magnitude | Duration | Probability | Significance |
|---|---|---|---|---|---|---|
| Before Mitigation | –- | local | medium | short-term | likely | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **After Mitigation** | –- | local | low-medium | short-term | moderate | 1 |

| **Environmental Feature** | **5. Pans and Wetlands** |
|---|---|
| **Relevant Alternatives & Activities** | **All alternatives; watercourse crossings; maintenance** |
| **Project life-cycle** | **Construction & operation phase** |

| **Potential Impact** | **Proposed Management Objectives / Mitigation Measures** |
|---|---|
| Damage to wetlands from crossings, including erosion, loss of vegetation, adverse effects to biota, and disturbance of flow. | 5.1. Repeat mitigation measures 1.1 – 1.7, 2.2 – 2.12 and 3.2 – 3.9.<br>5.2. A roadway through the wetland zones will have to be established in order to excavate a trench for the pipeline. A servitude roadway already exists due to the existing water pipeline along this route. Vehicular movement should be limited only to this roadway.<br>5.3. The soil that is removed during the excavations should be stored in the layers in which they were removed. The storage of this soil should also be done on a geotextile so as to not smother the vegetation and to allow for a quicker recovery of the affected vegetation. This is important as the area is regarded as being generally arid and the regeneration of vegetation is therefore slow.<br>5.4. Upon completion of the laying of the pipeline, the soil should be replaced in the trench in the layer order in which they were removed. It is important to realise that wetland functionality relies substantially on movement of soil water.<br>5.5. After filling in the trench, the affected area should be carefully reinstated to avoid channel formation through surface water favouring excavated areas. The bare soil should then be revegetated with species from the surrounding area – seeded or planted.<br>5.6. Undertake de-compaction of the area, depending on how long the area was active and how compacted the soils have become.<br>5.7. No dumping of any materials or storage of any equipment should be allowed within the wetland zones.<br>5.8. The construction area footprint should be maintained at a bare minimum to negate the potential ecological impacts.<br>5.9. Attempt to limit traffic to essential vehicles and plant were there area alternative access routes. Expedite construction activities in watercourse through forward planning of the works and the preparation of location-specific method statements. |

| | **+/- Impacts** | **Extent** | **Magnitude** | **Duration** | **Probability** | **Significance** |
|---|---|---|---|---|---|---|
| **Before Mitigation** | –- | local | medium-high | short-term | likely | 3 |
| **After Mitigation** | –- | local | medium | short-term | unlikely | 2 |

| Environmental Feature | 6. Water Users |
|---|---|
| Relevant Alternatives & Activities | All |
| Project life-cycle | Operation phase |

| Potential Impact | Proposed Management Objectives / Mitigation Measures |
|---|---|
| Impacts to lawfully entitled water users through temporary / permanent reallocation of water use downstream of Mokolo Dam. | 6.1. To be considered as a contingency measure.<br>6.2. Abstractions based on DWA operating rules - include allocation to each user based on the dam level at a decided date (currently April) of each year and the level of assurance at which water is allocated to different users.<br>6.3. Compliance with the conditions of the Reserve, as determined and administered under the National Water Act (No. 36 of 1998). |

| | +/- Impacts | Extent | Magnitude | Duration | Probability | Significance |
|---|---|---|---|---|---|---|
| **Before Mitigation** | –- | local | medium-high | short-term | unlikely | 3 |
| **After Mitigation** | –- | local | medium | short-term | unlikely | 2 |

## 10.3 Geology and Soil

### *10.3.1 Impact Overview*

Suitable soft material for use as bedding, selected or general soft backfill for the pipeline will need to be sourced from borrow pits. Permits are required for the proposed borrow pits, in terms of the Minerals and Petroleum Resources Development Act (No. 28 of 2002).

Blasting will be required, based on geotechnical conditions encountered. All blasting will comply with the relevant legislation and SANS stipulations. Specific mitigation measures are contained in the EMP, including the use of blast mats to safeguard against fly-rock, and the protection of property and accompanying monitoring practices.

A large quantity of spoil material, including excess rock and soil, will need to be disposed of during the installation of the pipeline. Best practices will be employed, which will include the filling of existing and new borrow pits, and the landscaping and rehabilitation (including the management of drainage to limit erosion risks) of these areas.

Two steep areas are traversed, namely along the initial section from Mokolo Dam (Alternatives A and B) and at Rietspruitnek (Main Route). Due to the steep gradients of these sections, erosion (at cleared areas, trenches, stockpiles, access roads) may take place during and after rainfall events. Suitable stormwater management will be undertaken during the construction and operation phases to prevent the occurrence of erosion.

Soil may be polluted by poor storage of construction material, spillages and inadequate housekeeping practices. Specific mitigation measures are contained in the EMP, where the primary objective is the effective and safe management of materials on site, in order to minimise the impact of these materials on the natural environment. The same objective applies to the correct management and handling of hazardous substances (e.g. fuel).

Scour valves will be installed at the low points along the alignment to assist with de-watering of the pipeline for maintenance and inspection. A detail hydraulic analysis will be conducted to determine the optimum positioning of the scour valves. Measures need to be implemented to manage soil erosion due to scouring events.

### *10.3.2 Impact Assessment*

| **Environmental Feature** | **8. Geology & Soil** |
|---|---|
| **Relevant Alternatives & Activities** | **All alternatives; borrow pits** |
| **Project life-cycle** | **Construction phase** |

| **Potential Impact** | **Proposed Management Objectives / Mitigation Measures** |
|---|---|
| Improper disposal of large quantity of spoil material. | 8.1. Spoil material that is not contaminated (e.g. fuel spillages) to be used to fill borrow pits and quarries. Surplus material to be suitably disposed of. |

| | **+/- Impacts** | **Extent** | **Magnitude** | **Duration** | **Probability** | **Significance** |
|---|---|---|---|---|---|---|
| **Before Mitigation** | –- | local | medium-high | short-term | almost certain | 3 |
| **After Mitigation** | –- | local | low | short-term | unlikely | 1 |

| Environmental Feature | 9. Geology & Soil |
|---|---|
| Relevant Alternatives & Activities | Main Route; Alternative A; Alternative B; borrow pits; construction camps |
| Project life-cycle | Construction & operation phase |

| Potential Impact | Proposed Management Objectives / Mitigation Measures |
|---|---|
| Soil erosion on steep slopes. | 9.1. Stabilisation of cleared areas to prevent and control erosion. The method chosen (e.g. watering, planting, retaining structures, commercial anti-erosion compounds) will be selected according to the site specific conditions. Drainage management should also be implemented to ensure the minimization of potential erosion.<br>9.2. Acceptable reinstatement and rehabilitation to prevent erosion during operation phase. |

| | +/- Impacts | Extent | Magnitude | Duration | Probability | Significance |
|---|---|---|---|---|---|---|
| Before Mitigation | –- | local | medium-high | short-long | likely | 3 |
| After Mitigation | –- | local | low | short-term | unlikely | 1 |

| Environmental Feature | 10. Geology & Soil |
|---|---|
| Relevant Alternatives & Activities | All alternatives |
| Project life-cycle | Operation phase |

| Potential Impact | Proposed Management Objectives / Mitigation Measures |
|---|---|
| Soil erosion due to scouring (i.e. periodic discharging of the pipeline). | 10.1. Manage soil erosion during scouring events. |

| | +/- Impacts | Extent | Magnitude | Duration | Probability | Significance |
|---|---|---|---|---|---|---|
| Before Mitigation | –- | local | medium | short-term | almost certain | 3 |
| After Mitigation | –- | local | low | short-term | unlikely | 1 |

## 10.4 Geohydrology

### *10.4.1 Impact Overview*

Blasting activities are strictly controlled by the EMP. Where blasting is anticipated in close proximity to boreholes, the landowner should be consulted with and mitigation measures to be implemented should be discussed. Mitigation measures should include:

- Pump testing of boreholes prior to blasting to determine yields, in order to determine the impact of blasting activities on borehole yields.

- Implement special methods to limit potential damage to boreholes in areas where blasting will take place.
- Implementation of controlled blasting or mechanical excavation techniques in areas where normal blasting techniques could potentially damage or destroy boreholes. No uncontrolled blasting is to be allowed, as all blasts are to be properly planned and controlled to achieve the desired rock breaking for the trench type required.
- Implementing standard monitoring practices for monitoring of blast shock. This includes borehole testing before blasting and thereafter once the shock waves have dissipated and the soils have settled properly. This is to identify any resulting damage.

The blasting activities will also be guided by the findings of the detailed geotechnical investigations.

Preventative measures will be implemented to ensure the safeguarding of groundwater from potential contamination during the construction stage. As mentioned, the primary objective stipulated in the EMP is the effective and safe management of materials on site, in order to minimise the impact of these materials on the natural environment.

### *10.4.2 Impact Assessment*

| **Environmental Feature** | **11. Geohydrology** |
|---|---|
| **Relevant Alternatives & Activities** | **All alternatives; borrow pits** |
| **Project life-cycle** | **Construction phase** |
| **Potential Impact** | **Proposed Management Objectives / Mitigation Measures** |
| Disturbance to the aquifer from blasting. | 11.1. Strict control of blasting activities to safeguard boreholes and aquifer.<br>11.2. Water supply from borehole can be replaced with supply from pipeline, following necessary negotiations. |

| | **+/- Impacts** | **Extent** | **Magnitude** | **Duration** | **Probability** | **Significance** |
|---|---|---|---|---|---|---|
| **Before Mitigation** | –- | local | high | permanent | unlikely | 3 |
| **After Mitigation** | –- | local | low | short-term | unlikely | 1 |

## 10.5 Flora

### *10.5.1 Impact Overview*

As mentioned, the pipeline route was selected to follow existing linear infrastructure (e.g. roads, existing pipeline) and farm boundaries, where the motivation was that these corridors were regarded as less sensitive than previously undisturbed areas.

A temporary construction servitude will be established along the pipeline route, wherein vegetation will be cleared to allow for trenching and the installation of the pipeline and building of chambers. The areas earmarked for the construction camps and borrow pits will also need to be cleared of vegetation. Riparian vegetation will be cleared during the crossing of the Rietspruit and its tributaries.

Apart from the areas adjacent to existing linear disturbances, the vegetation along the Phase 1 pipeline route has a high conservation priority, mainly due to the game farms that are prevalent in the region. Of the floral species recorded along the route, 12 species with medicinal properties were identified. During the clearing of the construction footprint, access roads and at the construction camps and borrow pits, vegetation will be removed. This may include the disturbance or removal of protected species. As far as reasonably practical, these species will be avoided and will be demarcated as no-go areas. The following species were highlighted by the biodiversity specialist (Galago Environmental, 2010) as important: *Acacia erioloba*, *Adansonia digitata, Boscia albitrunca*, *Combretum imberbe*, *Sclerocarya birrea* subsp. *caffra*. A qualified and / or appropriately experienced botanist or experienced person who knows the specific vegetation type well will mark protected trees when the route is pegged and the necessary permits will be obtained under the National Forests Act (No. 84 of 1998) if avoidance is not possible.

According to Galago Environmental (2010), the banks of the Mokolo River close to the pump station, the Rietspruit as well as seepage lines in the Waterberg are deemed sensitive and should be expeditiously rehabilitated following the installation of the pipeline. The biodiversity specialist highlighted that a key ecological concern is the potential deleterious effect of the abstraction at Mokolo Dam on the downstream Mokolo

River system, as the river provides a unique habitat to a range of narrowly specialized species and also acts as a dispersal corridor (Galago Environmental, 2010). As part of Intermediate Reserve Determination for the Mokolo River, the riparian vegetation specialist assessed the response on the marginal and other riparian zones to operational scenarios (DWA, 2010). The Reserve includes provisions for the maintenance of the riparian vegetation.

Potential impacts to the riparian habitat and the associated mitigation measures are discussed under **Section 10.1**.

### *10.5.2 Impact Assessment*

| **Environmental Feature** | **12. Flora** |
|---|---|
| **Relevant Alternatives & Activities** | **All alternatives; borrow pits, construction camps** |
| **Project life-cycle** | **Construction phase** |
| **Potential Impact** | **Proposed Management Objectives / Mitigation Measures** |
| Disturbance to protected flora species. | 12.1. A qualified and / or appropriately experienced botanist or experienced person who knows the specific vegetation type well will mark protected trees when the route is pegged and the necessary permits will be obtained under the National Forests Act (No. 84 of 1998) if avoidance is not possible. Protected trees as well as other protected species are to be identified and protected or relocated where possible. |

| | **+/- Impacts** | **Extent** | **Magnitude** | **Duration** | **Probability** | **Significance** |
|---|---|---|---|---|---|---|
| **Before Mitigation** | -- | local | medium-high | short-term | likely | 3 |
| **After Mitigation** | -- | local | medium | short-term | likely | 1 |

| **Environmental Feature** | **13. Flora** |
|---|---|
| **Relevant Alternatives & Activities** | **All alternatives; borrow pits, construction camps** |
| **Project life-cycle** | **Construction phase** |
| **Potential Impact** | **Proposed Management Objectives / Mitigation Measures** |
| Encroachment of alien plants and noxious weeds. | 13.1. All weeds including alien plants and noxious weeds must be removed during the entire lifespan of the project.<br>13.2. Inspect rehabilitated area at three monthly intervals during the first and second growing season to determine the efficacy of rehabilitation measures. |

| | **+/- Impacts** | **Extent** | **Magnitude** | **Duration** | **Probability** | **Significance** |
|---|---|---|---|---|---|---|
| **Before Mitigation** | -- | local | medium-high | short-term | likely | 3 |
| **After Mitigation** | -- | local | medium | short-term | likely | 1 |

## 10.6 Fauna

### *10.6.1 Impact Overview*

According to Galago Environmental (2010), displacement of indigenous vegetation by more vigorous pioneer flora will not have a noticeable effect on vertebrates. Vertebrates rely on vegetative cover for nourishment and refuge, and are not concerned about specific plant species compositions. Animals are further more mobile to find more suitable micro-habitats. It is not expected that there will be a loss of rupiculous habitat in mountainous areas of the route.

The pipeline will not cause a loss of protected fauna and should furthermore not have a significant effect on small vertebrate populations (Galago Environmental, 2010), should strict control measures be implemented.

With game farming constituting the dominant land use along the pipeline route, the management of potential impacts (e.g. interference with hunting, game viewing and other eco-tourism activities, disturbance and risk of harm to game animals, disturbance to breeding patterns of animals, temporary movement of game fences, risk of poaching, loss of animals due to improper access control and loss of habitat) demands special attention. The pipeline is predominantly aligned alongside existing linear infrastructure (e.g. roads, existing pipeline) and farm boundaries. This approach attempts to limit the disturbance to game farms, where the game fence can be temporarily moved and erected on the boundary of the construction servitude. Specific provisions are included in the EMP to manage impacts to animals on game farms, and the related objectives and mitigation measures are included in the assessment below.

### *10.6.2 Impact Assessment*

| **Environmental Feature** | **14. Fauna** |
|---|---|
| **Relevant Alternatives & Activities** | **All alternatives; borrow pits, construction camps** |
| **Project life-cycle** | **Construction phase** |

| **Potential Impact** | **Proposed Management Objectives / Mitigation Measures** |
|---|---|
| Disturbance to animals on game farms. | 14.1. Adequate consultation with landowner to determine specific requirements in terms of access, fences, game, existing infrastructure along pipeline route, etc.;<br>14.2. Proper access control to be maintained;<br>14.3. Ensure that fences damaged or removed during the construction activities of the proposed pipeline are adequately restored of rebuilt to an acceptable standard;<br>14.4. Strict control of blasting to protect game animals;<br>14.5. Suitable screening of construction area and safeguarding of trench on game farms;<br>14.6. Allowance for migration of animals to watering points on game farms; and<br>14.7. Stringent and dedicated control of poaching. |

| | **+/- Impacts** | **Extent** | **Magnitude** | **Duration** | **Probability** | **Significance** |
|---|---|---|---|---|---|---|
| **Before Mitigation** | –- | local | medium-high | short-term | likely | 3 |
| **After Mitigation** | –- | local | medium | short-term | unlikely | 2 |

## 10.7 Socio-Economic Aspects

### *10.7.1 Impact Overview*

The possible adverse impacts of MCWAP Phase 1 to the socio-economic environment are mainly associated (but not limited to) with the following:

- Construction-related issues (e.g. influx of job seekers; damage to private property; reduction in eco-tourism activities); and
- Impacts during the operation stage, including those linked to water management (e.g. water use restrictions / curtailments downstream of Mokolo Dam) and compensation for the registration of the final servitude.

Various provisions are included in the EMP to ensure adequate control of the impacts that pertain to socio-economic aspects, and certain of these measures are reiterated below:

- TCTA and the Engineer must negotiate with the landowners and adjacent landowners for permission and the right to make use of access roads / private roads during the construction and operational phases.
- The landowner should formally request information regarding the construction programme and details on the preparation of the site for construction, as well as details on the construction activities which will be undertaken on the landowner's property, prior to the commencement of construction activities. The construction activity details could include the following:
  a) Layout plan showing the exact location of the proposed pipeline, the width of the construction and final servitude, the location of the air valves, scour valves and pipe access points;
  b) Activities involved in the preparation of the site to commence with construction activities, and the timeframe in which this will be undertaken;
  c) Details on the temporary fencing which will be erected on site during the construction phase, e.g. fencing alongside the construction servitude or trenches, around construction camp sites, and temporary perimeter fences;
  d) Details on repairs and re-construction of permanent fencing which was damaged or removed during the construction activities. This should include details on the materials which will be used and proposed construction timeframe;
  e) Details on how fencing will be maintained, frequency of inspections, and the response timeframe for the repair of damaged fencing;

These matters need to be agreed upon upfront by the Engineer and TCTA in the form of a baseline survey and questionnaire to identify special conditions and needs to be met.

The negotiations with the landowners for the registration of the servitude will be undertaken by TCTA, as the project's implementing agent. TCTA's land rights acquisition strategy will adhere to all statutory requirements, as per the Promotion of Administrative Justice Act (No. 99 of 2000), the Expropriation Act (No. 63 of 1975) and the National Water Act (No. 36 of 1998). Determination of compensation will be done in terms of 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 expropriation of the right. In case of servitude 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).

I&APs (especially the Mokolo Irrigation Board) have expressed significant concern about the availability of water in the Mokolo Dam to cater for the MCWAP Phase 1 requirements, whilst still ensuring that the needs of the downstream agricultural water users can be met. The legal entitlement of water use from the dam will not be reduced. Abstraction from the dam will be undertaken based on operating rules which DWA will develop, which will typically include an allocation to each user based on the dam level at a decided date (currently April) of each year and the level of assurance at which water is allocated to different users. The process is to assess the risk of non-supply based on the dam level and estimated demands on the dam for the year. Restrictions may then be implemented should it be necessary, if it is a period of low flow and low dam level, to ensure supply to the users in accordance to their assurance. This measure is to protect all users.

A water conservation and demand management strategy will also be considered, which aims to ensure effective and sustainable use of available water sources through water conservation, loss management and demand management. The objective of MCWAP is not to infringe on current water use entitlements (in terms of Section 32 of the National Water Act, No. 36 of 1998), including the entitlements and rights of the environment (i.e. the Reserve).

The economic impact of the project (according to Conningarth, 2010), is summarised in the table to follow.

**Table26: Impacts on the Economic Activities in the Mokolo Catchment**

| | Activity | Intensity of Impact | Duration |
|---|---|---|---|
| MCWAP -Construction | Cattle Farming | Low | Temporary |
| | Game farming and Related Activities | Low | Temporary |
| | Irrigation (water reduction) | None | Temporary |
| | Business Tourism | Medium | Temporary |
| | Lephalale Local Municipality | Medium | Temporary |
| MCWAP - Operational | Cattle Farming | Low | Permanent |
| | Game farming and Related Activities | Low | Permanent |
| | Irrigation Farming (water re-allocation risk) | Medium | Permanent |
| | Business Tourism | Low | Permanent |
| | Lephalale Local Municipality | Low | Permanent |

The Macro-economic impacts (2009 – 2030) on the Lephalale area, including the Mokolo catchment economy, of all identified capital investment on the construction and operation of the augmentation pipelines and the weirs, irrigation, game farming, hunting and tourism are positive impacts in terms of GDP and employment opportunities (Conningarth, 2010).

### *10.7.2 Impact Assessment*

| Environmental Feature | 15. Socio-economic aspects |
|---|---|
| Relevant Alternatives & Activities | All alternatives; borrow pits, construction camps |
| Project life-cycle | Construction phase |

| Potential Impact | Proposed Management Objectives / Mitigation Measures |
|---|---|
| • No / poor access granted to landowners to properties. | 15.1. Adequate consultation with landowner to determine specific requirements in terms of access, fences, game, existing infrastructure along pipeline route, etc.;<br>15.2. Make provision for landowners to access their properties.<br>15.3. Make provision for landowners to access firebreak roads.<br>15.4. Speed limits to be strictly adhered to.<br>15.5. The movement of any vehicles and/or personnel outside of designated working areas will not be permitted.<br>15.6. Access roads to be maintained in a suitable condition.<br>15.7. Suitable erosion protective measures to be implemented for access roads during the construction phase.<br>15.8. Damage to the existing access roads as a result of construction activities will be repaired to the satisfaction of TCTA and the Engineer, and in accordance with agreements with landowners (where relevant).<br>15.9. Ensure that central service nodes such as schools, clinics, water sources, places of worship, etc. remain easily and safely accessible.<br>15.10. Traffic safety measures (e.g. traffic warning signs, flagmen) to be implemented.<br>15.11. Proper access control to be maintained to protect game and livestock, in accordance with agreements with landowners (where relevant). |
| • Damage to fencing. | 15.12. Any damaged fencing is to be replaced to meet pre-existing conditions.<br>15.13. All fences erected for construction purposes (e.g. fences around camp sites, fencing around trenches, etc.) should be inspected on a daily basis to detect whether any damage has occurred, and should be repaired immediately, to prevent animals from escaping, to prevent easy access for poaching, and intrusion by predators.<br>15.14. On farms or in areas where livestock / game occur, erect fences according to appropriate specifications (depending on the type on animals that occur on the farms) for the construction camps and construction servitude to protect animals from construction-related activities.<br>15.15. Where necessary, electrified fences on game farms should be erected according to appropriate specifications depending on the type of animals that occur on the property. Safety precautions should be implemented for electrified fences. All electrified fences should comply with minimum safety standards.<br>15.16. Where necessary, game screens should be erected to minimise construction-related impacts (e.g. noise) to animals on game farms |

| | |
|---|---|
| • Disruption of existing services. | 15.17. Identify and record existing services, including reticulation.<br>15.18. Conform to requirements of relevant service providers (e.g. Telkom, Eskom, water, sewerage, roads) and Exxaro (for existing pipeline) when working within servitudes of existing services.<br>15.19. Immediately notify service providers of disturbance to services. Rectify disturbance to services, in consultation with service providers. Maintain a record of all disturbances and remedial actions on site.<br>15.20. Notify landowners of any disruptions to essential services.<br>15.21. Deviate landowners' existing services (e.g. reticulation, irrigation lines), where possible, to accommodate construction avidities |
| • An increase in the risk of criminal activity due to an influx of workers during the construction and operational phases. | 15.22. Prevent trespassing of construction workers on private property.<br>15.23. Construction workers to clearly identifiable. |
| • Impacts to farming operations. | 15.24. Adequate consultation with landowner to determine specific requirements in terms of farming operations.<br>15.25. If and where feasible, coordinate construction activities with farming activities, to minimise disruptions in respect of both sets of activities. |

| | +/- Impacts | Extent | Magnitude | Duration | Probability | Significance |
|---|---|---|---|---|---|---|
| **Before Mitigation** | –- | local | medium-high | short-term | likely | 3 |
| **After Mitigation** | –- | local | medium | short-term | unlikely | 2 |

| **Environmental Feature** | **16. Socio-economic aspects** |
|---|---|
| **Relevant Alternatives & Activities** | **All alternatives; borrow pits, construction camps** |
| **Project life-cycle** | **Construction phase** |
| **Potential Impact** | **Proposed Management Objectives / Mitigation Measures** |
| • Job creation.<br>• Direct opportunities for Small Medium and Micro Enterprise (SMMEs) | 16.1. Establish a 'labour and employment desk'.<br>16.2. Create opportunities for the employment of women.<br>16.3. Where possible use labour-intensive methods of construction.<br>16.4. Use local labour as far as possible.<br>16.5. Develop a community labour agreement with targets for employment and for progression.<br>16.6. Training of labour to benefit individuals beyond completion of the project.<br>16.7. Preference to be given to local SMMEs, as far as practicable. |

| | +/- Impacts | Extent | Magnitude | Duration | Probability | Significance |
|---|---|---|---|---|---|---|
| **Before Mitigation** | + | local | low | short-term | unlikely | 1 |
| **After Mitigation** | + | local | medium | short-term | unlikely | 2 |

| Environmental Feature | 17. Socio-economic aspects |
|---|---|
| Relevant Alternatives & Activities | Main Route |
| Project life-cycle | Construction phase |

| Potential Impact | Proposed Management Objectives / Mitigation Measures |
|---|---|
| Damage to property and risk to residents of the Phumolong Community Trust, if dwellings encroach upon construction footprint. | 17.1. Preventative measures to ensure that dwellings of the Phumolong Community Trust in Steenbokpan do no encroach onto permanent servitude.<br>17.2. Resettlement must be conducted in terms of international best practice and accompanied by a comprehensive resettlement action plan. |

| | +/- Impacts | Extent | Magnitude | Duration | Probability | Significance |
|---|---|---|---|---|---|---|
| **Before Mitigation** | + | local | low | short-term | unlikely | 1 |
| **After Mitigation** | + | local | medium | short-term | unlikely | 2 |

## 10.8 Archaeological and Cultural Features

### *10.8.1 Impact Overview*

In order to reduce the impact to the environment, the pipeline route was selected to follow existing linear infrastructure. The potential for heritage resources along the existing Exxaro pipeline and other linear infrastructure is anticipated to be minimal due to the previous disturbances that would have been caused during the construction of this infrastructure.

A Phase 1 Heritage Impact Assessment, in accordance with Section 38 of the South African Heritage Resources Act (No. 25 of 1999), was conducted as the project exceeds 300m in length.

The Limpopo Heritage Resources Authority (LIHRA) was consulted and has indicated (in a letter dated 11 November 2009, included in **Appendix B**) that "*the LIHRA established no facts to challenge the proposed development*".

The primary objective of the EMP in terms of archaeology / historical resources is to ensure that no artifacts of historical or cultural value are negatively impacted, damaged or destroyed.

### *10.8.2 Impact Assessment*

| Environmental Feature | 18. Archaeological and Cultural Features |
|---|---|
| Relevant Alternatives & Activities | All alternatives; borrow pits, construction camps |
| Project life-cycle | Construction phase |

| Potential Impact | Proposed Management Objectives / Mitigation Measures |
|---|---|
| Disturbance of heritage resources. | 18.1. Should remains and/or artefacts be discovered on the site during earthworks, all work will cease in the area affected and the Contractor will immediately inform the Construction Manager.<br>18.2. Should any heritage resources be exposed during excavation or be found on site, a registered heritage specialist must be called to site for inspection.<br>18.3. Should any heritage resources be exposed during excavation or be found on site, the relevant heritage resource agency (i.e. LIHRA) must be informed about the finding.<br>18.4. Under no circumstances may any heritage material be destroyed or removed from site.<br>18.5. Should any remains be found on site that is potentially human remains, the South African Police Service should also be contacted. |

| | +/- Impacts | Extent | Magnitude | Duration | Probability | Significance |
|---|---|---|---|---|---|---|
| **Before Mitigation** | –- | local | medium-high | short-term | unlikely | 2 |
| **After Mitigation** | –- | local | low | short-term | unlikely | 1 |

## 10.9 Visual Quality

### *10.9.1 Impact Overview*

Construction activities will be visually obtrusive against the bushveld backdrop. A temporary construction servitude will be established along the pipeline route, wherein vegetation will be cleared to allow for trenching and the installation of the pipeline and building of chambers. The areas earmarked for the construction camps will also need to be cleared of vegetation. The borrow pits required to source suitable fill material will also be unsightly whilst they remain un-rehabilitated.

Where possible, development corridors (i.e. where there is existing linear infrastructure such as roads and the existing pipeline) and farm boundaries were selected as alignment criteria for the pipeline. This approach was adopted to *inter alia* minimise the visual impact of the pipeline.

The VIA for MCWAP Phase 1 (Axis Landscape Architecture, 2010), only concentrated on the following:

- Alternatives A and B, where the last-mentioned was identified as an option following concerns raised by the landowner regarding installing the pipeline along the access road to Mokolo Dam (i.e. Alternative A). According to Axis Landscape Architecture (2010), the servitude of Alternative A will be highly visible from some vantage points and erven in the Sable Hills Eco Park. Alternative B will only be visible while driving on the local roads at the end of the servitude next to the dam. During the construction phase the severity and visual intrusion of Alternative A will be high due to the exposed soil and enlarged servitude while Alternative B will be moderate due to the screening of the vegetation and topography.
- Break Pressure Tank at Rietspruitnek, situated on the Farm Fancy 556LQ.

The VIA did not consider the remainder of the project area, as the pipeline will be underground and it follows existing linear infrastructure. Mitigation measures are prescribed in the EMP to ensure that the visual appearance of the construction site is not an eyesore the adjacent areas. Examples include the erection of a suitable fence and screen during construction and the reinstatement and rehabilitation of the development footprint.

### *10.9.2 Impact Assessment*

| **Environmental Feature** | **19. Visual Quality** |
|---|---|
| **Relevant Alternatives & Activities** | **All alternatives; borrow pits, construction camps** |
| **Project life-cycle** | **Construction phase** |

| **Potential Impact** | **Proposed Management Objectives / Mitigation Measures** |
|---|---|
| Reduction in visual quality due to construction activities. | 19.1. Suitable screening of works area.<br>19.2. Construction camps to be situated in areas with reduced impact to tourists.<br>19.3. Ongoing housekeeping to maintain a tidy construction area.<br>19.4. Proper reinstatement and rehabilitation of construction area. |

| | **+/- Impacts** | **Extent** | **Magnitude** | **Duration** | **Probability** | **Significance** |
|---|---|---|---|---|---|---|
| **Before Mitigation** | –- | local | medium-high | short-term | likely | 2 |
| **After Mitigation** | –- | local | medium | short-term | likely | 1 |

| Environmental Feature | 20. Visual Quality |
|---|---|
| Relevant Alternatives & Activities | Main Route – Operational Reservoir |
| Project life-cycle | Operation phase |
| **Potential Impact** | **Proposed Management Objectives / Mitigation Measures** |
| Reduction of visual quality of area surrounding BPT | 20.1. Reduction in visual impact (e.g. screening, blending, etc.). |

| | +/- Impacts | Extent | Magnitude | Duration | Probability | Significance |
|---|---|---|---|---|---|---|
| **Before Mitigation** | –- | local | medium | long-term | likely | 2 |
| **After Mitigation** | –- | local | medium | long-term | likely | 1 |

## 10.10 Positive Impacts

To allow for a balanced impact evaluation of MCWAP Phase 1, the various positive effects and outcomes that may be brought about by the project need to be considered. The potential positive impacts may include the following:

- Water provision for major strategic developments in the industrial and mining sectors;
- Water provision for commercial and domestic developments;
- Employment creation and skills transfer (mainly during the construction phase);
- Opportunities for local Contractors, suppliers and informal traders (mainly during the construction phase);
- Through adequate negotiations, directly affected landowners can apply for water take-off points for domestic and stock-watering purposes only;
- Possible opportunity to rehabilitate previous Exxaro pipeline footprint; and
- The area cleared as a permanent servitude would create a break in the dense vegetation that will serve as a firebreak belt and may be of use as an access route in times of emergency. This also provides an anti-poaching patrol corridor if the landowner chooses to use it in this manner.

Mitigation measures to promote the project's positive impacts are included in the EMP.

## 10.11 Cumulative Impacts

| Box 5: | What is a "Cumulative Impact"? |
|---|---|
| According to GN No. R. 385 (2006), ***"cumulative impact"***, in relation to an activity, means the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area. | |

### *10.11.1 Watercourse Crossings*

Where the pipeline follows existing linear infrastructure, and thus traverses watercourses alongside existing crossings, a cumulative impact may be caused to the water resource quality (i.e. flow, water quality, aquatic biota and habitat). By implementing the mitigation measures contained in the EMP and in **Section 10.1**, which includes the maintenance of a dry works area and adequate reinstatement (including erosion protection) and rehabilitation measures, these impacts should be managed at a satisfactory level. By crossing watercourses alongside existing infrastructure, the overall impact to the receiving water environment should be less that creating a new crossing point.

### *10.11.2 Development corridor*

Cumulative impacts are possible when increasing the footprints of existing linear developments (e.g. pipeline, roads, power lines). However, the adoption of a development corridor aims to lessen the impacts to environmental features such as visual quality, flora, fauna, socio-economic aspects, heritage resources, especially when considered from a macro scale. Individual landowners on smaller farms could be detrimentally affected by increased development corridors, which needs to be considered.

### *10.11.3 Noise*

The new pump station at Mokolo Dam together with the existing pump station will have to provide the total requirements until the completion of the Crocodile River Transfer Scheme. The two operational pump stations would lead to an incremental increase in noise levels. With the adoption of the noise attenuation measures and mitigation

measures included in the EMP, and considering the remoteness of the pump stations, the impacts should be adequately mitigated. Noise measurements during the operational stage would prescribe any additional interventions required to ensure that noise levels remain within regulated ranges.

### *10.11.4 Air*

During construction, cumulative effects to air quality could be caused by the construction activities associated with the various developments along the delivery line (from Lephalale to Steenbokpan). However, dust from the pipeline installation should be sufficiently managed by the measures included in the EMP.

### *10.11.5 Traffic*

Heavy vehicle construction traffic for the delivery of material and transportation of soil to-and-from borrow pits and the transportation of construction workers will lead to an increase in traffic on the regional transportation network. With the implementation of the Traffic Management Plan and consultation with the road infrastructure authorities, impacts should be ameliorated to tolerable levels.

### *10.11.6 Social Aspects*

In a regional context, the various developments earmarked for the greater Waterberg District will lead to the influx of job seekers, with potential cumulative impacts. The mitigation measures contained in the SIA and EMP are deemed suitable to manage these impacts.

# 11 LEGISLATION AND GUIDELINES CONSIDERED

## 11.1 Legislation

The legislation that has possible bearing on MCWAP Phase 1 is captured in **Table 26** below. **Note:** this list does not attempt to provide an exhaustive explanation, but rather an identification of the most appropriate sections from pertinent legislation.

**Table 27: Environmental Statutory Framework for MCWAP Phase 1**

| Legislation | Relevance |
|---|---|
| Constitution of the Republic of South Africa, (No. 108 of 1996) | • Chapter 2 – Bill of Rights.<br>• Section 24 – environmental rights. |
| National Environmental Management Act (No. 107 of 1998) | • Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment).<br>• Section 28 – Duty of care and remediation of environmental damage.<br>• Environmental management principles.<br>• Authorities – DEA and DEDET. |
| GN No. R. 385 of 21 April 2006 | • Process for undertaking Scoping and the EIA. |
| GN No. R. 386 of 21 April 2006 | 1 The construction of facilities or infrastructure, including associated structures or infrastructure, for:<br>(k) the bulk transportation of sewage and water, including storm water, in pipelines with -(a) an internal diameter of 0,36 metres or more; or(b) a peak throughput of 120 litres per second or more;<br>(m) any purpose in the one in ten year flood line of a river or stream, or within 32 metres from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including - canals; channels; bridges; dams; and weirs;<br>4 The dredging, excavation, infilling, removal or moving of soil, sand or rock exceeding 5 cubic meters from a river, tidal lagoon, tidal river, lake, in-stream dam, floodplain or wetland.<br>7 The above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic metres but less than 1 000 cubic metres at any one location or site.<br>12 The transformation or removal of indigenous vegetation of 3 hectares or more or of any size where the transformation or removal would occur within a critically endangered or an endangered ecosystem listed in terms of section 52 of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).<br>15 The construction of a road that is wider than 4 metres or that has a reserve wider than 6 metres excluding roads that fall within the ambit of another listed activity or which are access roads of less than 30 metres long. |

| Legislation | Relevance |
|---|---|
| | 16 The transformation of undeveloped, vacant or derelict land to – establish infill development covering an area of 5 hectares or more, but less than 20 hectares; or residential, mixed, retail, commercial, industrial or institutional use where such development does not constitute infill and where the total area to be transformed is bigger than 1 hectare.<br>20 The transformation of an area zoned for use as public open space or for a conservation purpose to another use. |
| GN No. R. 387 of 21 April 2006 | 1 The construction of facilities or infrastructure, including associated structures or infrastructure, for:<br>(c) the above ground storage of a dangerous good, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of 1 000 cubic metres or more at any one location or site including the storage of one or more dangerous goods, in a tank farm;<br>(n) the transfer of 20 000 cubic metres or more water between water catchments or impoundments per day;<br>(o) the final disposal of general waste covering an area of 100 square metres or more or 200 cubic metres or more of airspace.<br>2 Any development activity, including associated structures and infrastructure, where the total area of the developed area is, or is intended to be, 20 hectares or more.<br>7 Reconnaissance, exploration, production and mining as provided for in the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), as amended in respect of such permits and rights.<br>10 Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). |
| National Water Act (No. 36 of 1998) | • Chapter 3 – Protection of water resources.<br>• Section 6 to 18 – The Reserve.<br>• Section 19 – Prevention and remedying effects of pollution.<br>• Section 20 – Control of emergency incidents.<br>• Chapter 4 – Water use.<br>• Watercourse crossings.<br>• Authority – DWA. |
| Environment Conservation Act (No. 73 of 1989): | • Environmental protection and conservation.<br>• Section 25 – Noise regulation.<br>• Section 20 – Waste management.<br>• Authority – DEA |
| National Environmental Management Air Quality Act (No. 39 of 2004) | • Air quality management<br>• Section 32 – dust control.<br>• Section 34 – noise control.<br>• Authority – DEA. |
| National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004) | • Management and conservation of the country's biodiversity.<br>• Protection of species and ecosystems.<br>• Authority – DEA. |
| National Environmental Management: Protected Areas Act (No. 57 of 2003) | • Protection and conservation of ecologically viable areas representative of South Africa's biological diversity and natural landscapes. |
| National Forests Act (No. 84 of 1998) | • Section 15 – authorisation required for impacts to protected trees. |

| Legislation | Relevance |
|---|---|
| | • Authority – DWA. |
| Minerals and Petroleum Resources Development Act (No. 28 of 2002) | • Permit required for borrow pits.<br>• Authority – Department of Mineral Resources (DMR). |
| Occupational Health & Safety Act (No. 85 of 1993) | • Provisions for Occupational Health & Safety<br>• Authority – Department of Labour. |
| National Heritage Resources Act (No. 25 of 1999) | • Section 34 – protection of structure older than 60 years.<br>• Section 35 – protection of heritage resources.<br>• Section 36 – protection of graves and burial grounds.<br>• Section 38 – Heritage Impact Assessment for linear development exceeding 300m in length; development exceeding 5 000m$^2$ in extent.<br>• Authority – LIHRA |
| Conservation of Agricultural Resources Act (No. 43 of 1983) | • Control measures for erosion.<br>• Control measures for alien and invasive plant species.<br>• Authority – Department of Agriculture. |
| World Heritage Convention Act (No. 49 of 1999) | • Protection of World Heritage Sites. |
| National Road Traffic Act (No. 93 of 1996) | • Authority – Department of Transport |
| Tourism Act of 1993 | • Authority – South African Tourism Board |
| Limpopo Environmental Management Act (No. 7 of 2003) | • Management and protection of the environment in the Limpopo Province. |

## 11.2 Environmental Authorisations Required

From the relevant legislation listed in **Section 11.1**, the following environmental authorisations will be required for MCWAP Phase 1:

1. Approval required from DEA for listed activities associated with the project. Scoping and EIA conducted under NEMA, in accordance with the EIA Regulations (GN No. R385, R386 and R387 of 21 April 2006).
2. Permit to be obtained under National Forests Act (No. 84 of 1998) if protected trees are to be cut, disturbed, damaged, destroyed or removed.
3. Permit to be obtained from LIHRA under the National Heritage Resources Act (No. 25 of 1999) if heritage resources are to be impacted on.
4. Environmental Management Programme to be submitted for approval to DMR for borrow pits, under the Minerals and Petroleum Resources Development Act (No. 28 of 2002).
5. Water use authorisation for end users of transferred water, in terms of Section 21 of the National Water Act (No. 36 of 1998).

Should portable sewage treatment works be required, based on the available capacity of the Paarl Sewage Treatment Works at the time of construction, then the necessary authorisation must be sought in terms of the National Water Act (No. 36 of 1998) and NEMA, if applicable.

# 12 PUBLIC PARTICIPATION – EIA PHASE

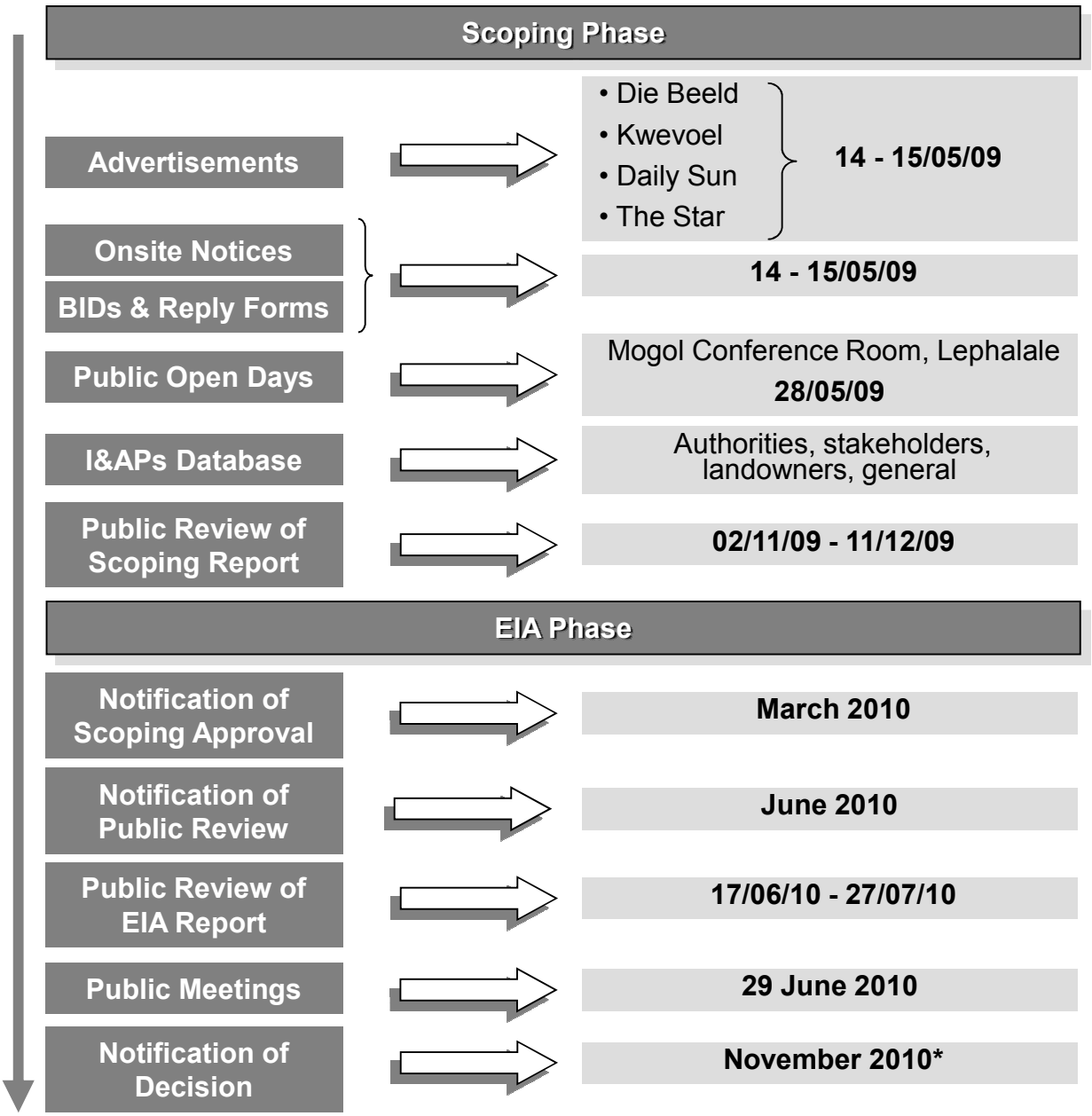
The purpose of public participation for MCWAP includes:

5. Providing I&APs with an opportunity to obtain information about MCWAP;
6. Allowing I&APs to present their views, issues and concerns regarding MCWAP;
7. Granting I&APs an opportunity to recommend measures to avoid or reduce adverse impacts and enhance positive impacts associated with MCWAP; and
8. Enabling DWA and the project team to incorporate the needs, concerns and recommendations of I&APs into the project.

| Box 6: | What is an "I&AP"? |
|---|---|
| According to GN GN No. R. 385 (2006), "*Interested and Affected Party*" (I&AP) means an party contemplated in section 24(4)(d) of the NEMA, and which in terms of that section includes –<br>(a) any person, group of persons or organisation interested in or affected by an activity; and<br>(b) any organ of state that may have jurisdiction over any aspect of the activity. | |

The public participation process that was followed for MCWAP Phase 1 is governed by NEMA and GN No. R. 385. The amended Plan of Study for the EIA (refer to **Appendix A**) stipulates the activities to be undertaken as part of the public participation for MCWAP Phase 1, in accordance with regulatory requirements, which forms the basis of the discussions to follow. Note that the public participation conducted for the Scoping phase will not receive attention in this section as it was comprehensively discussed in the Scoping Report. Emphases will thus primarily be placed on the EIA public participation process.

**Figure 60** outlines the public participation process undertaken for the MCWAP Phase 1 Scoping and Environmental Impact Assessment phases.




**Note:** * - *dates may change during course of EIA*

**Figure 60: Public Participation Process for MCWAP Phase 1**

## 12.1 Maintenance of the I&AP Database

The database of I&APs (refer to **Appendix K**), which contains particulars of *inter alia* authorities, stakeholders, landowners and members of the general public, was maintained during the EIA phase. Note that the directly affected landowners were

identified using the information provided by Exxaro for their existing pipeline from Mokolo Dam, through a deed search on all the affected properties within a 200m corridor for the pipeline route, and through discussions held with the Agricultural Sector, Councillors and known landowners. For the water users downstream of the Mokolo Dam, extensive consultation was been undertaken with the Mokolo Irrigation Board especially through Working Groups.

## 12.2 Notification – Approval of Scoping Report

Advertisements were placed in the following newspapers as notification that the Scoping Report had been approved by DEA (refer to copies of the newspaper advertisements contained in **Appendix L**):

- Regional newspapers –
  - Die Beeld (Afrikaans) on 11 March 2010; and
  - The Star (English) on 11 March 2010.
- Local newspaper –
  - Kwevoel (Afrikaans) on 12 March 2010; and
  - Mogol Pos (Afrikaans) on 12 March 2010.

In addition, all I&APs on the database were notified of the approval of the Scoping Report and commencement of the EIA phase via fax, email or registered mail.

## 12.3 Appraisal of Alternatives Suggested by I&APs

Notable comments received regarding deviations from the proposed pipeline alignment include a proposed alternative route suggested by the landowner of the Farms Wolvenfontein 645LQ and Witbank 647LQ. To accommodate the recommendations from the I&AP, Alternative B was incorporated into the EIA and was evaluated from a technical and environmental perspective. The comparative analysis found Alternative B to be the preferred option (as opposed to Alternative A).

## 12.4 Comments and Response Report

Note that during the initial notification period of the Scoping process, comments were received after the specified cut-off date of 19 June 2009, which excludes comments on the draft Scoping Report which were included in the final Scoping Report submitted to DEA. The Scoping Comments and Response Report stipulated that these comments would be attended to during the EIA phase, and that the comments would only appear in the EIA Comments and Response Report, which would be lodged in the public domain.

The correspondence received from I&APs during the EIA phase and after 19 June 2009 is included in **Appendix M**. The EIA Comments and Response Report (contained in **Appendix N**) summarises the salient issues and queries raised, as well as statements made, by I&APs through correspondence received (including completed Reply Forms, letters, faxes and emails) and discussions at meetings during the EIA phase. This report also attempts to address the comments through input from the project team.

All comments received following the public review of the draft EIA Report will be included in the EIA Comments and Response Report of the final EIA Report to be submitted to DEA.

## 12.5 Review of Draft EIA Report

### *12.5.1 Notification*

I&APs were notified as follows of the opportunity to review the draft EIA Report:

1. A notification letter and a summary of the draft EIA Report were forwarded to I&APs; and
2. The following newspaper advertisements were placed as notification in June 2010:
   - Regional newspapers –
     - Die Beeld (Afrikaans);
     - The Star (English);
   - Local newspaper –
     - Kwevoel (Afrikaans);

- Mogol Pos (Afrikaans).

### *12.5.2 Lodging of Draft EIA Report*

The draft EIA Report was placed at the locations provided in **Table 28** to allow the I&APs to review the document. A forty-day review period (from **17 June 2010 until 27 July 2010**) is granted.

**Table 28: Locations for review of Draft EIA Report**

| Copy No. | Location | Address | Tel No. |
|---|---|---|---|
| 1 | Lephalale Local Municipal office | Lephalale Civic Centre, corner of Joe Slovo and Dou Water St, Lephalale | 014 763 2193 |
| 2 | Lephalale Public Library | | 014 762 1453 |
| 3 | Lephalale Dept of Agriculture | Cnr Chris Hani Street and Groote Geluk St | 014 763 2137 |
| 4 | Agri Lephalale Office | 6A Jacobus St | 014 763 1888 |
| 5 | Lephalale District Agricultural Union | NTK Landmerk Gebou, Louis Botha Ave | 014 763 3263 |
| 6 | Mokolo Irrigation Board | Ellisras Hardeware Gebou, Office No. 4, Stroh St | 014 763 3095 |
| 7 | Steenbokpan Winkel | Steenbokpan | 014 766 0167 |
| 8 | Transvaal Agricultural Union (TAU) | Obaro, Warmbadweg, Thabazimbi | 072 549 8579 |
| 9 | Crocodile River West Irrigation Board | Koedoeskop | 014 785 0610 |
| 10 | Makoppa Irrigation Board | G. Fritz, Farm Fairfield, Makoppa | 083 469 3777 |
| 11 | Hartbeespoort Irrigation Board | Nick Fourie, Brits | 082 332 3223 |
| 12 | Pretoria Central Library | Cnr Van der Walt and Vermeulen St | 012 358 8954 |

The draft EIA Report can also be downloaded from the DWA website (http://www.dwaf.gov.za/projects.asp).

### *12.5.3 Commenting on the Draft EIA Report*

For remarks on the draft EIA Report the reviewer can complete Comment Sheets, which is included in **Appendix P**. These completed Comment Sheets need to be forwarded to Nemai Consulting on or before 27 July 2010.

Comments received from I&APs from the review of the draft EIA Report will be contained in the updated Comments and Response Report in the final EIA Report, which will be submitted to DEA.

### *12.5.4 Public Meeting*

Public meetings will be held to present the MCWAP Phase 1 draft EIA Report on 29 June 2010 at the Mogol Conference Room in Lephalale (09h00 – 12h00) and the Ashante venue in the vicinity of the Mokolo Dam (15h00 – 18h00). All I&APs were notified via email, fax or post regarding the details of the meeting. Advertisements were also placed in local and regional newspapers (same as listed in **Section 12.2**) in June 2010 as notification of the public meeting. The aims of the meetings include the following:

- To present the project details (i.e. scheme components);
- To present the findings of the specialist studies;
- To address key issues raised during the Scoping Phase;
- To elaborate on the potential environmental impacts (qualitative and quantitative), and the proposed mitigation of these impacts;
- To present the findings of the comparative analysis of the alternatives;
- To explain the EIA process; and
- To allow for queries and concerns to be raised, and for the project team to respond.

Opportunity will be provided directly after the public meeting for I&APs to view the project information (including maps, posters, aerial photographic fly-over and presentations) and to interact more closely with the project team and specialists present.

### *12.5.5 Authorities Meeting*

A Scoping-phase authorities meeting was held on 14 July 2009 with DEA, DEDET, DMR, DWA and the Waterberg District Municipality, and apologies were tendered by local authorities.

An EIA-phase authorities meeting will be scheduled with the following parties to present the draft EIA Report:

- DEA;
- DEDET;
- DMR;

- DWA;
- Department of Agriculture;
- Waterberg District Municipality; and
- Lephalale Local Municipality.

## 12.6 Notification of DEA Decision

All I&APs will be notified via email, fax or post within 10 days after having received written notice from DEA on the final decision for MCWAP Phase 1 EIA Report. Advertisements will also be placed in local and regional newspapers regarding the Department's decision. These notifications will include the appeal procedure to the decision and key reasons for the decision. A copy of the decision would be provided to I&APs on request.

## 12.7 Broader Public Involvement Process

Over-and-above public participation associated with the EIA protocol, a broader Public Involvement Process (PIP) is also being conducted for MCWAP to ensure that comprehensive, inclusive and robust consultative procedures are followed. The process aims to also adhere to the DWAF Generic Public Participation Guidelines (2001).

The Agricultural Sector is the most prominent interest group, considering the issues surrounding water availability and the land use type encountered in the project area. From the overall MCWAP perspective, key members from this sector include (*inter alia*):

- Lephalale District Agricultural Union;
- Transvaal Agricultural Union (TAU);
- Agri SA;
- National African Farmers' Union (NAFU);
- Mokolo Irrigation Board;
- Crocodile West Irrigation Board;
- Hartebeespoort Dam Irrigation Board;
- Makoppa farmers; and

- Steenbokpan Farmers Association.

In recognition of the above-mentioned, the project team engaged with this sector prior to the initiation of the EIA process. On 27 January 2009 a meeting was convened with representatives from the Agricultural Sector, in order to establish an Agricultural Forum. This forum, which has been active since March 2009, grants the Agricultural Sector an opportunity to collectively engage with DWA and the project team regarding planning aspects and the impacts of MCWAP on this interest group. Working groups have also been held with the irrigation boards, which allowed for more technically-orientated discussions.

**Appendix O** contains a report on the matters raised by the Agricultural Sector. The purpose of this report is to provide a brief description of the water resources situation and planning processes followed by DWA whereby the proposed project to augment water supplies to the Lephalale area was derived at. The purpose of the report is further also to group and consolidate the array of questions, matters and concerns raised by the representatives of the Agricultural Sector, discuss it and to provide response to these matters. In most instances this report serves to briefly confirm the responses already provided at meeting(s) of the Agri-Forum and Crocodile and Mokolo working groups.
With the above objective in mind the report serves to exchange information regarding the planning processes already followed, the water resources available and the processes that will still follow.

A Project Steering Committee (PSC) chaired by DWA was established for MCWAP, and meetings have been held on 03 February 2009 (PSC Meeting no.1) and 03 March 2010 (PSC Meeting no.2). The purpose of the meetings was to allow for the sharing of information, to ensure improved coordination, and to provide a platform for high-level discussions between the intended water users, affected parties and various relevant government departments and stakeholders.

Separate meetings were held with landowners that are directly affected by the project infrastructure. These meetings served to identify concerns of I&APs, and to guide the technical and environmental investigations.

A summary of the meetings held under the overall MCWAP PIP and Scoping phase public participation is tabulated below.

**Table 29: Meetings held for MCWAP PIP and Scoping public participation**

| MCWAP Phase 1 Project Meetings | | | | |
|---|---|---|---|---|
| **No.** | **Date** | **MCWAP Component** | **Audience/ Party / Landowner** | **Venue** |
| 1. | 27-01-09 | Phase 1, 2 and De-bottlenecking | Thabazimbi – Lephalale Agri sector | Ben Alberts Nature Reserve |
| 2. | 03/02/09 | Project Steering Committee | All Stakeholders | Lephalale Palm Hotel |
| 3. | 05-03-09 | Phase 1 & De-bottlenecking | Mokolo Dam – Lephalale – Steenbokpan affected landowners | Ashante Conference Venue |
| 4. | 06-03-09 | Phase 1, 2 and De-bottlenecking | Thabazimbi – Lephalale Water Forum | Rra Dtau Game Lodge |
| 5. | 06-03-09 | Phase 1, 2 and De-bottlenecking | Thabazimbi – Lephalale Environmental Forum | Rra Dtau Game Lodge |
| 6. | 26-05-09 | Phase 1 & De-bottlenecking | Mokolo Working Group | Koedoeskop Agricultural Union Hall |
| 7. | 26-05-09 | Phase 1, 2 and De-bottlenecking | Thabazimbi – Lephalale Agri Sector – Agri Forum | Koedoeskop Agricultural Union Hall |
| 8. | 28-05-09 | Phase 1 | Mokolo Dam – Lephalale – Steenbokpan affected landowners | Mogol Klub |
| 9. | 28-05-09 | Phase 1 & De-bottlenecking | Mokolo Dam – Lephalale – Steenbokpan affected landowners | Ashante Conference Venue |
| 10. | 22-06-09 | Phase 1 | Farm Witbank/ Wolvenfontein R/645 | Farm Witbank |
| 11. | 22-06-09 | Phase 1 & De-bottlenecking | Farm Goedgedaght | Ashante Conference Venue |
| 12. | 22-06-09 | Phase 1 & De-bottlenecking | Farms Fancy, Fouriekloof & Goedehoop | Waterfall Lodge |
| 13. | 22-06-09 | Phase 1 | Farms Fancy and Worcester | Farm: Fancy |
| 14. | 08-07-09 | Phase 1 | Farm Fouriekloof | Modimolle (Nylstroom) |
| 15. | 08-07-09 | Phase 1 & De-bottlenecking | Farm Wolvenfontein 3/645 | Farm Wolvenfontein 3/645 |
| 16. | 08-07-09 | Phase 1 | Farm Zeeland R/526 | Farm Zeeland R/526 |
| 17. | 08-07-09 | Phase 1 | Farms Buffelsjagt, Enkeldraai & Kringgatspruit | Farm Buffelsjagt |
| 18. | 08-07-09 | Phase 1 | Farm Worcester | Mogol Klub |
| 19. | 10-07-09 | Phase 1 & Phase 2 | Steenbokpan Area | Steenbokpan Agricultural Union Hall |
| 20. | 10-07-09 | Phase 1 & Phase 2 | Farm Theunispan 23/293 - Phomulong Community Trust | Steenbokpan Winkel |
| 21. | 14-07-09 | Phase 1 | Farm Taaiboschpan | Aurecon Offices - Centurion |
| 22. | 17-07-09 | Phase 1 & De-bottlenecking | Farm Wolvenfontein 1/645 | KV3 Offices - Pretoria |

| MCWAP Phase 1 Project Meetings | | | | |
|---|---|---|---|---|
| **No.** | **Date** | **MCWAP Component** | **Audience/ Party / Landowner** | **Venue** |
| 23. | 28-07-09 | De-bottlenecking Phase | Farm Sterkfontein 3/642 | KV3 Offices - Pretoria |
| 24. | 22-09-10 | Phase 1 & Phase 2 | Farm Taaiboschpan | Aurecon Offices - Centurion |
| 25. | 05-11-09 | Phase 1 & De-bottlenecking | Farm Wolvenfontein 3/645 | Aurecon Offices, Centurion |
| 26. | 12-11-09 | Phase 1 | Phase 1 Public Meeting | Mogol Klub, Lephalele |
| 27. | 12-11-09 | De-bottlenecking | De-bottleneckiong Public Meeting | Ashante Conference Venue |
| 28. | 13-11-09 | Phase 1 | Farm Wolvenfontein 3/645 (Site Visit) | Farm Wolvenfontein 3/645 |
| 29. | 13-11-09 | Phase 1 | Farm Fancey (Site Visit) | Farm Fancey |
| 30. | 13-01-10 | Phase 1 | Farm Hanglip 1&3/508 | Maxis, Lephalale |
| 31. | 14-01-10 | Phase 1 & Phase 2 | Farm Vangpan 294 | Farm Vangpan 294 |
| 32. | 31-01-10 | Phase 1 & Phase 2 | Farm Theunispan 23/293 - Phomulong Community Trust | Farm Theunispan |
| 33. | 01-03-10 | Phase 1 & De-bottlenecking | Mokolo Working Group | Mokolo Irrigation Board Offices |
| 34. | 25-03-10 | Phase 1, 2 and De-bottlenecking | Thabazimbi – Lephalale Agri Sector – Agri Forum | Thaba Nkwe, Thabazimbi |

## 12.8 Landowner Consent

In terms of regulation 16(1) of GN No. R. 385 of 21 April 2006, landowner consent is required if the applicant (i.e. DWA) is not the owner of the land on which the proposed activity is to be undertaken. According to regulation 16(3), this stipulation does not apply to a linear activity provided the applicant "has given notice of the proposed activity to the owners of the land on which the activity is to be undertaken as soon as the proposed route or route alternatives have been identified". The last mentioned provision was attended to during public participation. Landowner consent will thus not be sought for the linear components of MCWAP Phase 1.

For the Break Pressure Tank on the Farm Fancy 556LQ, all site inspections were undertaken with prior consent of the landowner. However, the landowner refused to sign the Landowner Consent Form without the clarification of matters pertaining to future water costs, which are attended to in the Comments and Response Report.

# 13 ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

It should be noted that the sizing and exact location of the MCWAP-related infrastructure takes place within a dynamic planning environment, with role-players such as the intended end users of the transferred water, affected landowners, authorities and other stakeholders. The information presented in this draft EIA Report is consistent with what was communicated to I&APs during public participation.

The approach adopted during the environmental assessment included the appraisal of a 200m-wide corridor (i.e. 100m on either side of the centre line). This allows for reasonable deviations from the proposed alignment within this corridor, based on potential onsite constraints (e.g. existing structures, geotechnical conditions, sensitive environmental features).

The final design will endeavour to align the pipeline as close as possible to existing linear infrastructure, within the confines of servitude restrictions and site-specific limitations. Although the placement of the pipeline in relation to the infrastructure (i.e. north, south, east or west) is not specified in the EIA Report, every feasible attempt will be made to select the alignment with the least overall impact (i.e. BPEO).

The following gaps in knowledge accompany the MCWAP Phase 1 EIA:

- For the VIA, the level of assessment excludes surveys to establish viewer preference and thereby their sensitivity. Viewer sensitivity is determined by means of a commonly used rating system (Axis Landscape Architecture, 2010).
- Although a detailed floral assessment for the identification of exact locations of protected species was not conducted, a floral survey will be undertaken prior to construction to identify and mark protected species.

# 14 EIA CONCLUSIONS AND RECOMMENDATIONS

Cognisance must be taken of the following sensitive environmental features, for which mitigation measures are included in the EIA Report and EMP:

- Steep areas encountered along the pipeline route include the section on the Farm Witbank 647LQ and at Rietspruitnek on the Farm Fancy 556LQ. Measures to prevent erosion would need to be adopted for these areas.
- Watercourse crossing, namely at the Mokolo River (tributary only), Rietspruit (tributary and main stem), Kutangspruit (tributary and main stem) and Sandloop River (tributary and main stem), could adversely affect resource quality (i.e. flow, water quality, habitat and aquatic biota).
- For groundwater resources, care must be taken when blasting in close proximity to boreholes.
- Apart from the areas adjacent to existing linear disturbances, the vegetation along the Phase 1 pipeline route has a high conservation priority, especially on game farms. Important flora species along the route include *Acacia erioloba*, *Adansonia digitata, Boscia albitrunca*, *Combretum imberbe*, *Sclerocarya birrea* subsp. *caffra*. Maintaining floral biodiversity by managing exotic species is also crucial.
- Animals on game farms require specific measures to ensure that risks and disturbances are adequately managed.
- Special care should be exercised to minimise traffic disruptions along the R510 road, access road to Mokolo Dam, the new road around the Medupi power station in the already degraded area and other lower order roads which are situated alongside to the pipeline route.
- Informal dwellings in Steenbokpan in the area that belongs to the Phumolong Community Trust.
- Heritage resources identified along pipeline route include:
  - Cemetery on the Farm Goedgedacht;
  - Farm house on the Farm Goedgedacht;
  - Hennie de Lange's Kafee Theunispan; and
  - Steenbokpan Bosveld Drankwinkel.

There are two main categories of impacts, coupled with the related I&AP issues, namely:

- **Impacts associated with the development of the physical infrastructure -**
  Through the assessment of the potentially significant impacts during the pre-construction, construction, and operation phases of the physical infrastructure, which included the evaluations undertaken during the specialist studies, it can be concluded that impacts can be mitigated to a satisfactory level by adopting the mitigation measures recommended by the specialists and contained in the EMP.

- **Impacts linked to water transfer and the potential restriction / curtailment of water use and reduction in water levels downstream of Mokolo Dam -**
  MCWAP is endorsed by the Department of Public Enterprise as a Strategically Important Development (SID), due to the national strategic importance of the intended developments (notably the power stations) that serve as the primary end users of the transferred water.

  Restrictions may be implemented should it be necessary (i.e. if it is a period of low flow and low dam level) to ensure supply to the water users in accordance to their assurance. This measure is to protect all users.

  Downstream of Mokolo Dam, the water requirements of the water users and aquatic ecosystem (in terms of quantity and quality) are secured through existing entitlements (i.e. Existing Lawful Use – Section 32 of the National Water Act, No. 36 of 1998) and the Reserve, respectively.

  A River Management System will be developed with the active participation and leadership of the Mokolo Irrigation Board and the Agri-Forum.

  Mitigation measures are also included in the EMP and recommended by the specialist studies to manage impacts associated with reduced water levels due to the operation of the scheme.

A water conservation and demand management strategy will be considered, which aims to ensure effective and sustainable use of available water sources through water conservation, loss management and demand management. The objective of MCWAP is not to infringe on current water use entitlements, including the entitlements and rights of the environment (i.e. the Reserve).

By following existing linear infrastructure and managing the impacts through the advocated mitigation measures, ensuring conformance to the Reserve conditions and upholding existing water use entitlements (through the water use authorisation process), it can be concluded that there are no fatal flaws associated with the project. It is also concluded that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified mitigation measures.

The following key recommendations accompany the EIA for MCPWA Phase 1:

a) From the comparative analysis, which included concurrence by the specialists, Alternatives B and C are supported as the preferred options to minimise impacts to the environment.
b) The project should proceed under a strict compliance monitoring system, as instructed by the EMP.
c) On the Farm Sterkfontein 642LQ the Rietspruit was found to have a good Present Ecological State and therefore it is recommended that the pipeline crossing be undertaken as close of possible to the existing Exxaro pipeline crossing point, in order to minimise impacts to the watercourse system.
d) Ecological damage within the Waterberg Biosphere must be minimised.
e) Prevent disturbance to family cemetery located on the Farm Goedgedacht 602LQ. Alternatively, if the graves are of an historic nature and need to be exhumed and relocated the prescribed process must be followed in consultation with LIHRA (Marais-Botes, 2010).
f) It is advocated that mechanisms be identified whereby water users and DWA can contribute to the goals and objectives of the Waterberg Biosphere Reserve, in consultation with the Management Committee and UNESCO.

g) Should the informal dwellings in the area that belongs to the Phumolong Community Trust encroach upon the pipeline construction servitude in the future, suitable relocation would need to be undertaken in consultation with the trust and other appropriate authorities. Ensure that future encroachment on the permanent servitude is prohibited.

The following conditions are regarded as critical mitigation measures emanating from the EIA:

- Ongoing communication with the affected landowners and stakeholders (including Exxaro) during the implementation of the project.
- Prior to any construction, undertake necessary negotiations with directly affected landowners and establish requirements for access, fencing, game requirements, existing reticulation, etc.
- Ensure compliance with the Reserve, as determined and administered under the National Water Act (No. 36 of 1998).
- Diligent compliance monitoring of the EMP, environmental authorisation and other relevant environmental legislation by an Independent ECO is crucial to ensure compliance with the stipulated management measures.
- River crossings to be suitably stabilised to prevent damage to the structure and function of the affected watercourses.
- Suitable flow diversion required to maintain dry works areas for river crossings.
- A qualified and / or appropriately experienced botanist or experienced person who knows the specific vegetation type well will mark protected trees when the route is pegged and the necessary permits must be obtained under the National Forests Act (No. 84 of 1998) if avoidance is not possible.
- Suitable fencing and access control required to protect animals on game farms.
- Strict security measures to be implemented.
- During scouring of the pipeline, measures need to be implemented to manage erosion of the structures of the receiving watercourses.

  Should portable sewage treatment works be required, then the necessary authorisation must be sought in terms of the National Water Act (No. 36 of 1998) and NEMA (if applicable).

# 15 REFERENCES

Axis Landscape Architecture. 2010. MCWAP Phase 1 Augment The Supply From Mokolo Dam - Visual Impact Assessment. MCWAP Phase 1 EIA Specialist Report.

Department of Environmental Affairs and Tourism (DEAT). 2005a. Guideline 3: General Guide to the Environmental Impact Assessment Regulations, 2005. Integrated Environmental Management Guideline Series. Department of Environmental Affairs and Tourism (DEAT), Pretoria.

Department of Environmental Affairs and Tourism (DEAT). 2005b. Guideline 4: Public Participation, in terms of the EIA Regulations. Integrated Environmental Management Guideline Series. Department of Environmental Affairs and Tourism (DEAT), Pretoria.

Department of Water Affairs. 2008a. Mokolo Crocodile (West) Water Augmentation Project (MCWAP) Feasibility Study. Phase 1 Feasibility Stage. Prepared by Africon in association with Kwezi V3 Engineers, Vela VKE, WRP Consulting Engineers and specialists. Department of Water Affairs and Forestry (DWAF), Pretoria.

Department of Water Affairs. 2008b. Mokolo Crocodile (West) Water Augmentation Project (MCWAP) Feasibility Study. Report 12, Phase 2 Feasibility Stage. Prepared by Africon in association with Kwezi V3 Engineers, Vela VKE, WRP Consulting Engineers and specialists. Department of Water Affairs (DWA), Pretoria.

Department of Water Affairs. 2010. Intermediate Reserve Determination Study for the Surface and Groundwater Resources in the Mokolo Catchment, Limpopo Province: Ecological, Goods & Services and Socio-Economic Consequences of Various Operational Scenarios Report. Volume 2 – Ecological and Goods & Services Consequences of Operational Scenarios. Prepared by Rivers for Africa and Clean Stream Biological Services, edited by Louw, MD and Koekemoer, S. RDM Report no. 26/8/3/10/14/0010.

Department of Water Affairs and Forestry. 2001. Generic Public Participation Guidelines, DWAF, September 2001. Department of Water Affairs and Forestry (DWAF), Pretoria.

Department of Water Affairs and Forestry. 2004. Internal Strategic Perspective: Limpopo Water Management Area. Prepared by Goba Moahloli Keeve Steyn (Pty) Ltd, in association with Tlou & Matji (Pty) Ltd and Golder Associates (Pty) Ltd.on behalf of the Directorate: National Water Resource Planning. Report No. P WMA 01/000/00/0304. Department of Water Affairs and Forestry (DWAF), Pretoria.

Department of Water Affairs and Forestry. 2007. Intermediate Reserve Determination Study for the Surface and Groundwater Resources in the Mokolo Catchment, Limpopo Province. Study being executed by Water for Africa, Inception Report Project No WP 9132. Department of Water Affairs and Forestry (DWAF), Pretoria.

Department of Water Affairs and Forestry. 2008a. Mokolo Crocodile (West) Water Augmentation Project (MCWAP) Feasibility Study. Phase 1A: Feasibility Stage Prepared by Africon in association with Kwezi V3 Engineers, Vela VKE and specialists. Department of Water Affairs and Forestry (DWAF), Pretoria.

Department of Water Affairs and Forestry. 2008b. Mokolo Crocodile (West) Water Augmentation Project (MCWAP) Feasibility Study. Mokolo River Development Options Prepared by Africon in association with Kwezi V3 Engineers, Vela VKE and specialists. Department of Water Affairs and Forestry (DWAF), Pretoria.

Department of Water Affairs and Forestry. 2008c. Mokolo Crocodile (West) Water Augmentation Project (MCWAP) Feasibility Study. Dams, Abstraction Weirs and River Works Report. Prepared by Africon in association with Kwezi V3 Engineers, Vela VKE and specialists. Department of Water Affairs and Forestry (DWAF), Pretoria.

Department of Water Affairs and Forestry. 2008d. Mokolo Crocodile (West) Water Augmentation Project (MCWAP) Feasibility Study. Water Resources Report. Prepared by

Africon in association with Kwezi V3 Engineers, Vela VKE, WRP Consulting Engineers and specialists. Department of Water Affairs and Forestry (DWAF), Pretoria.

Department of Water Affairs and Forestry. 2009a. Mokolo Crocodile (West) Water Augmentation Project (MCWAP) Feasibility Study. Institutional Arrangements and River Management. Report 8: Institutional Part 1. Prepared by Africon in association with Kwezi V3 Engineers, Vela VKE, WRP Consulting Engineers and specialists. Department of Water Affairs and Forestry (DWAF), Pretoria.

Department of Water Affairs and Forestry. 2009b. Mokolo Crocodile (West) Water Augmentation Project (MCWAP) Feasibility Study. Operation & Maintenance Philosophy. Report 8: Institutional Part 3. Prepared by Africon in association with Kwezi V3 Engineers, Vela VKE, WRP Consulting Engineers and specialists. Department of Water Affairs and Forestry (DWAF), Pretoria.

Digby Wells & Associates. 2009. Environmental Impact Assessment and Environmental Management Plan for the Zeeland Water Treatment Works. EXXARO COAL (PTY) LTD. REF: 12/1/9/-7/1(E) – W2. June 2009.

Enviross, 2009. MCWAP: Debottlenecking Pipeline Section, Lephalale. Wetland Delineation and Ecological Survey. MCWAP De-bottlenecking Basic Assessment Specialist Report.

Enviross, 2010. MCWAP PHASE 1: Wetlands & Watercourse Survey. MCWAP Phase 1 EIA Specialist Report.

Galago Environmental. 2010. Flora and Fauna Habitat Assessment – MCWAP PHASE 1. MCWAP Phase 1 EIA Specialist Report.

Golder Associates. 2009. Environmental Impact Assessment for the Proposed Wastewater Treatment Works At Exxaro Grootegeluk Coal Mine, Near Lephalale, Limpopo Province. June 2009.

Lephalale Local Municipality. 2006. Spatial Development Framework. Prepared by Winterbach, Potgieter & Vennote Planners.

Lephalale Local Municipality. 2007. Integrated Development Plan, 2007/2008 Financial Year.

Lephalale Local Municipality. 2010. Integrated Development Plan Review, 2009/2010 Financial Year.

Marais-Botes. L. 2010. Heritage Impact Assessment for the Proposed Mokolo and Crocodile River (West): Water Augmentation Project (MCWAP) – Phase 1: Augment Supply From Mokolo Dam. MCWAP Phase 1 EIA Specialist Report.

Mucina, L. and Rutherford, M.C. 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Münster, F. 2005. *Guideline for determining the scope of specialist involvement in EIA processes: Edition 1*. CSIR Report No ENV-S-C 2005 053 A. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

Nemai Consulting. 2010. Draft Social Impact Assessment – MCWAP Phase 1. MCWAP Phase 1 EIA Specialist Report.

Neville Bews & Associates, 2010. Draft Social Impact Assessment Report. MCWAP Phase 1.

River Health Programme. 2006. State-of-Rivers Report. The Mokolo River System. Department of Environmental Affairs and Tourism (DEAT), Pretoria.

River Health Programme. 2008. An Exploratory Biomonitoring Survey of the Matlabas River Catchment. Limpopo Province. Part 1. Fish, Invertebrates and Eco-Status. Department of Environmental Affairs and Tourism (DEAT), Pretoria.

UNESCO. 2009. World Network of Biosphere Reserves.

**Websites:**

www.dwaf.gov.za/iwqs/wms/data/a42/a42_90335

www.waterbergbiosphere.org