SCOPING REPORT:

THE CONSTRUCTION OF A NEW DAM AND ASSOCIATED INFRASTRUCTURE AS PART OF THE UPGRADING OF THE BULK WATER SUPPLY SCHEME TO AMSTERDAM, MPUMALANGA

Report prepared for: Gert Sibande District Municipality

Report dated: March 2017 (draft)

Report number: EIA 2017/01

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PROJECT INFORMATION SUMMARY

PROJECT TITLE	Scoping Report: Construction of a new dam and associated infrastructure as part of the upgrading of the bulk water supply scheme to Amsterdam, Mpumalanga

CLIENT	Gert Sibande District Municipality
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DARDLEA REFERENCE NO.	
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UNDERTAKING BY EAP

as required in terms of Section 2(j) of Appendix 2 of the Environmental Impact Assessment Regulations, 2014.

I, ..., hereby confirm that:

- *the information provided in this Draft Scoping Report is, to the best of my knowledge, correct as at the time of compilation thereof;*
- *comments and inputs obtained from stakeholders and interested and affected parties through the scoping phase have been included in this Draft Scoping Report;*
- *information provided to interested and affected parties during the scoping phase has been included in this Draft Scoping Report;*
- *responses provided to interested and affected parties during the scoping phase have been included in this Draft Scoping Report.*

Signed at..... on this ..... day of..... of 2017.

Signature:.....

Company:.....

I, ..., hereby confirm that:

- *the information provided in this Draft Scoping Report is, to the best of my knowledge, correct as at the time of compilation thereof;*
- *comments and inputs obtained from stakeholders and interested and affected parties through the scoping phase have been included in this Draft Scoping Report;*
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- *responses provided to interested and affected parties during the scoping phase have been included in this Draft Scoping Report.*

Signed at..... on this ..... day of..... of 2017.

Signature:.....

Company:.....

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1. INTRODUCTION

Gert Sibande District Municipality intends to construct a new dam and abstraction facility in either the Gabosha River or the Thole River in order to improve the delivery of potable water to the Amsterdam and KwaThandeka communities.

Two possible dam sites were identified, namely Dam Site A and Dam Site B. Proposed Dam Site A is located in close proximity to KwaThandeka within the Thole River. Proposed Dam Site B is located upstream of Amsterdam (and the Amsterdam Water Treatment Works (WTW)) within the Gabosha River. Both sites are located on the Remainder of Portion 11 of the farm Amsterdam 408 IT.

As part of the project, a bulk water pipeline will be installed from the dam site to the existing Amsterdam WTW while a distribution pipeline will be installed from the WTW to Amsterdam/KwaThandeka. In addition, the Dorps Dam will be desilted and the Amsterdam WTW upgraded. The pipelines will also be located on the Remainder of Portion 11 of Amsterdam 408 IT and within the Amsterdam/KwaThandeka urban area.

Various alternatives in terms of this project were investigated as detailed in this report.

The Minister of Environmental and Water Affairs listed in terms of Sections 24(2), 24(5), 24D and 44, read with section 47A(1)(b) of the National Environmental Management Act, 1998 (Act No. 107 of 1998), a number of activities that require an environmental impact assessment (either a Basic Assessment or a full Environmental Impact Assessment) before undertaking these activities.

The proposed development would involve the following listed activities as identified in terms of Section 24(2) and 24D of the National Environmental Management Act, 1998:

GN R983 – LISTING NOTICE 1 (REQUIRES A BASIC ASSESSMENT)	
Listed Activity	**Description**
9	The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water—(i) with an internal diameter of 0.36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where—(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.
12	The development of (i) canals exceeding 100 square metres in size; (ii) channels exceeding 100 square metres in size; (iii) bridges exceeding 100 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, exceeds 100 square metres in size; (vi) bulk storm water outlet structures exceeding 100 square metres in size; (vii) marinas exceeding 100 square metres in size; (viii) jetties exceeding 100 square metres in size; (ix) slipways exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size; (xi) boardwalks exceeding 100 square metres in size; or (xii) infrastructure

GN R983 – LISTING NOTICE 1 (REQUIRES A BASIC ASSESSMENT)	
Listed Activity	**Description**
	or structures with a physical footprint of 100 square metres or more; where such development occurs (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a water course;- excluding (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads and road reserves.
19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing, dredging, excavation, removal or moving – (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within ambit of activity 21 in this Notice, in which case that activity applies.
24	The development of—(i) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) a road with a reserve wider than 13.5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding—(a) roads which are identified and included in activity 27 in Listing Notice 2 of 2014; or (b) roads where the entire road falls within an urban area.
27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.

GN R984 – LISTING NOTICE 2 (REQUIRES A FULL EIA)	
Listed Activity	**Description**
15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for - (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.
16	The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the highwater mark of the dam covers an area of 10 hectares or more.

GN R985 – LISTING NOTICE 3 (REQUIRES A BASIC ASSESSMENT)	
Listed Activity	**Description**
Listing Notice No. 3 becomes applicable if the site is located within a specific geographical area (e.g. endangered ecosystems or critical biodiversity areas).	
4	The development of a road wider than 4 metres with a reserve less than 13.5 metres.
14	The development of - (i) canals exceeding 10 square metres in size; (ii) channels exceeding 10 square metres in size; (iii) bridges exceeding 10 square metres in size; (iv) dams, where the dam including infrastructure and water surface area exceeds 10 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area exceeds 10 square metres in size; (vi) bulk storm water outlet structures exceeding 10 square metres in size; (vii) marinas exceeding 10 square metres in size; (viii) jetties exceeding 10 square metres in size; (ix) slipways exceeding 10 square metres in size; (x) buildings exceeding 10 square metres in size; (xi) boardwalks exceeding 10 square metres in size; or (xii) infrastructure or structures with a physical footprint of 10 square metres or more where such development occurs - (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.

In order to obtain environmental authorisation, a Scoping Report and an Environmental Impact Assessment Report must be compiled as described in Regulations 21 to 24 and Appendices 2, 3 and 4 of the Environmental Impact Assessment Regulations, 2014, promulgated in terms of Section 24(5), 24M and 44 of the National Environmental Management Act, 1998 (Act 107 of 1998).

According to Appendix 2 of the Regulations, the objective of the scoping process is to, through a consultative process-

a. identify the relevant policies and legislation relevant to the activity;
b. motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
c. identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
d. identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
e. identify the key issues to be addressed in the assessment phase;
f. agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and

g. identify suitable measures to avoid, manage or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

AdiEnvironmental cc was appointed as independent environmental consultant to conduct the required Environmental Impact Assessment Process and compile the necessary documentation. This Scoping Report is compiled in accordance with Appendix 2 of the Environmental Impact Assessment Regulations, 2014 and indicates the environmental outcomes, impacts and residual risks of the proposed activity.

In essence, this scoping report provides the following information:

- details of the Environmental Assessment Practitioner and applicant (Section 2.1),
- an overview of the proposed project (Section 2.4),
- need and desirability of the proposed project (Section 2.3),
- an overview of the alternatives investigated (Section 5),
- an overview of the environmental features of the proposed site and immediate surrounding area (Section 3),
- an indication of the interested and affected parties (I&APs) identified to date (Section 4),
- an indication of issues of concern/comments received from interested and affected parties (I&APs) to date (Section 4),
- an indication of potential environmental impacts that could take place as a result of the proposed project (Section 6),
- plan of study for undertaking of the Environmental Impact Assessment process (Section 7),
- terms of reference of specialist studies to be conducted (Section 7),
- undertaking by Environmental Assessment Practitioner (see front of report).

Diagram 1 provides a schematic description of the Environmental Impact Assessment (EIA) process to be followed. This EIA process will be conducted strictly according to the above-mentioned Regulations. The aim of the process is to ensure that the environmental impacts are considered, the relevant I&APs are consulted and the decision making authorities are provided with sufficient information to make an informed decision.

The decision making authority is the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA). This Department will decide to grant or refuse the approval of the project. On approval, an Environmental Authorisation and Record of Decision will be issued in the name of the project applicant.

The project applicant will be responsible for complying with the conditions set in the Environmental Authorisation and Record of Decision.

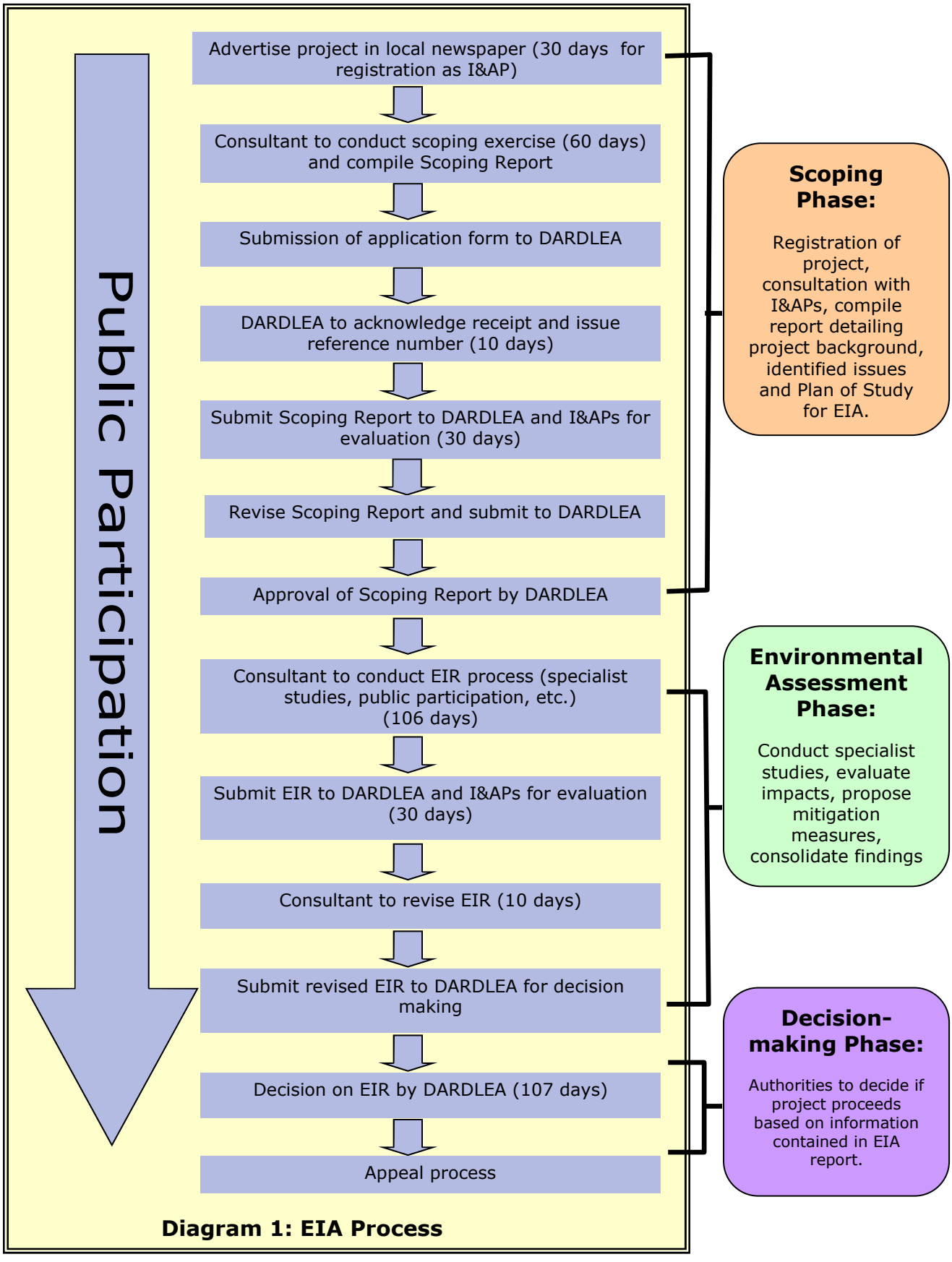

Diagram 1: EIA Process

2. DESCRIPTION OF THE ACTIVITY

2.1 Details of the project applicant and environmental consultant

Name and address of applicant: Gert Sibande District Municipality P.O. Box 1748 Ermelo 2350	
Contact person: Mike Dondo (Senior Manager: Water & Sanitation)	
Telephone number:	017 – 801 7214
Cell number:	071 1446 793
e-mail address:	Mike.Dondo@misa.gov.za

Afri Infra Group (Pty) Ltd. (on behalf of the Gert Sibande District Municipality) appointed AdiEnvironmental cc, an independent environmental consultancy, to undertake the Environmental Impact Assessment process for the proposed development in accordance with the Environmental Impact Assessment Regulations (EIA), 2014.

Name and address of environmental consultant: AdiEnvironmental cc P.O. Box 647 Witbank (eMalahleni Central) 1035	
Contact persons:	Mrs. A. Erasmus *Pr. Sci. Nat.* Ms. R. Janse van Rensburg
Cell number:	083 271 8260
Telephone number:	(013) 697 5021
Fax number:	(013) 697 5021
e-mail address:	adie@adienvironmental.co.za riana@adienvironmental.co.za

AdiEnvironmental cc has no vested interest (other than fair remuneration) in the approval of this project, and hereby declares its independence as required by the EIA Regulations, 2014.

A copy of the completed application form and the declaration of independence by the applicant and environmental consultant are provided in Appendix 1.

A copy of the Curriculum Vitae of both Mrs. A. Erasmus and Ms. R. Janse van Rensburg are provided in Appendix 2 together with a list of projects completed to date.

2.2 Nature of the activity/development

Gert Sibande District Municipality intends to construct a new dam and abstraction facility in either the Gabosha River or the Thole River in order to improve the delivery of potable water to the Amsterdam and KwaThandeka communities.

Two possible dam sites were identified, namely Dam Site A and Dam Site B. Proposed Dam Site A is located in close proximity to KwaThandeka within the Thole River. Proposed Dam Site B is located upstream of Amsterdam (and the Amsterdam Water Treatment Works (WTW)) within the Gabosha River. Both sites are located on the Remainder of Portion 11 of the farm Amsterdam 408 IT.

As part of the project, a bulk water pipeline will be installed from the dam site to the existing Amsterdam WTW while a distribution pipeline will be installed from the WTW to Amsterdam/KwaThandeka. In addition, the Dorps Dam will be desilted and the Amsterdam WTW upgraded. The pipelines will also be located on the Remainder of Portion 11 of Amsterdam 408 IT and within the Amsterdam/KwaThandeka urban area.

The proposed development would involve the following listed activities as identified in terms of Section 24(2) and 24D of the National Environmental Management Act, 1998:

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GN R983 – LISTING NOTICE 1 (REQUIRES A BASIC ASSESSMENT)	
Listed Activity	**Description**
	moving – (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within ambit of activity 21 in this Notice, in which case that activity applies.
24	The development of—(i) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) a road with a reserve wider than 13.5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding—(a) roads which are identified and included in activity 27 in Listing Notice 2 of 2014; or (b) roads where the entire road falls within an urban area.
27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.

GN R984 – LISTING NOTICE 2 (REQUIRES A FULL EIA)	
Listed Activity	**Description**
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16	The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the highwater mark of the dam covers an area of 10 hectares or more.

GN R985 – LISTING NOTICE 3 (REQUIRES A BASIC ASSESSMENT)	
Listed Activity	**Description**
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14	The development of - (i) canals exceeding 10 square metres in size; (ii) channels exceeding 10 square metres in size; (iii) bridges exceeding 10 square metres in size; (iv) dams, where the dam including infrastructure and water surface area exceeds 10 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area exceeds 10 square metres in size; (vi) bulk storm water outlet structures exceeding 10 square metres in size; (vii) marinas exceeding 10 square metres in size; (viii) jetties exceeding 10 square metres in size; (ix) slipways exceeding 10 square metres in size; (x) buildings exceeding 10 square metres in size; (xi) boardwalks exceeding 10 square metres in size; or (xii) infrastructure or structures with a physical footprint of 10 square metres or more where such development occurs - (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the

GN R985 – LISTING NOTICE 3 (REQUIRES A BASIC ASSESSMENT)	
Listed Activity	**Description**
	port or harbour.

In order to obtain environmental authorisation, a Scoping Report and an Environmental Impact Assessment Report must be compiled as described in Regulations 21 to 24 and Appendices 2, 3 and 4 of the Environmental Impact Assessment Regulations, 2014, promulgated in terms of Section 24(5), 24M and 44 of the National Environmental Management Act, 1998 (Act 107 of 1998).

2.3 Reason for project (need and desirability)

According to Afri Infra (2016), the objective of this project is to upgrade and refurbish the Bulk Water Supply Infrastructure to Amsterdam, situated in the jurisdiction area of the Mkhondo Local Municipality (MLM).

The Amsterdam Regional Water Supply Scheme currently serves a population of approximately 14 500 people who reside within the boundaries of the scheme. These residents are reliant on the scheme to provide a sustainable water supply.

The scheme currently abstracts water from a single location within the catchment of the Gabosha River and is not connected to any National Bulk Water Infrastructure.

The project aims to:

- Eradicate Backlogs (access to basic infrastructure);
- Serve housing and settlement infrastructure;
- Support and stimulate economic growth and development;
- Improve water service quality:
  - drinking water quality (WTW); and
  - consider Operation & Maintenance (O&M) challenges (limited finances, ownership, lack of adequate skilled staff, lack of management, poor asset management);
- Improve supply interruptions (reliability of supply);
- Optimize cost/appropriate technology;
- Support integrated resource planning and management;
- Promote cooperation between authorities with regards to sharing of resources, responsibilities and risks; and
- Increase sustainability (Afri Infra, 2016).

2.4 Description of the development and all relevant components

Gert Sibande District Municipality intends to construct a new dam and abstraction facility in either the Gabosha River or the Thole River in order to improve the delivery of potable water to the Amsterdam and Kwathandeka communities.

Two possible dam sites were identified, namely Dam Site A and Dam Site B. Proposed Dam Site A is located in close proximity to KwaThandeka within the

Thole River (Figure 2.1). Proposed Dam Site B is located upstream of Amsterdam (and the Amsterdam Water Treatment Works (WTW)) within the Gabosha River (Figure 2.1). Both sites are located on the Remainder of Portion 11 of the farm Amsterdam 408 IT (Figure 2.1). The dam wall would be 20 metres in height with a footprint of approximately 20 hectares.

As part of the project, a bulk water pipeline will be installed from the dam site to the existing Amsterdam WTW (orange line; Figure 2.1) while a distribution pipeline will be installed from the WTW to Amsterdam/KwaThandeka (yellow line; Figure 2.1). In addition, the Dorps Dam will be desilted and the Amsterdam WTW (Figure 2.1) upgraded. The pipelines will also be located on the Remainder of Portion 11 of Amsterdam 408 IT and within the Amsterdam/Kwathandeka urban area.

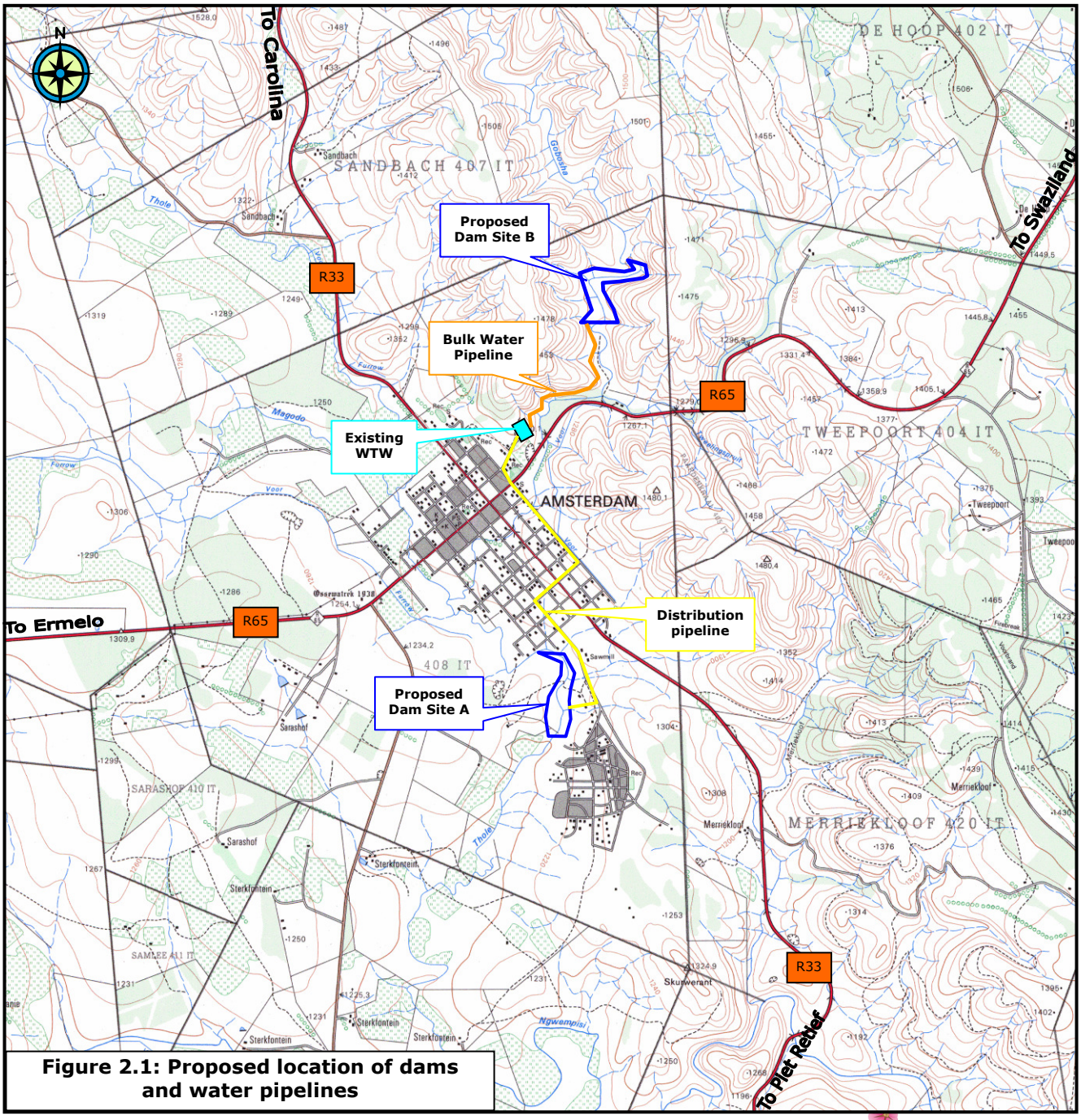


Figure 2.1: Proposed location of dams and water pipelines

As indicated in Section 5 of this report, various alternatives in terms of this project were also investigated.

Further details with regards to the infrastructure required will be provided in the Environmental Impact Assessment Report (EIAR).

2.5 Services required

2.5.1 Water

During the construction phase, potable water for site workers will have to be provided by the appointed contractors at the various construction sites.

2.5.2 Electricity

During the construction phase, the appointed contractors will have to provide their own electrical supply by means of generators at the various construction sites.

2.5.3 Sewage

During the construction phase, the contractor will have to ensure that chemical toilets are provided on site according to the number of site workers.

2.5.4 Waste management

Any rubble produced during the construction phase will have to be removed and disposed of by the appointed contractor at a registered waste disposal facility.

Further details with regards to services required will be provided in the Environmental Impact Assessment Report (EIAR).

2.6 Phases of development

2.6.1 Estimated start and completion dates of construction

Construction will only commence once the relevant approvals have been obtained.

2.6.2 Construction phase

This would involve the construction of the following infrastructure:

- Dam (either at Dam Site A or Dam Site B; Figure 2.1);
- Bulk water pipeline (Figure 2.1);
- Distribution pipeline (Figure 2.1).

2.6.3 Operational phase

This would involve the utilization of the following infrastructure:

- Dam (either at Dam Site A or Dam Site B; Figure 2.1);
- Bulk water pipeline (Figure 2.1);
- Distribution pipeline (Figure 2.1).

2.6.4 Decommissioning phase

If the situation of decommissioning in terms of the overall project does arise, an Environmental Management Plan (EMP) will need to be compiled in order to manage the activities associated with the decommissioning of the site.

2.7 Applicable legislation, policies and/or guidelines

Table 2.1 provides an indication of legislation, policies and/or guidelines applicable to the said project.

TABLE 2.1: APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

Title of legislation, policy or guideline:	Administering authority:	Aim of legislation, policy or guideline
The Constitution of the Republic of South Africa, 1996 (Act 108 of 1996)	Department of Justice and Constitutional Development	To establish a Constitution with a Bill of Rights for the RSA. It sets out of a number of fundamental environmental rights (Section 24).
Development Facilitation Act, 1995 (Act 67 of 1995) and amendments	Department of Rural Development and Land Reform	To provide for planning and development.
Environment Conservation Act, 1989 (Act 73 of 1989) and amendments	Department of Agriculture, Rural Development, Land and Environmental Affairs	To control environmental conservation.
National Environmental Management Act, 1998 (Act 107 0f 1998) and amendments	Department of Agriculture, Rural Development, Land and Environmental Affairs	To provide for the integrated management of the environment.
National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) and amendments	Department of Agriculture, Rural Development, Land and Environmental Affairs	To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto.
National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) and amendments	Department of Agriculture, Rural Development, Land and Environmental Affairs	To provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; the establishment and functions of a South African Biodiversity Institute; and for matters connected therewith.
National Environmental Management: Waste Act, 2008 (Act 59 of 2008) and amendments	Department of Agriculture, Rural Development, Land and Environmental Affairs	To reform the law regulating waste management in order to protect health and the environment by providing for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.
National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) and amendments	Department of Environmental Affairs	To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; and for matters in connection therewith.

TABLE 2.1: APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES		
Title of legislation, policy or guideline:	**Administering authority:**	**Aim of legislation, policy or guideline**
Environmental Impact Assessment Regulations, 2014 (Government Gazette No. 33306 of 18 June 2010) and amendments	Department of Agriculture, Rural Development, Land and Environmental Affairs	Regulations pertaining to environmental impact assessments.
National Water Act, 1998 (Act 36 of 1998) and amendments	Department of Water and Sanitation	To control water management aspects.
National Veld and Forest Fire Act, 1998 (Act 101 of 1998) and amendments	Department of Agriculture, Forestry and Fisheries	To prevent and combat veld, forest and mountain fires throughout South Africa.
National Heritage Resources Act, 1999 (Act 25 of 1999) and amendments	South African Heritage Resources Agency	This legislation aims to promote good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed to future generations.
Protection of Personal Information Act, 2013 (Act 4 of 2013)	Department of Justice and Constitutional Development	The purpose of this act is to give effect to the constitutional right to privacy by safeguarding personal information and to regulate the manner in which personal information may be processed.
Promotion of Access to Information Act, 2000 (Act 2 of 2000) and amendments	Department of Justice and Constitutional Development	To give effect to the constitutional right of access to any information held by the State and any information that is held by another person and that is required for the exercise or protection of any rights; and to provide for matters connected therewith.
Promotion of Administrative Justice Act, 2000 (Act 3 of 2000) and amendments	Department of Justice and Constitutional Development	The Act aims to make the administration (e.g. Government and Parastatals) effective and accountable to people for its actions.
Conservation of the Agricultural Resources Act, 1983 (Act 43 of 1989) and amendments	Department of Agriculture, Forestry and Fisheries	To provide control over the utilization of the natural resources of the Republic in order to promote the conservation of soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.
Occupational Health and Safety Act, 1993 (Act 85 of 1993) and amendments	Department of Labour	To provide for the health and safety of persons at work and for the health and safety of persons in connection with the activities of persons at work and to establish an advisory council for occupational health and safety.
Health Act, 1977 (Act 63 of 1977) and amendments	Department of Health	To promote public health.
Mpumalanga Nature Conservation Act, 1998 (Act 10 of 1998) and amendments	Mpumalanga Tourism and Parks Agency	To control nature conservation.
Various by-laws of the Mkhondo Local Municipality.	Mkhondo Local Municipality	To regulate land use within the Mkhondo Local Municipal area.
Integrated Development Plan for the Mkhondo Local Municipality	Mkhondo Local Municipality	Broad spatial framework guidelines for the Mkhondo Local Municipality.
Various by-laws of the Gert Sibande District Municipality.	Gert Sibande District Municipality	To regulate land use within the Gert Sibande District Municipal area.
Spatial Development Framework for the Gert Sibande District Municipality	Gert Sibande District Municipality	Spatially based policy guidelines whereby changes, needs and growth in the region can be managed to benefit the whole community.
Water Services Development Plan for the Gert Sibande District Municipality	Gert Sibande District Municipality	Long term planning in terms of the provision of water supply and sanitation services to local communities and addressing socio-economic, technical, financial, management and environmental aspects thereof.
Integrated Environmental Management Guideline Series (Guideline 5 – 10 October	Department of Economic Development,	To provide clarity on the processes to be followed when applying for an

TABLE 2.1: APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES		
Title of legislation, policy or guideline:	**Administering authority:**	**Aim of legislation, policy or guideline**
2012) – Companion to the Environmental Impact Assessment Regulations, 2010	Environment and Tourism	environmental authorisation in terms of the EIA Regulations and gives a comprehensive interpretation of the listed activities.
National Biodiversity Framework (NBF, 2008)	Department of Environmental Affairs	To co-ordinate and align the efforts of the organisations and individuals involved in conserving and managing South Africa's biodiversity
Convention on Biological Diversity (29 December 1993)	Party to International Convention	Develop strategies, plans or programs for conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plant or programs which shall reflect, inter alia, the measures set out in this Convention.
Tripartite Interim Agreement between the Republic of Mozambique and the Republic of South African and the Kingdom of Swaziland for co-operation on the protection and sustainable utilisation of the water resources of the Incomati and Maputo Water Resources (Interim IncoMaputo Agreement, 2002).	Republic of Mozambique, Republic of South Africa and the Kingdom of Swaziland	Deals with the co-operation between the 3 countries on the protection and sustainable utilisation of the water resources of the Incomati and Maputo Water Resources.

3. BIOPHYSICAL DESCRIPTION OF THE PROPOSED SITES

3.1 Location of the sites

Two possible dam sites were identified, namely Dam Site A and Dam Site B. Proposed Dam Site A is located in close proximity to KwaThandeka within the Thole River (Figure 2.1). Proposed Dam Site B is located upstream of Amsterdam (and the Amsterdam Water Treatment Works (WTW)) within the Gabosha River (Figure 2.1). Both sites are located on the Remainder of Portion 11 of the farm Amsterdam 408 IT (Figure 2.1).

The dam wall would be 20 metres in height with a footprint of approximately 20 hectares. The co-ordinates of the proposed dam sites are:

	Latitude (S):			**Longitude (E):**		
• Dam Site A	26°	38′	30.81″	30°	40′	23.08″
• Dam Site B	26°	36′	07.55″	30°	40′	41.03″

As part of the project, a bulk water pipeline will be installed from the dam site to the existing Amsterdam WTW (orange line; Figure 2.1) while a distribution pipeline will be installed from the WTW to Amsterdam/KwaThandeka (yellow line; Figure 2.1). In addition, the Dorps Dam will be desilted and the Amsterdam WTW (Figure 2.1) upgraded. The pipelines will also be located on the Remainder of Portion 11 of Amsterdam 408 IT and within the Amsterdam/Kwathandeka urban area.

The co-ordinates of the distribution pipeline crossing at the Gabosha River is:

	Latitude (S):			**Longitude (E):**		
• Crossing	26°	37′	20.01″	30°	40′	11.37″

There is only one Surveyor-General 21 digit site reference number for this project as the sites all occur on the same property namely:

T	0	I	T	0	0	0	0	0	0	0	0	0	4	0	8	0	0	0	1	1

The said property falls under the jurisdiction of the Mkhondo Local Municipality (MP301) and the Gert Sibande District Municipality.

3.2 Climate

Amsterdam is located within the Escarpment Physiographic Region where the altitude ranges between 600 to 1500 m above mean sea level (mamsl), with the average being 1210 mamsl (Beuster and Clarke, 2008).

Table 3.1 provides an indication of the climate associated with the Escarpment Physiographic Region and therefore the Amsterdam area (i.e. the project area).

Table 3.1: Climate associated with the Escarpment Physiographic Region and therefore the Amsterdam area (taken from Beuster and Clarke, 2008)

Mean Annual Temperature	17°C
Mean Annual Temperature (December)	20°C
Mean Annual Temperature (June)	12°C
Mean Annual Precipitation	800 – 1000 mm
Mean Annual Evaporation (S-Pan)	1500 mm/year
Start of rainy season	Early summer (December)
Driest year in 5	600 – 800 mm/year
Wettest year in 5	1000 – 1200 mm/year

3.3 Geology

According to the 1:250 000 geology map (2630 Mbabane), the proposed Dam Site A, Dam Site B, distribution pipeline and bulk water pipeline route are underlain by pyroclastic rocks and ash-flow tuff of the Gobasha Member, Amsterdam Formation (Rag; Figure 3.1). The southern portion of Dam Site A is underlain by ultrabasic rocks, pyroxenite and norite of the Suite Thole (Rt; Figure 3.1). These rocks are of Randian Age and thus very old. Dykes might be present in areas (Figure 3.1).

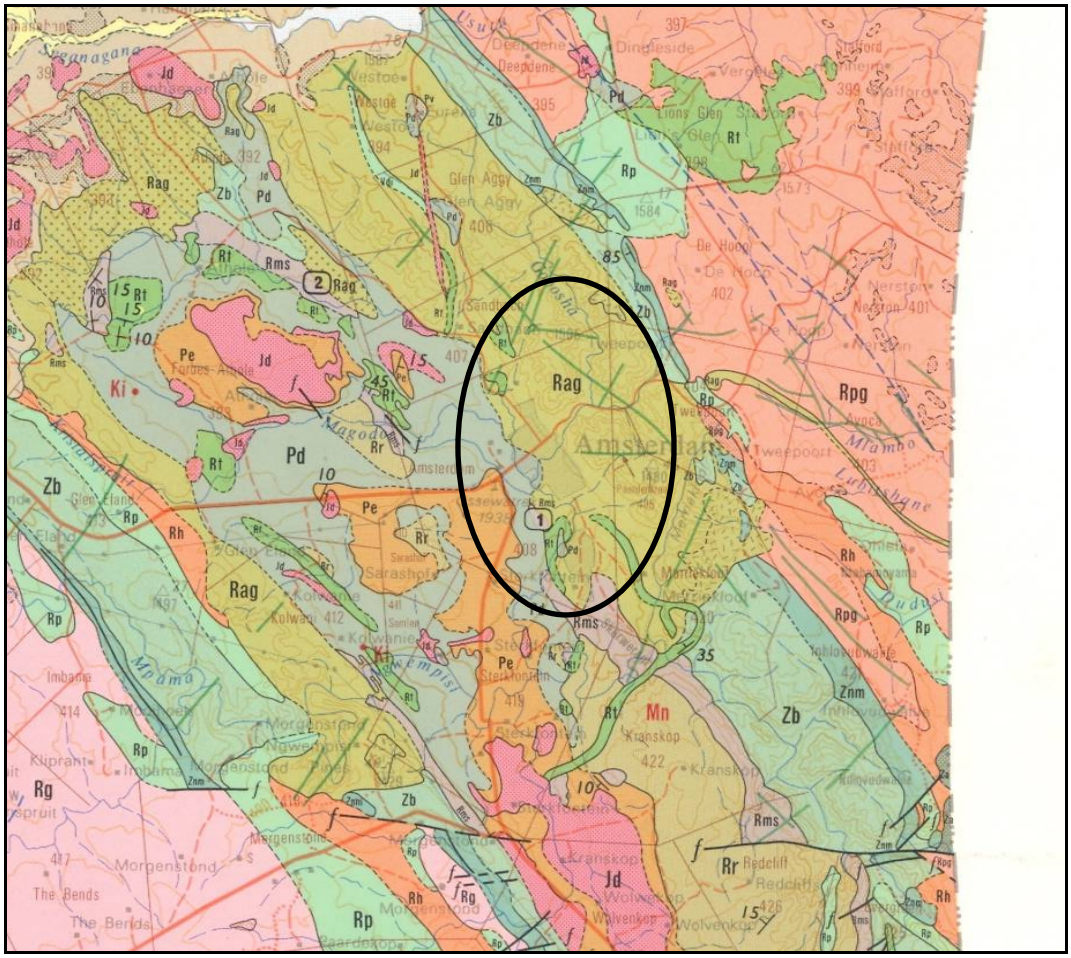


Figure 3.1: Geology of Amsterdam area (taken from 1:250 000 geology map, 2630 Mbabane).

The proposed Dam Site A, Dam Site B, bulk water pipeline route and distribution pipeline route are not affected by dolomites or mining (i.e. opencast or underground).

3.4 Topography

Dam Site A:
Dam Site A would be located within the Thole River (Figure 2.1) with the dam wall located at approximately 1200m above mean sea level (Figure 2.1).

The dam would be located within a valley between low hills rising to a height of 1220 mamsl on the western side and 1304 mamsl on the eastern side (Figure 2.1). According to the AGIS Comprehensive Map drafted by the Department of Agriculture, Forestry and Fisheries, the terrain type of the proposed Dam Site A is indicated as Level Plains with some relief (Figure 3.2).

The topography of the surrounding area has been impacted in terms of the development of the residential areas of Amsterdam and KwaThandeka, agricultural activities (cultivated lands), excavations, roads, etc.

Distribution pipeline:
The proposed distribution pipeline from the existing Amsterdam WTW to the proposed Dam Site A would extend through an area previously indicated as Level Plains with some relief (Figure 3.2). Today, this area is built-up and represents the residential area of Amsterdam. The topography of this area has thus already been impacted upon.

Dam Site B:
Dam Site B would be located within the Gabosha River (Figure 2.1) with the dam wall located at approximately 1280m above mean sea level (Figure 2.1).

The proposed dam would be located within a valley surrounded by very rugged topography (Figure 2.1) that extends to approximately 1480mamsl on both sides. According to the AGIS Comprehensive Map drafted by the Department of Agriculture, Forestry and Fisheries, the terrain type of the proposed Dam Site B is indicated as Open High Hills or Ridges (Figure 3.2).

Very little, if any, impact on topography has taken place within the proposed Dam Site B area due to the ruggedness of the topography.

Bulk water pipeline:
The proposed bulk water pipeline from the proposed Dam Site B to the existing Amsterdam WTW would extend mostly through Open High Hills or Ridges as indicated in Figure 3.2.

No impact on topography has taken place along the proposed pipeline route. However, the topography of the surrounding area has been impacted in terms of the provincial R65 road, gravel roads, excavations (sand), etc.

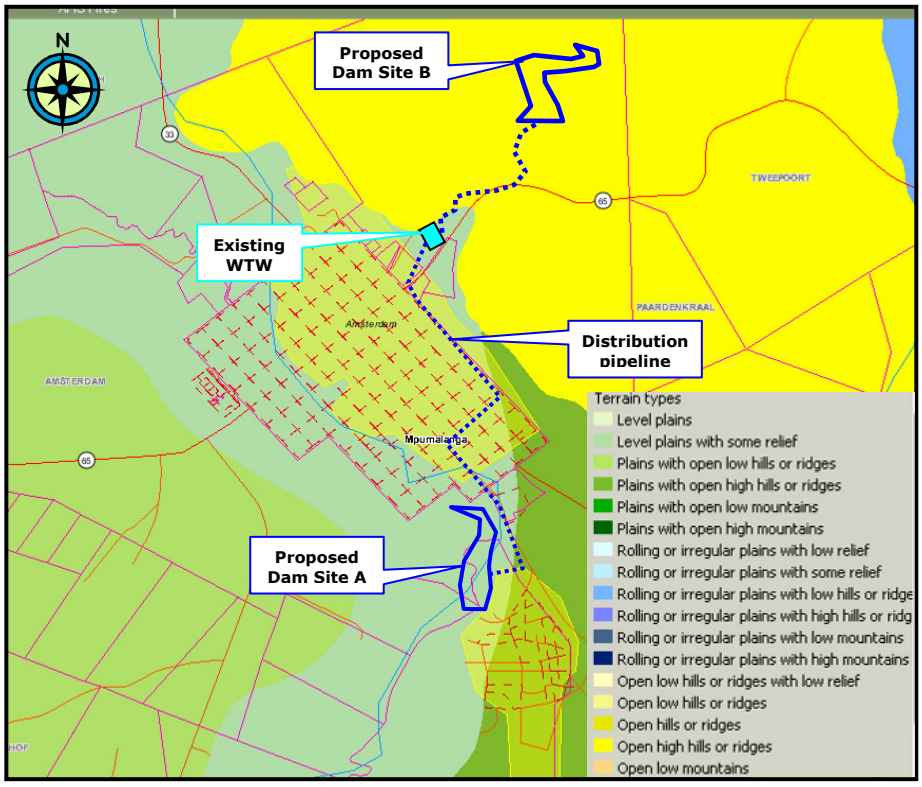


Figure 3.2: Terrain type of the Amsterdam area (taken from Department of Agriculture, Forestry and Fisheries).

3.5 Soils/land capability/agricultural potential

Dam Site A:
According to the AGIS Comprehensive Map drafted by the Department of Agriculture, Forestry and Fisheries, red and yellow soils with low to medium base status (Figure 3.3) would be associated with the proposed Dam Site A. In addition, wetland soils would be associated with the Thole River and therefore Dam Site A.

Dam Site A occurs within land type Ac (Figure 3.4) described as follows: *Red-yellow apedal, freely drained soils (red and yellow, dystrophic and/or mesotrophic). Dominantly (> 40%) red and yellow, freely drained, apedal (= structureless) soils. Normally associated with high rainfall areas, where soils are subjected to moderate (= mesotrophic) to intense (= dystrophic) leaching of nutrients from the soil profile. Soils are thus mostly low in base elements (K, Ca, Mg, Na). A broad range of textures may occur.*

Dam Site A is indicated as Moderate potential arable land (Figure 3.5) with a grazing potential of less than 4ha/animal unit (Figure 3.6). The area is used for grazing purposes by local residents. Small cultivated areas (fenced vegetable gardens) are present on the eastern side of the proposed Dam Site A.

Distribution pipeline:
Red and yellow soils with low to medium base status would be present along the proposed distribution pipeline from the existing Amsterdam WTW to the proposed Dam Site A (Figure 3.3). The soil along this route has already been impacted in terms of the development of the Amsterdam residential area.

Wetland soils would be associated with areas where the pipeline extends across the Gabosha River and other tributaries.

The distribution pipeline would extend through land type Ac (Figure 3.4) described as follows: *Red-yellow apedal, freely drained soils (red and yellow, dystrophic and/or mesotrophic). Dominantly (> 40%) red and yellow, freely drained, apedal (= structureless) soils. Normally associated with high rainfall areas, where soils are subjected to moderate (= mesotrophic) to intense (= dystrophic) leaching of nutrients from the soil profile. Soils are thus mostly low in base elements (K, Ca, Mg, Na). A broad range of textures may occur.*

The distribution pipeline would extend through an area indicated as Moderate potential arable land (Figure 3.5) with a grazing potential of less than 4ha/animal unit (Figure 3.6). However, the majority of the proposed pipeline route would extend through a built up area (i.e. residential area of Amsterdam) where the land capability and grazing potential has already been impacted upon.

Dam Site B:
According to the AGIS Comprehensive Map drafted by the Department of Agriculture, Forestry and Fisheries, the soils of Dam Site B can be described as: '*Soils with minimal development, usually shallow on hard or weathering rock with or without intermittent diverse soils. Lime rare or absent in the landscape'.*

In addition, wetland soils would be associated with the Gabosha River and therefore Dam Site B.

Dam Site B occurs within land type Fa (Figure 3.4) described as follows: *Glenrosa and/or Mispah soil forms (other soils may occur); lime rare or absent in the entire landscape. Generally shallow soils consisting of a topsoil directly underlain by weathered rock (Glenrosa form) or hard rock (Mispah form), sometimes with surface rock and steep slopes. Found in moister areas or areas with acidic parent materials, where little lime exists. Lime rare or absent in the entire landscape.*

Dam Site B is indicated as Non-arable with low to moderate potential grazing land (Figure 3.5). The grazing potential is indicated as less than 4ha/animal unit (Figure 3.6). No cultivation was noted within the proposed Dam Site B area (Figure 2.1) due to the rocky nature of the area. The said area may however be used for grazing purposes.

Bulk water pipeline:
According to the AGIS Comprehensive Map drafted by the Department of Agriculture, Forestry and Fisheries, the soils along the bulk water pipeline (Figure 3.3) can be described as: '*Soils with minimal development, usually shallow on hard or weathering rock with or without intermittent diverse soils. Lime rare or absent in the landscape'.*

In addition, wetland soils would be associated with the Gabosha River and therefore Dam Site B.

The bulk water pipeline would extend through land type Fa (Figure 3.4) described as follows: *Glenrosa and/or Mispah soil forms (other soils may occur); lime rare or absent in the entire landscape. Generally shallow soils consisting of a topsoil directly underlain by weathered rock (Glenrosa form)*

or hard rock (Mispah form), sometimes with surface rock and steep slopes. Found in moister areas or areas with acidic parent materials, where little lime exists. Lime rare or absent in the entire landscape.

The bulk water pipeline would extend through an area indicated as Non-arable with low to moderate potential grazing land (Figure 3.5). The grazing potential is indicated as less than 4ha/animal unit (Figure 3.6). No cultivation was noted along the proposed pipeline route due to the rocky nature of the area. The said area may be used for grazing purposes.

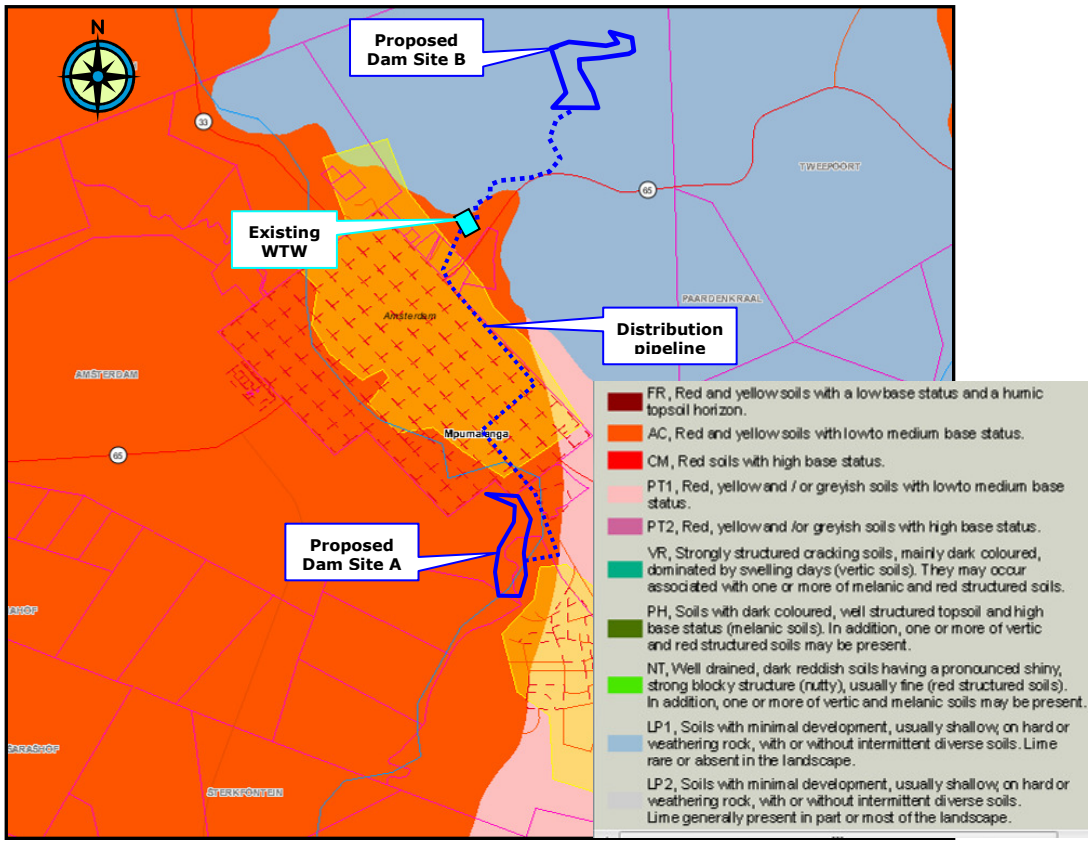


Figure 3.3: Generalised soil patterns of the Amsterdam area (taken from Department of Agriculture, Forestry and Fisheries).

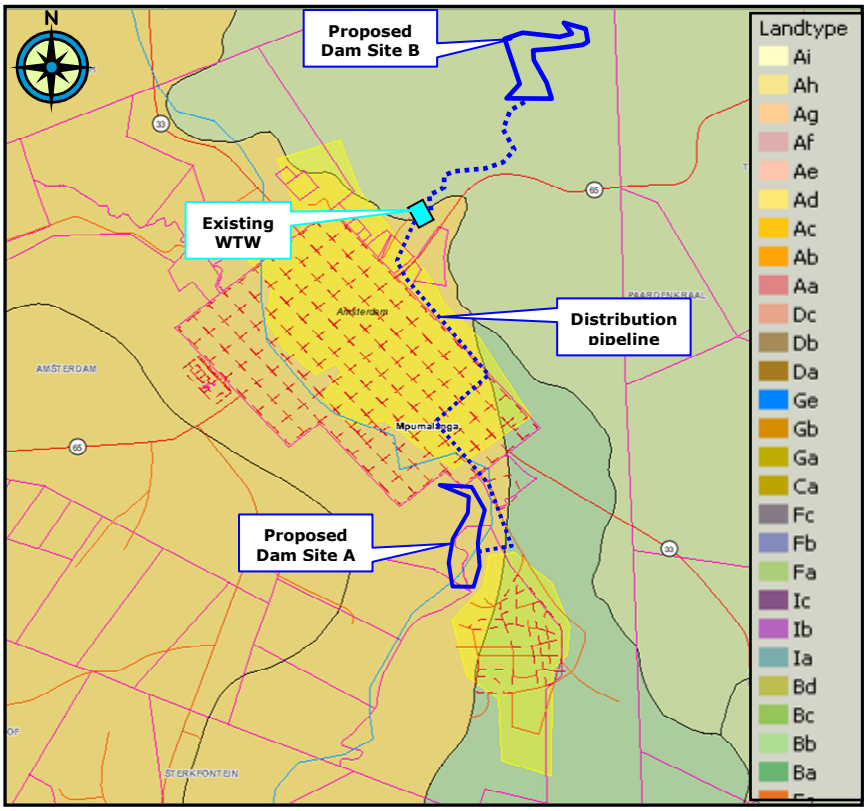


Figure 3.4: Land type of the Amsterdam area (taken from Department of Agriculture, Forestry and Fisheries).

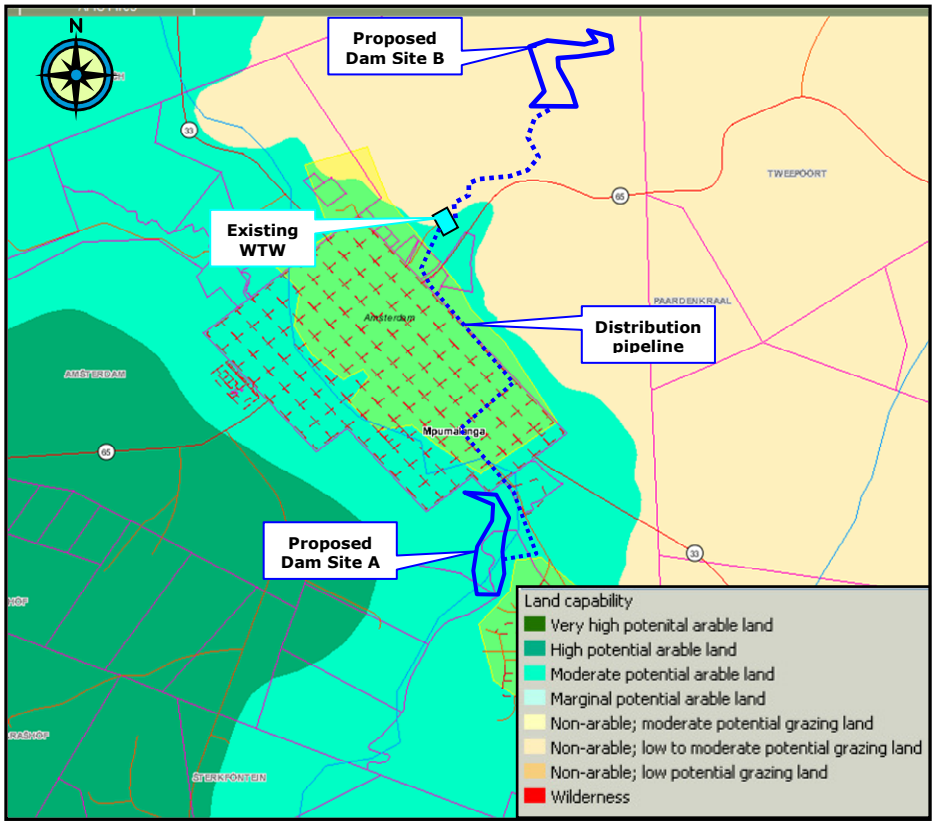


Figure 3.5: Land capability of the Amsterdam area (taken from Department of Agriculture, Forestry and Fisheries).

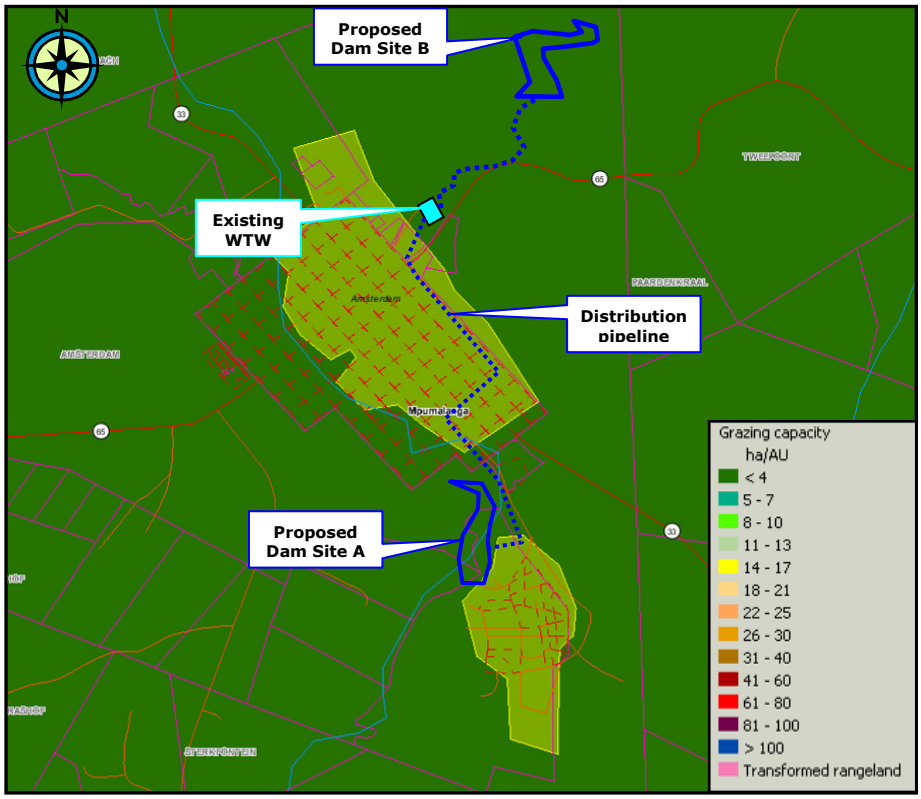


Figure 3.6: Grazing capacity of the Amsterdam area (taken from Department of Agriculture, Forestry and Fisheries).

3.6 Land use

3.6.1 Zoning of the site

Dam Site A:
Dam Site A is zoned as 'Agriculture' as it does not form part of the existing residential areas of Amsterdam and KwaThandeka.

Distribution pipeline:
The distribution pipeline would extend through the residential area of Amsterdam (Figure 3.8) which is zoned for residential purposes.

Dam Site B:
Dam Site B is zoned as 'Agriculture' and does not form part of the residential area of Amsterdam.

Bulk water pipeline:
The bulk water pipeline route is zoned as 'Agriculture' as it does not form part of the residential area of Amsterdam.

3.6.2 Land ownership

Dam Site A, the distribution line, the proposed bulk water pipeline and Dam Site B are all located on the Remaining Extent of Portion 11 of the farm Amsterdam 408 IT. This property belongs to the Mkhondo Local Municipality. A copy of the Windeed printout is provided in Appendix 1.

3.6.3 Servitudes

Dam Site A:
No servitudes are known to be associated within the proposed Dam Site A.

Distribution line:
The distribution pipeline would extend through the residential area of Amsterdam (Figure 3.8) which is zoned for residential purposes. The proposed distribution line would be located within the road reserve.

Dam Site B:
No servitudes are known to be associated within the proposed Dam Site B.

Bulk water pipeline:
No servitudes are known to be associated with the proposed bulk water pipeline route.

3.6.4 Major existing infrastructure

Dam Site A:
From an aerial view (Figure 3.7a), it is evident that no infrastructure is present within the proposed Dam Site A. An outfall sewer line is known to extend along the eastern side of the proposed dam site.

Distribution pipeline:
The distribution pipeline would extend through the residential area of Amsterdam (Figure 3.7a) and thus existing infrastructure (e.g. roads, houses, etc.) is present adjacent to the proposed route.

Dam Site B:
From an aerial view (Figure 3.7b), no infrastructure is present within the proposed Dam Site B.

Bulk water pipeline:
From an aerial view (Figure 3.7b), no infrastructure is present along the proposed bulk water pipeline route.

3.6.5 Surrounding land uses

Dam Site A:
As indicated in Figure 3.7a, the residential areas of Amsterdam and KwaThandeka occur in the immediate surrounding area of proposed Dam Site A (i.e. along the eastern side). Informal settlements and smallholdings are also present in this area. Old lands and areas of cultivation are also indicated to be present (Figure 3.8).

The unrehabilitated Amsterdam Waste Disposal Site is located on the western side of the proposed Dam Site A (Figure 3.8a) while the Amsterdam Waste Water Treatment Works (WWTW) is located approximately 1.8km downstream.

Distribution pipeline:
The distribution pipeline would extend through the residential area of Amsterdam (Figure 3.8).

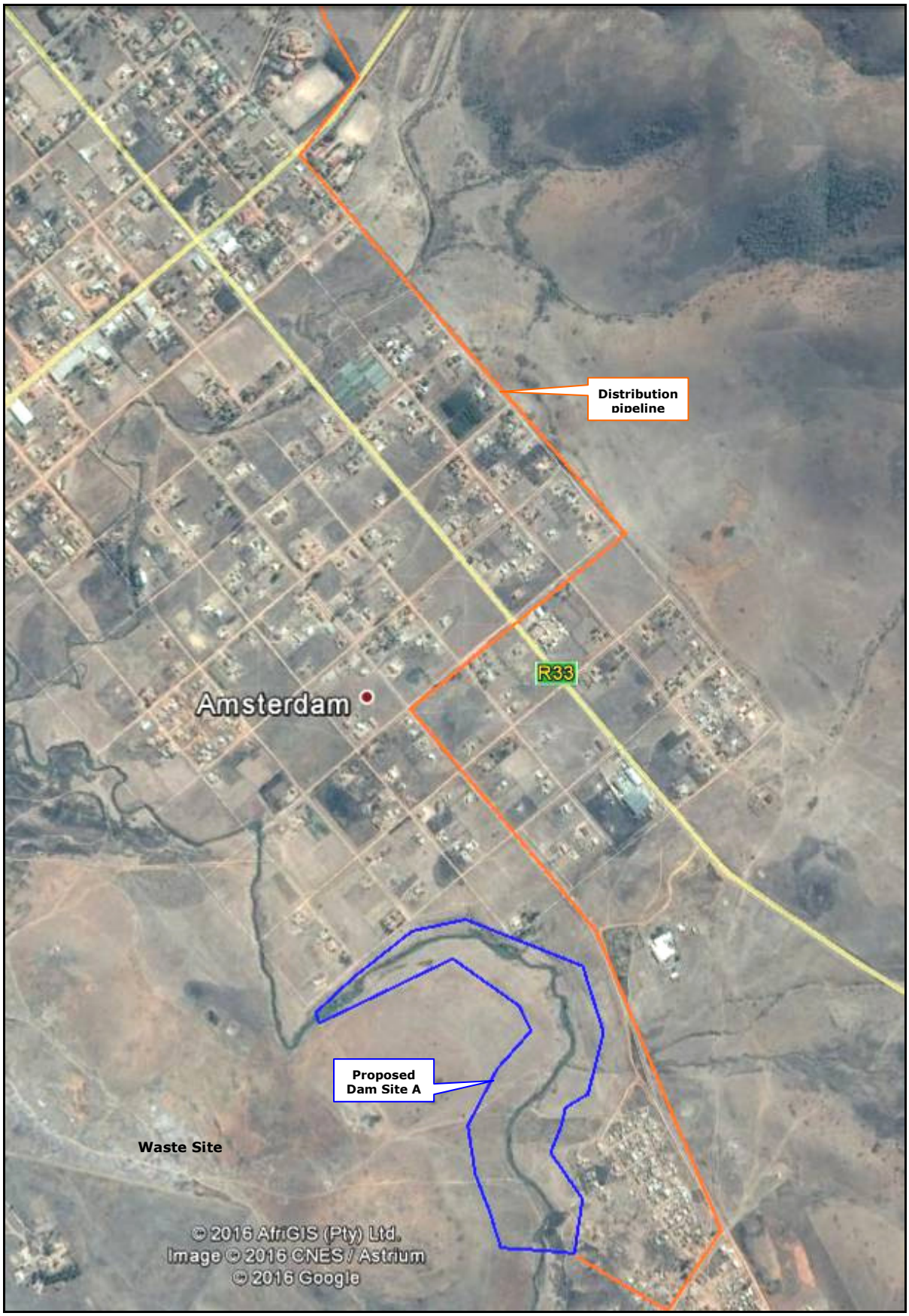


Figure 3.7a: Aerial view of Dam Site A and distribution pipeline.

Figure 3.7b: Aerial view of Dam Site B and bulk water pipeline.

Dam Site B:

As indicated in Figure 3.7b and Figure 3.8, no cultivation, afforestation, old lands or mining takes place within the immediate area surrounding the proposed Dam Site B. Afforestation is however present to the east of the dam site in the adjacent catchment area.

Bulk water pipeline:
As indicated in Figure 3.7b and Figure 3.8, no cultivation, afforestation, old lands or mining takes place within the immediate surrounding area of the proposed bulk water pipeline route. The provincial R65 road is however present to the south of the proposed route as indicated in Figure 3.7b.

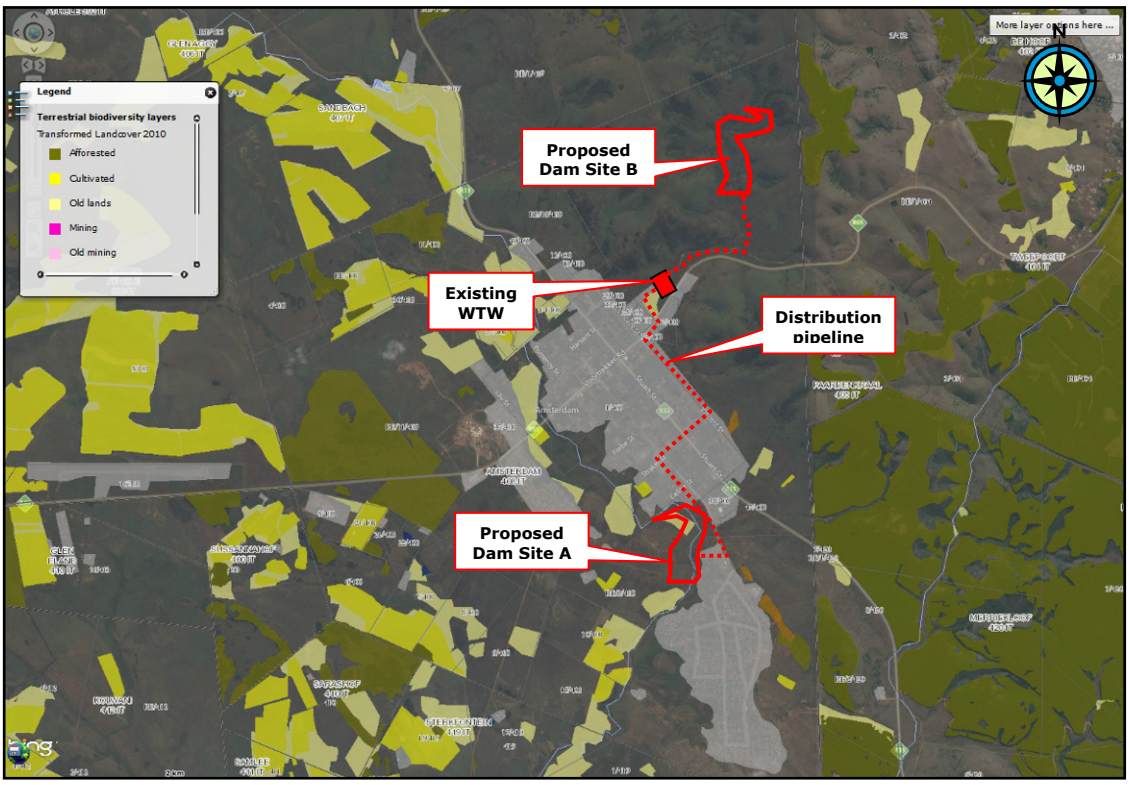


Figure 3.8: Landcover map of the Amsterdam area (Mpumalanga Biodiversity Sector Plan, 2013).

3.7 Natural vegetation

According to 'The vegetation of South Africa, Lesotho and Swaziland', the study area falls within the Mesic Highveld Grassland Bioregion, specifically the **KaNgwane Montane Grassland** (veld type Gm16; Figure 3.9) (Mucina & Rutherford, 2006). The vegetation type was previously referred to by Low and Rebelo (1998) as North-eastern Mountain Grassland (43) and by Acocks (1953) as Piet Retief Sourveld veld Grassland (64).

This grassland occurs along the gentle slopes of the Escarpment, from the Phongolo Valley in the south, northwards to the Usutu Valley and to the uppermost Lomati Valley near Carolina, including the western grassland areas of Swaziland.

It occurs at an altitude of 880 – 1740m (Mucina & Rutherford, 2006) and is present on the undulating hills and plains that occur on the eastern edge of the Escarpment (Mucina & Rutherford, 2006).

This vegetation unit is transitional between the Highveld and Escarpment and contains elements of both. The vegetation structure is comprised of a short closed grassland layer with many forbs, and a few scattered shrubs on the rocky outcrops (Mucina & Rutherford, 2006).

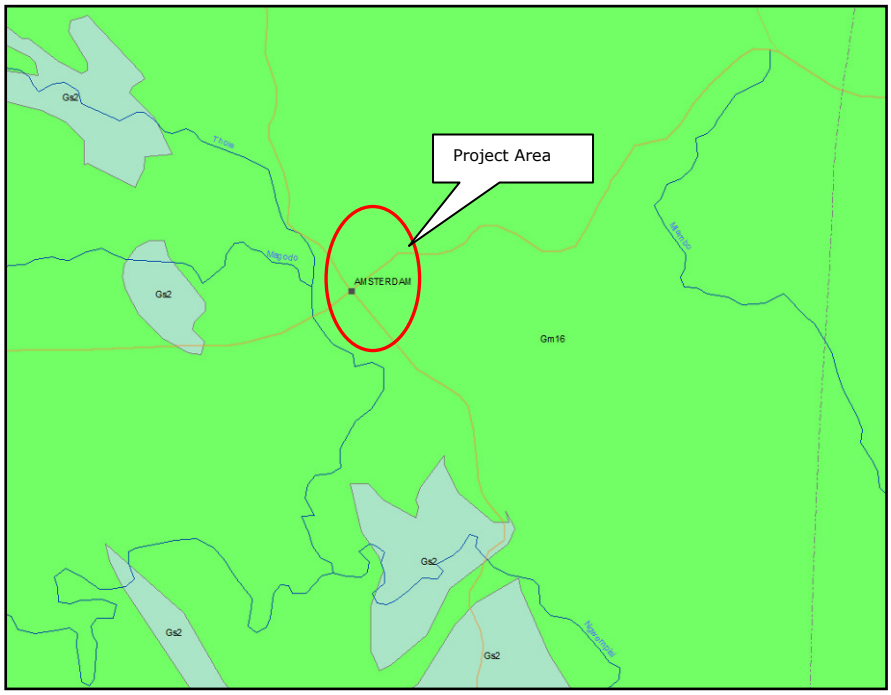


Figure 3.9: Vegetation type of the Amsterdam area (taken from Mucina and Rutherford, 2006).

Centre of Endemism

The KaNgwane Montane Grassland occurs on the southern edge of the Barberton Centre of Endemism (Van Wyk and Smith, 2001). According to Mucina & Rutherford (2006), the following biogeographically important taxa are associated with this vegetation type.

SPECIES	TYPE	ENDEMIC
Hemizygia modesta	Herb	Barberton endemic
Hemizygia thorncroftii	Herb	
Selago stewartii	Herb	
Watsonia watsonioides	Geophytic herb	Northern sourveld endemic
Kleinia galpinii	Succulent herg	
Hemizygia albiflora	Low shrub	

Endemic taxa include the following:

SPECIES	TYPE
Lotononis difformis	Herb
Lotononis spicata	Herb
Streptocarpus occultis	Herb
Syncolostemon comptonii	Low shrub

Conservation status

According to Mucina & Rutherford (2006), the conservation status of this vegetation type is Vulnerable. The conservation target is 27% but only 0.4% is formally protected within formally proclaimed nature reserves (Malalotja, Nooitgedacht Dam, Songimvelo). Approximately 30% of this vegetation type has already been converted to plantations (alien trees) with approximately 6% under cultivation.

The National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004), lists this vegetation type as **Vulnerable**.

> **Vulnerable (VU) ecosystems -** being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems.

The stated purpose of listing 'threatened ecosystems' is primarily to reduce the rate of ecosystem degradation and species extinction.

Mpumalanga Biodiversity Conservation Plan, 2006

The proposed Dam Site A, Dam Site B, the bulk water pipeline and the distribution line are indicated to occur within areas classified as **'Irreplaceable'** and **'Highly Significant'** (Figure 5.10a) in terms of the terrestrial biodiversity assessment of the Mpumalanga Biodiversity Conservation Plan (2006).

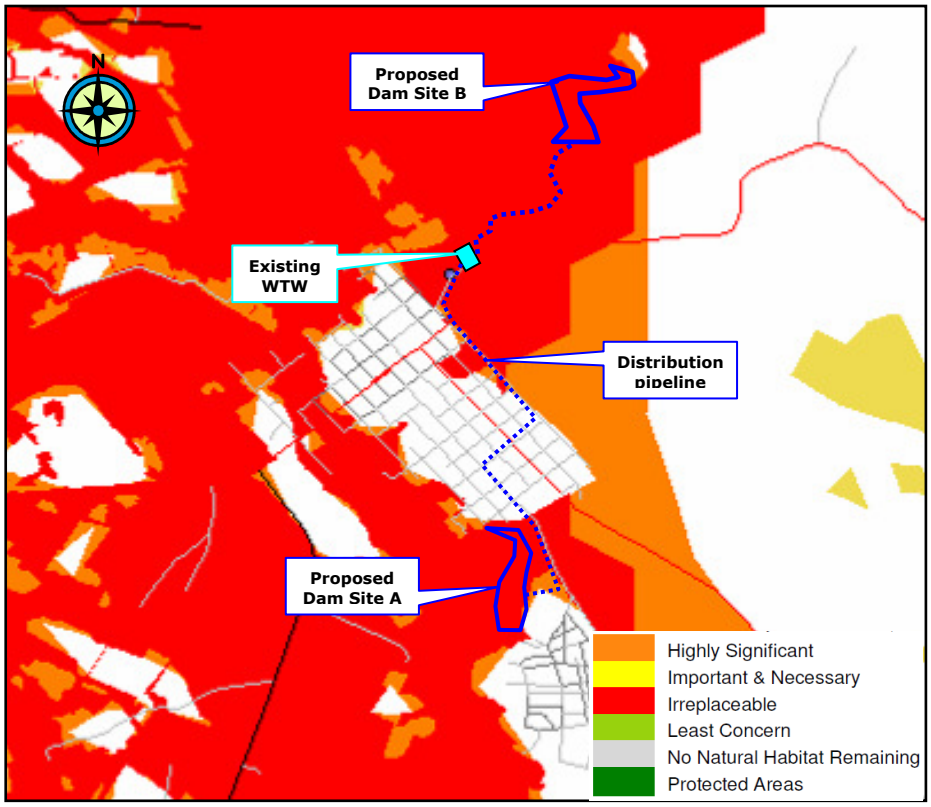


Figure 5.10a: Terrestrial biodiversity assessment of the Amsterdam area (taken from the Mpumalanga Biodiversity Conservation Plan, 2006).

Mpumalanga Biodiversity Sector Plan, 2013

The Mpumalanga Biodiversity Sector Plan (MBSP, 2013) is a biodiversity planning tool that provides the most recent spatial biodiversity information to inform land-use and development planning (Lotter *et al*., 2014). The main mapping categories used in the MBSP (in descending order of importance in terms of meeting conservation targets), are:

- Protected Areas;
- Critical Biodiversity Areas (Irreplaceable and Optimal);

- Ecological Support Areas;
- Other Natural Areas;
- Modified (Heavily Modified and Moderately Modified-old lands).

According to the Mpumalanga Biodiversity Sector Plan (MBSP, 2013), the proposed Dam Site A, Dam Site B and the bulk water pipeline would be located within areas identified as Critical Biodiversity Area (CBA) Optimal (Figure 5.10b). The proposed Dam Site B would also be located in close proximity to an area classified as Critical Biodiversity Area (CBA) Irreplaceable (Figure 5.10b).

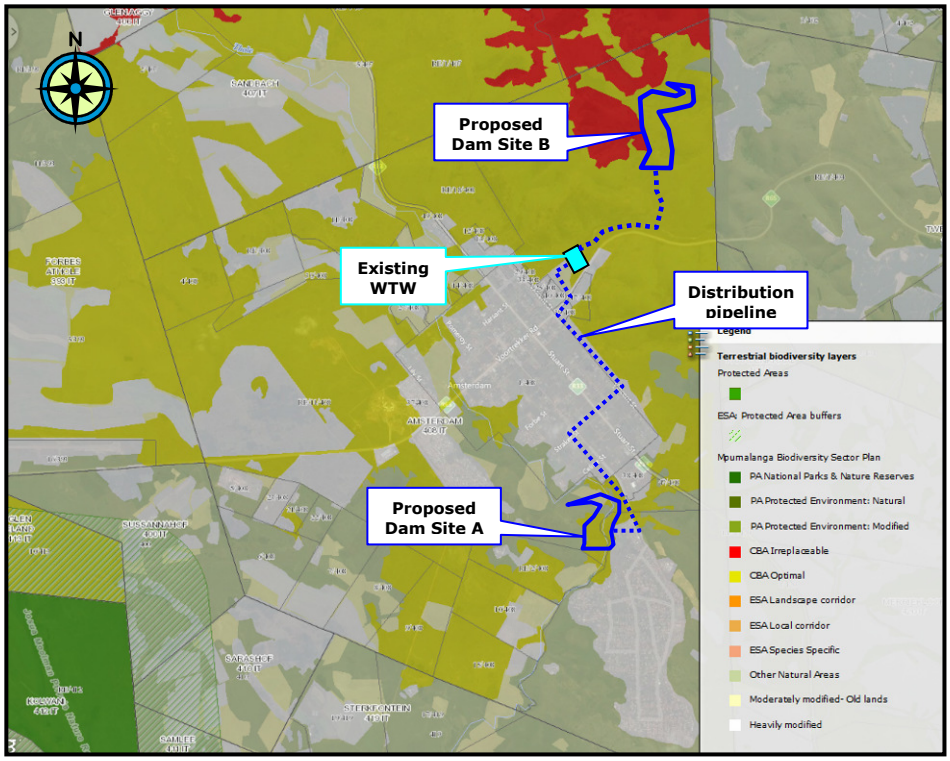


Figure 3.10b: Terrestrial biodiversity assessment of the Amsterdam area (taken from the Mpumalanga Biodiversity Sector Plan, 2013).

The distribution line would extend through the residential area of Amsterdam indicated as **'Heavily Modified'** (Figure 3.10b).

Threatened species

Table 3.2 provides an indication of the Red Data plant species found in the KaNgwane Montane Grassland, which could be present on site.

Table 3.2: Red data species found in the KaNgwane Montane Grassland vegetation type (taken from Venter and Niemand, 2017).

Species name	Status	Habitat	Habitat on site
Alepidea cordifolia	Endangered	Forest margins, west and south facing mountain slopes and near drainage lines or islands within wetlands.	Possible in portions of the Dam Site B area.

Species name	Status	Habitat	Habitat on site
Aloe integra	Vulnerable	Dry highveld grassland, on exposed, rocky sites with short grass on north- and northwest-facing slopes.	Possible in the grassland areas of Dam Site B, mostly above the proposed dam site.
Aloe kniphofioides	Vulnerable	Montane grassland.	Possible in the grassland areas.
Asclepias dissona	Cr. PE	Damp grassland.	Possible in grassland areas adjacent to the wetland and river areas.
Asparagus fractiflexus	Endangered	High altitude, open grasslands, on rocky outcrops or among boulders.	Unlikely.
Brachystelma angustum	Vulnerable	Pockets of shallow, humic soils on white quartzitic ridges, where competition from grasses is restricted.	No habitat on site.
Brachystelma longifolium	Vulnerable	Granite domes, between rocks.	No habitat on site.
Cephalaria foliosa	Vulnerable	Moist montane grassland, in wetlands and near streams, 1000-1500 m.	Only marginal habitat present.
Dioscorea strydomiana	Critically endangered	Exposed, open grassland, in serpentine soils on steep, southeast-facing slopes, 1100 m.	No habitat on site.
Eugenia pusilla	Extinct	Last collected in 1920, and never seen again despite numerous searches. The area where it was last seen has been transformed to wattle plantations. KaNgwane Montane Grassland.	Unlikely.
Gerbera aurantiaca	Vulnerable	Mistbelt grassland, well-drained doleritic areas.	Unlikely.
Gladiolus paludosus	Vulnerable	Wetlands or marshes in high altitude grassland that remain wet throughout the year or dry out for only a short period.	Unlikely.
Indigofera hybrida	Vulnerable	Dry highveld grassland.	Possible in grassland unit.
Melanospermum italae	Vulnerable	Mistbelt grassland, in sandy or gritty places around or on rock sheets and around extensive rock outcrops, 1200-1500 m.	Possible in grassland unit.
Ozoroa barbertonensis	Vulnerable	Grassland, on rocky hillsides between rocks on white-green band of serpentine soil, 1000 m.	No habitat on site.
Streptocarpus occultus	Vulnerable	Grassland, on granite outcrops or boulders.	Unlikely.
Vachellia ebutsiniorum	Endangered	Exposed, open grassland, on steep, southeast-facing slopes, apparently on serpentine soils, 1 100 m.	No habitat on site.

The declining species *Eucomis montana* may also be present in the montane grassland areas of Dam Site B. Although not currently threatened, the species should be protected from further decline.

Vegetation on site

Dam Site A:
From an aerial view (Figure 3.7a), it is apparent that the following vegetation units would be associated with the proposed Dam Site A:

- Grassland;
- Wetland;
- Rocky outcrop;
- Old lands;
- Transformed.

The above-mentioned vegetation units would be impacted to varying degrees due to the close proximity of the residential area of Amsterdam and KwaThandeka and the use of the area for agricultural purposes (e.g. grazing, cultivation, etc.).

Distribution pipeline:
The majority of the distribution pipeline would be located within the road reserve associated with the roads extending through the residential area of Amsterdam. The vegetation of the road reserve area would be seen as Transformed.

Wetland vegetation would however be associated with the areas where the Gabosha River is crossed.

Dam Site B:
From an aerial view (Figure 3.7b), it is apparent that the following vegetation units would be associated with the proposed Dam Site B:

- Grassland;
- Wetland and/or riparian;
- Woodland;
- Rocky outcrop.

It is possible that the above-mentioned vegetation units may be close to pristine in view of the lack of activities taking place within this area. However, alien vegetation could to be present along the banks of the Gabosha River as a result of surrounding forestry activities.

Bulk water pipeline:
From an aerial view (Figure 3.7b), it is apparent that the following vegetation units would be associated with the bulk water pipeline route:

- Grassland;
- Wetland and/or riparian;
- Woodland;
- Rocky outcrop.

It is possible that the above-mentioned vegetation units may be close to pristine in view of the lack of activities taking place within this area.

3.8 Animal life

Dam Site A:
As indicated in Section 3.7, the following vegetation units – grassland, wetland, rocky outcrop, old lands, transformed - would be associated with the

proposed Dam Site A and could provide natural animal habitats (terrestrial and aquatic).

However, these vegetation units could be impacted to varying degrees due to the close proximity of the residential area of Amsterdam and KwaThandeka and the use of the area for agricultural purposes (e.g. grazing, cultivation, etc.). In addition, the animal life could be impacted in terms of poaching, etc.

According to Kotze (2016), eleven (11) fish species are expected to occur within the Thole River (Table 3.3) where the proposed Dam Site A would be located.

The most important migratory species in the Thole River system is the catadromous Longfin eel and the various potadromous fish species, most importantly *Labeobarbus marequensis* and *Labeobarbus polylepis* (Table 3.3).

One catadromous species, namely the Longfin eel (Anguilla mossambica) is expected to be present (Table 3.3) in this reach. This fish species has the highest requirement for migration (VERY HIGH), as it cannot complete it lifecycle without free movement between freshwater and the sea (Kotze, 2016).

Table 3.3: Fish species occurring in the Thole River and the relative importance of migration for their survival (taken from Kotze, 2016)

SPECIES	COMMON NAME	SPATIAL RANGE OF MIGRATION #	IMPORTANCE OF MIGRATION FOR SPECIES SURVIVAL*	REASONS FOR MIGRATING	CONSERVATION STATUS
Amphilius uranoscopus	Stargazer (mountain catfish)	1	3	Reproduction, dispersal and localize feeding movement	Common
Anguilla mossambica (adult)	Longfin eel	5	5	Adults: reproduction (downstream)	**Rare**
Barbus anoplus (adults)	Chubbyhead barb	3	3	Adults- reproduction, Young-feeding & recolonization	Widespread and common
Barbus argenteus	Rosefin barb	?	2	Local	Common
Chiloglanis anoterus	Pennant-tail rock catlet	3	4	Local movement for breeding, temperature avoidance migrations	Common
Chiloglanis emarginatus	Pongola rock catlet	3	3	Reproduction and dispersal	**Near threatened (Skelton, 2003). (IUCN least concern)**
Clarias gariepinus	Sharptooth catfish	3	2	Reproduction, avoidance/habitat, dispersal and feeding	Widespread and common.
Labeobarbus marequensis	Largescale yellowfish	3	5	Reproduction and [dispersal], feeding	Common
Labeobarbus polylepis	Smallscale yellowfish	3	5	Reproduction and dispersal, feeding	**RSA Endemic. Becoming rare in Mpumalanga**
Pseudocrenilabrus	Southern	1	1	Dispersal	Common

SPECIES	COMMON NAME	SPATIAL RANGE OF MIGRATION #	IMPORTANCE OF MIGRATION FOR SPECIES SURVIVAL*	REASONS FOR MIGRATING	CONSERVATION STATUS
Philander	mouthbrooder				
Tilapia sparrmanii	Banded tilapia	3	2	Reproduction and feeding	Common

*Legend: #Spatial range: 5 between catchments/catadromous, 3 – between reaches, 1 – within reach. *Importance rating: 4-5: Migration critical for survival of species (large scale migrations undertaken for reproduction, avoidance, feeding and dispersal). 3: Migration moderately important for survival of species (uncertain). 1-2: migration not important for survival of species (migration mostly undertaken for dispersal).*

Eight (8) of the expected 11 species are classified as potamodromous and require free movement between river reaches to complete its life cycle (Table 3.3). These include Chubbyhead barb, Rosefin barb, Large-scale and Small-scale yellowfish, Sharptooth catfish, Pennant-tail rock catlet and Pongola Rock catlet and Banded tilapia. Of these species, the two yellowfish species and the Pennant-tail rock catlet have the highest requirement of migration for survival and are also of HIGH importance to consider.

Distribution pipeline:
The majority of the distribution pipeline would be located within the road reserve associated with the roads extending through the residential area of Amsterdam. The vegetation of the road reserve area would be seen as Transformed and would not provide natural animal habitats (terrestrial).

Wetland vegetation would however be associated with the areas where the Gabosha River is crossed and could provide natural animal habitats (aquatic).

Dam Site B:
As indicated in Section 3.7, the following vegetation units – grassland, wetland and/or riparian, woodland and rocky outcrop – would be associated with the proposed Dam Site B and could provide natural animal habitats (terrestrial and aquatic). It is possible that the above-mentioned vegetation units/natural animal habitats may be close to pristine in view of the lack of activities taking place within this area and could thus provide the necessary natural habitats for a number of animal species. Currently no information is available regarding fish species present in the Gabosha River.

Bulk water pipeline:
The following vegetation units – grassland, wetland and/or riparian, woodland and rocky outcrop - would be associated with the bulk water pipeline route and would provide natural animal habitats (terrestrial and aquatic). It is possible that the above-mentioned vegetation units/natural animal habitats may be close to pristine in view of the lack of activities taking place within this area and could thus provide the necessary natural habitats for a number of animal species.

Further information regarding potential threatened and near threatened mammals, reptiles, amphibians and bird species is provided in the sections below as well as Table 3.4 and Table 3.5.

Threatened mammal species
Table 3.4 provides an indication of threatened mammal species that could occur within the above-mentioned vegetation units/natural animal habitats.

Table 3.4: Threatened and near threatened mammal species that could occur in the study area based on their known and historical distribution ranges and the presence of suitable habitat (sensu Child *et al.*, in press) (taken from Venter and Niemand, 2017)

Family	Genus	Species	Common name	Conservation Status	Habitat	Potential occurrence
Bovidae	*Pelea*	*capreolus*	Vaal Rhebok	Near Threatened	Open short grassland along steep slopes and hillsides, mainly confined to the Highveld.	Possibly along the steep slopes and gradients consisting of open grassland at Dam Site B (mostly above the proposed dam site).
Bovidae	*Ourebia*	*oribi*	Oribi	Endangered	Open grassland consisting of both tall and short grass due to the selective grazing habits of the species. Mainly confined to untransformed Highveld grassland.	Probably an uncommon resident in the area and absent from Dam Site A (owing to high grazing frequency and human-induced activities).
Felidae	*Panthera*	*pardus*	Leopard	Near Threatened	Varied, but mainly associated with habitat of high spatial heterogeneity and topographic complexity. Generally avoid human confrontation.	Possibly in Dam Site B area.
Nesomyidae	*Dendromus*	*nyikae*	Nyika African Climbing Mouse	Data Deficient	Tall grassland and rank grassland.	Possibly at both alternative sites
Felidae	*Leptailurus*	*serval*	Serval	Near Threatened	Tall rank grassland bordering stream, seep and pans.	Possibly at both alternative sites.
Mustelidae	*Aonyx*	*capensis*	Cape Clawless Otter	Near Threatened	Mainly confined to perennial stream, rivers and dams.	Regarded as a regular foraging visitor to both the Thole (Dam Site A) and Gobosha (Dam Site B) rivers.
Mustelidae	*Hydrictis*	*maculicollis*	Spotted-necked Otter	Vulnerable	Fast-flowing streams and dams that remain relatively clear (since it hunts by sight).	Could occasionally utilize the Thole River (Dam Site A) during foraging, although regarded to occur more frequently on the Gobosha River (Dam Site B).
Hyaenidae	*Parahyaena*	*brunnea*	Brown Hyaena	Near Threatened	Varied.	Could occur on the study area, although more partial towards areas that are remote or where likely human persecution is low (e.g. Dam Site B).
Soricidae	*Crocidura*	*mariquensis*	Swamp Musk Shrew	Near Threatened	Moist grassland and sedge bordering streams, dams and seeps.	Could occur in moist grassland bordering the various streams and seeps.

Based on the information provided in Table 3.4, it is evident that eight threatened and near threatened mammal species could occur within the study area. However, most of these species would probably be present within the Dam Site B area (as opposed to the Dam Site A area), due to the low frequency of anthropogenic activities in the area, low grazing intensity and the remoteness of the area (Venter and Niemand, 2017).

Owing to the rural nature and extensive area of natural grassland surrounding the proposed Dam Site B, it is likely that the area will support large-bodied meta-carnivores and a higher proportion of threatened mammal species. Apart from the high diversity of mammal species expected, three species are worth mentioning due to their specific habitat preference and life histories. These include the near-threatened Leopard (*Panthera pardus*), the endangered Oribi (*Ourebia ourebi*) and the vulnerable Spotted-necked Otter (*Hydrictis maculicollis*).The latter is most likely to be affected by the proposed development and is especially sensitive to current water management regimes (Venter and Niemand, 2017).

Threatened reptile and amphibian species

There is no reptile or frog species of conservation concern is known to be sympatric to the project area (Venter and Niemand, 2017). However, the rocky grassland and slopes that border the proposed dam sites could provide potential habitat for the near threatened Striped Harlequin Snake (*Homoroselaps dorsalis*), Coppery Grass Lizard (*Chamaesaura aenea*) and Large-scaled Grass Lizard (*C. macrolepis*). These species show a wide distribution range consisting mainly of fragmented sub-populations. They are vulnerable towards overgrazing and veld fires, whereby they take refuge in rocky grassland and termitaria (*c. H. dorsalis*) (Bates *et al*., 2014). Accordingly, it is probably more likely to occur within the grassland at Dam Site B as opposed to Dam Site A where grazing appears to be persistent (Venter and Niemand, 2017).

Threatened bird species

From an avifaunal perspective, the area is expected to provide habitat for approximately 252 bird species (Venter and Niemand, 2017). However, recent surveys in the area showed that this diversity value is probably less and ranges on average between 69 and 93 species (based on the SABAP2 database and personal observations).

Of more importance is the high number of specialised bird species, many being biome-restricted or of conservation concern that could be present within the project area (Venter and Niemand, 2017). As indicated in Table 3.5, 21 threatened and near-threatened species are known to occur within the project area.

Table 3.5: Threatened and near threatened bird species that could utilise the study area based on their known distribution range and the presence of suitable habitat. Red list categories according to IUCN (2017)* and Taylor et al. (2015). (taken from Venter and Niemand, 2017)**

Species	Global Conservation Status*	National Conservation Status**	SABAP1 reporting rate (n=90)	SABAP2 reporting rate (n=4 full protocol)	Preferred Habitat	Potential Likelihood of Occurrence	Probability to be affected by proposed activity
Anthropoides paradiseus (Blue Crane)	Vulnerable	Near-threatened	22	50	Prefers open grasslands. Also forages in wetlands, pastures and agricultural land.	Could be present, although at low densities.	High
Alcedo semitorquata (Half-collared Kingfisher)	-	Near-threatened	17	No	Prefers clear fast-flowing streams with overhanging vegetation earth banks that provide breeding habitat.	Predicted to be resident along the perennial Thole and Gobosha Rivers.	High
Aquila verreauxii (Verreaux's' Eagle)	-	Vulnerable	10		High reporting rates owing to nearby habitat consisting of mountains and exposed cliff faces.	Rare to vagrant owing to sub-optimal habitat suitability.	Low
Balearica regulorum (Grey Crowned Crane)	Endangered	Endangered	37	Yes	Upland grassland in close association to wetland systems.	Could be present, although at low densities.	Moderate
Bugeranus carunculatus (Wattled Crane)	Vulnerable	Critically Endangered	1	No	Restricted to large upland wetlands and sponges dominated by short Cyperaceae, especially *Eleocharis* spp.	Probably absent or highly irregular.	Low
Bucorvus leadbeateri (Southern Ground Hornbill)	Vulnerable	Endangered	7	No	Confined to open woodland and hilly grassland.	Probably absent at Dam Site A but the surrounding hilly grassland at Dam Site B provides suitable foraging habitat.	Moderate
Calidris ferruginea (Curlew Sandpiper)	Near-threatened	-	2	No	Generally confined to muddy fringes of inland pans and impoundments, lagoons and estuaries.	Probably absent.	Low
Circus ranivorus (African Marsh Harrier)	-	Endangered	1	Yes	Restricted to permanent wetlands with extensive	Probably an irregular foraging visitor to	Moderate-low

Species	Global Conservation Status*	National Conservation Status**	SABAP1 reporting rate (n=90)	SABAP2 reporting rate (n=4 full protocol)	Preferred Habitat	Potential Likelihood of Occurrence	Probability to be affected by proposed activity
					reedbeds.	the wetland feeding into the Thole River system.	
Ciconia abdimii (Abdim's Stork)	-	Near-threatened	1	No	A non-breeding summer visitor to open grassland and recently tilled agricultural land.	An uncommon summer foraging visitor.	Low
Eupodotis senegalensis (White-bellied Korhaan)	-	Vulnerable	18	No	Prefers transitional habitat between grassland and savanna (e.g. Bankenveld).	Probably resident along the hilly grassland bordering Dam Site B. Historically occurred on the open grassland of Dam Site A but displaced by intense grazing and human activities.	Moderate
Eupodotis caerulescens (Blue Korhaan)	Near-threatened	(delisted)	1	Yes	Prefers extensive open short grassland and cultivated land.	An uncommon resident in the area.	Low
Falco biarmicus (Lanner Falcon)	-	Vulnerable	1	No	Varied, but prefers to breed in mountainous areas.	An occasional foraging visitor to the study area, although regarded to be more frequent at Dam Site B.	Moderate
Geronticus calvus (Southern Bald Ibis)	Vulnerable	Vulnerable	60	100	A species restricted to montane grassland (especially when burned) and breed/nest on steep cliffs.	A regular foraging visitor.	High
Gyps coprotheres (Cape Vulture)	Endangered	Endangered	2	No	Varied but breeds on steep south or east facing cliffs.	Irregular foraging visitor (mainly soaring overhead).	Low
Lioptilus nigricapillus (Bush Blackcap)	Near-threatened	Vulnerable	3	Yes	Afromontane forest and wattle plantations.	Could occur in the dense woodland stands along the proposed bulk water pipeline route.	High
Neotis	Near-	Vulnerable	12	No	Primary upland	Unlikely to	Moderate

Species	Global Conservation Status*	National Conservation Status**	SABAP1 reporting rate (n=90)	SABAP2 reporting rate (n=4 full protocol)	Preferred Habitat	Potential Likelihood of Occurrence	Probability to be affected by proposed activity
denhami (Denham's Bustard)	threatened				grassland, particularly on hilly terrain.	be present at A, but could be present on the hilly grassland surrounding Alternative B.	
Oxyura maccoa (Maccoa Duck)	Near-threatened	Near-threatened	1	Yes	Large saline pans and shallow impoundments.	Probably absent.	Low
Phoenicopterus ruber (Greater Flamingo)	-	Near-threatened	1	Yes	Restricted to large saline pans and other inland water bodies.	Absent.	Low
Polemaetus bellicosus (Martial Eagle)	Vulnerable	Endangered	3	Yes	Varied, from open karroid shrub to lowland savanna.	Uncommon foraging visitor.	Lo
Sagittarius serpentarius (Secretarybird)	Vulnerable	Vulnerable	24	No	Prefers open grassland or lightly wooded habitat.	Considered to be a regular foraging visitor on open grassland sites (both Alternative A and B).	High
Tyto capensis (African Grass-owl)	-	Vulnerable	4	Yes	Prefers rank moist grassland that borders drainage lines or wetlands.	A rare or uncommon resident.	High

The project area does not overlap with any Important Bird and Biodiversity Area, although it provides for a number of biome-restricted species with high affinities to the Afrotropical Highlands. These include Bush Blackcap (*Lioptilus nigricapillus*), Chorister Robin-chat (*Cossypha dichroa*) and Olive Bush-shrike (*Chlorophoneus olivaceus*) and the majority are confined to the densely wooded kloofs corresponding to the bulk water pipeline (Venter and Niemand, 2017).

3.9 Surface water

3.9.1 Catchment

The proposed Dam Site A would be located within the Thole River and the proposed Dam Site B would be located within the Gabosha River (Figure 2.1).

The Thole and Gabosha Rivers are tributaries of the Ngwempisi River (W53 catchments), which is a tributary of the Usutu River (Figure 2.1). The Usutu River has its headwaters in South Africa and flows into Swaziland after which it joins the Pongola River to form the Maputo River just before the South Africa/Mozambique border. The catchment is thus an international water course, forming part of the Maputo River Basin (Mallory and Jacobs, 2014).

The Tripartite Agreement between the Republic of Mozambique, the Republic of South Africa and the Kingdom of Swaziland (Interim IncoMaputo Agreement, 2002; Appendix 3) specifies the minimum amount of water that must be released into Swaziland. Table 3.6 provides an indication of the minimum cross-border flows into Swaziland as per the Interim IncoMaputo Agreement (IIMA).

Table 3.6: Minimum cross-border flows according to the Interim IncoMaputo Agreement (taken from Mallory and Jacobs, 2014).

RIVER	KEY POINT	INTERIM TARGET INSTREAM FLOW	
		MEAN (million m^3/a)	MINIMUM (m^3/s)
Ngwempisi	GS21	30	0.1
Usuthu	GS23	20	0.1
	Big Bend (GS16)	520	1.7

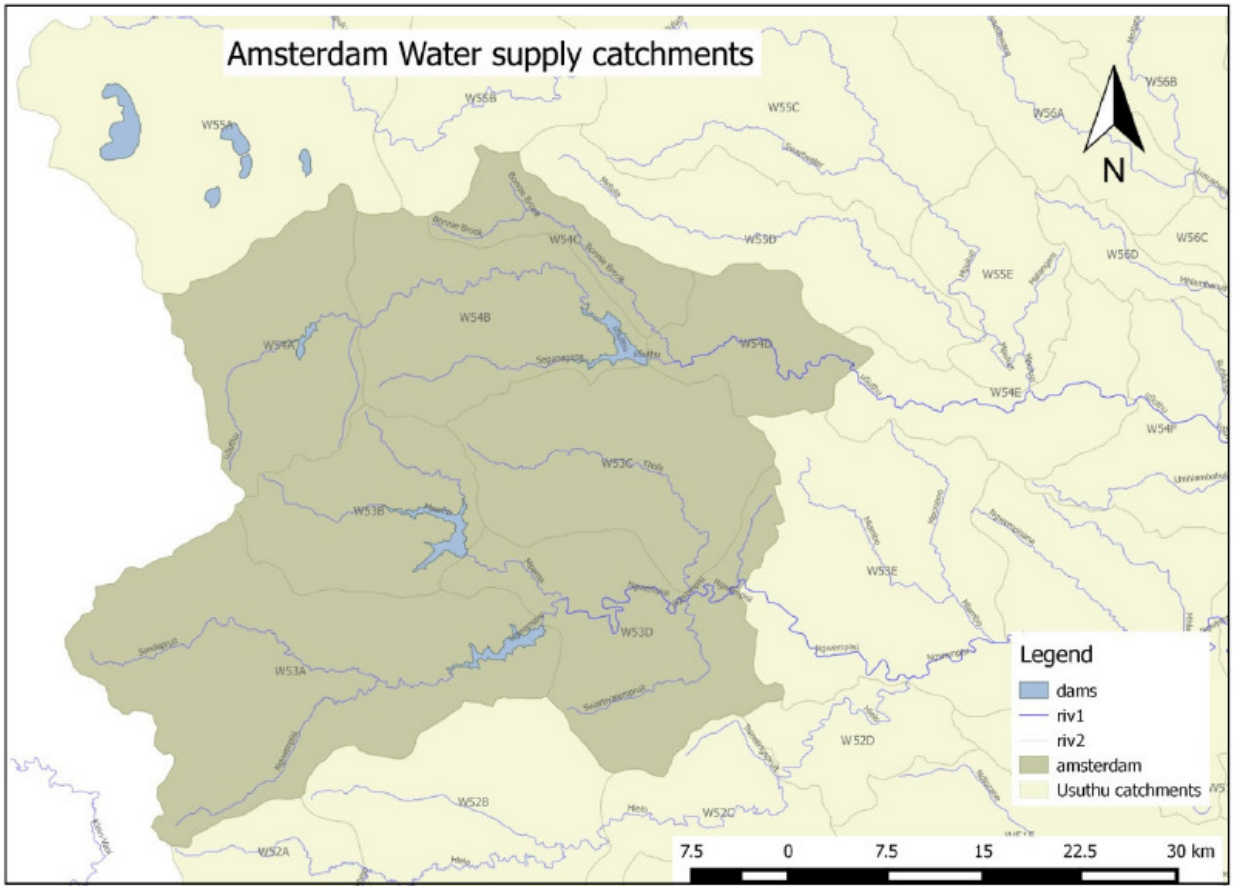


Figure 3.11: Catchments of the Amsterdam water supply area (taken from Mallory and Jacobs, 2014).

Table 3.7 provides hydrological and catchment information for the Usuthu and Ngwempisi catchments.

Table 3.7: Hydrology and catchment information for the Usuthu and Ngwempisi catchments (taken from Mallory and Jacobs, 2014).

QUATERNARY CATCHMENT	GROSS CATCHMENT AREA (km^2)	MEAN ANNUAL		
		EVAPORATION (mm)	PRECIPITATION (mm)	RUNOFF (million m^3/a)
NGWEMPISI RIVER				
W53A	548	1400	825	50.01
W53B	219	1400	857	19.17
W53C*	**316**	**1400**	**913**	**37.45**
W53D	315	1400	867	31.69
USUTHU RIVER				
W54A	251	1400	783	16.87
W54B	282	1400	846	24.4
W54C	107	1400	867	9.43
W54D	139	1400	896	20.17

*Legend: *: Proposed Dam Site A, Dam Site B, distribution pipeline and bulk water pipeline located in this catchment.*

Mallory and Jacobs (2014) indicated that Amsterdam falls within the W53C catchment that only contributes 19% of the runoff at the border with Swaziland. The remaining 81% is derived from the W53A, B and D catchments.

3.9.2 Water transfer scheme

The Usuthu River Government Water Scheme is located within the Ngwempisi/Usutu sub-catchment area transferring water from the upper Ngwempisi catchment to the Olifants catchment for power generation (i.e. for cooling purposes in Eskom power stations).

Table 3.8 provides an indication of water being transferred between the catchments as part of the Usuthu River Government Water Scheme.

Table 3.8: Details of the Usuthu River Government Water Scheme (taken from Mallory and Jacobs, 2014)

USUTHU RIVER GOVERNMENT WATER SCHEME: TRANSFERS OUT						
DAM	CATCHEMNT & RIVER	GROSS CAPACITY (10^6m^3)	SURFACE AREA (ha)	TRANSFER TO	TRANSFER VOLUME (10^6m^3/year)	
Churchill weir	W54C;			Westoe Dam	0.5	
Westoe Dam	W54B; Usuthu	61.90	733.3	Jericho Dam		70 (71 allocation)
Morgenstond Dam	W53A; Ngwempisi	100.77	977.2	Jericho Dam		
Jericho Dam	W53B; Mpama	59.50	982.5	Olifants WMA		

The Sandcliff Dam is also located on the Usuthu River within quaternary catchment W54A and has a surface area of 144 ha and an estimated gross capacity of 0.156 x 10^6 m^3 (Mallory and Jacobs, 2014).

3.9.3 Water use in the overall catchment area

Mallory and Jacobs (2014) indicated that the only significant land use in the Upper Usuthu catchment is forestry and irrigation (agriculture).

Domestic water use

A weir (known as Dorps Dam) in the Gabosha River is the current abstraction point for Amsterdam. This weir has a gross capacity of 220 000m^3 but is

currently silted up. Amsterdam is reliant on run-of-river (Mallory and Jacobs, 2014).

Other than water usage by Amsterdam, there is very limited abstractions for domestic use from run-of-river in the Ngwempisi catchment (Mallory and Jacobs, 2014).

Irrigation
Table 3.9 provides an indication of areas of registered irrigation water use and irrigation requirements for the Usuthu and Ngwempisi catchments.

Table 3.9: Areas of registered irrigation and irrigation requirements for the Usuthu and Ngwempisi catchments (taken from Mallory and Jacobs, 2014).

QUATERNARY CATCHMENT & AREA (km²)	CROPS (km²)				IRRIGATION	
	VEGETABLES	PASTURES	OTHER	MAIZE	AREA (km²)	REQUIREMENT (million m3/a)
NGWEMPISI RIVER						
W53A; 548	0.5	0.3	-	1.4	2.2	0.702
W53B; 219	0.45	-	-	-	0.45	0.191
W53C*; 316	**1.6**	**0.8**	**0.07**	**-**	**2.5**	**0.905**
W53D; 315	-	0.98	0.37	-	1.35	0.507
USUTHU RIVER						
W54A; 251	-	0.17	1.20	1.30	2.67	1.26
W54B; 282	-	-	-	-	-	-
W54C; 107	0.08	0.15	0.06	-	0.27	0.112
W54D; 139	-	-	-	-	-	-

*Legend: *: Proposed Dam Site A, Dam Site B, distribution pipeline and bulk water pipeline located in this catchment.*

Forestry
Table 3.10 provides an indication of areas of forestry in the Usuthu and Ngwempisi catchments as obtained from the WARMS database.

Table 3.10: Areas of forestry in the Usuthu and Ngwempisi catchments (taken from Mallory and Jacobs, 2014).

QUATERNARY CATCHMENT	CATCHMENT AREA (km²)	WARMS (km²)
NGWEMPISI RIVER		
W53A	548	164.96
W53B	219	34.45
W53C*	**316**	**56.95**
W53D	315	157.96
TOTAL:	**1398**	**414.32**
USUTHU RIVER		
W54A	251	25.41
W54B	282	78.07
W54C	107	46.45
W54D9	139	49.77
TOTAL:	**779**	**199.70**

*Legend: *: Proposed Dam Site A, Dam Site B, distribution pipeline and bulk water pipeline located in this catchment.*

Invasive alien plants
Table 3.11 provides an indication of the total areas covered by invasive alien plants (i.e. landscape and riparia) in the Usuthu and Ngwempisi catchments as obtained from the National Invasive Alien Plant Survey (NIAPS) project (Mallory and Jacobs, 2014).

Table 3.11: Areas covered by invasive alien plants in the Usuthu and Ngwempisi catchments (taken from Mallory and Jacobs, 2014).

QUATERNARY CATCHMENT	CATCHMENT AREA (km^2)	NIAPS (km^2)
NGWEMPISI RIVER		
W53A	548	0.7
W53B	219	1.9
W53C*	**316**	**4.2**
W53D	315	20.9
TOTAL:	**1398**	**27.70**
USUTHU RIVER		
W54A	251	0.7
W54B	282	82.2
W54C	107	0.0
W54D9	139	0.0
TOTAL:	**779**	**82.90**

*Legend: *: Proposed Dam Site A, Dam Site B, distribution pipeline and bulk water pipeline located in this catchment.*

Streamflow reduction due to forestry and invasive alien plants

Table 3.12 provides an indication of streamflow reduction due to forestry and invasive alien plants in the Usuthu and Ngwempisi catchments. The impact of forestry and alien vegetation on streamflow is very significant and will definitely impact on the yield of the system (Mallory and Jacobs, 2014).

Table 3.12: Streamflow reduction due to forestry and invasive alien plants in the Usuthu and Ngwempisi catchments (taken from Mallory and Jacobs, 2014).

QUATERNARY CATCHMENT	CATCHMENT AREA (km^2)	NATURAL MEAN ANNUAL RUNOFF (million m^3/a)	STREAMFLOW REDUCTION DUE TO	
			FORESTRY (million m^3/a)	ALIEN VEGETATION (million m^3/a)
NGWEMPISI RIVER				
W53A	548	39.63	7.78	0.06
W53B	219	58.8	1.36	0.21
W53C*	**316**	**19.75**	**2.11**	**1.77**
W53D	315	36.48	6.43	1.41
W53 TOTAL:	**1398**	**154.66**	**17.68**	**3.44**
USUTHU RIVER				
W54A	251	17.43	0.76	0.03
W54B	282	30.8	3.15	4.41
W54C	107	9.22	2.27	0.00
W54D	139	21.73	5.97	0.01
W54 TOTAL:	**779**	**79.18**	**12.15**	**4.45**
TOTAL:	**2177**	**233.84**	**29.83**	**7.89**

*Legend: *: Proposed Dam Site A, Dam Site B, distribution pipeline and bulk water pipeline located in this catchment.*

3.9.4 W53C catchment, Thole and Gabosha Rivers

Table 3.13 provides catchment information with regards to W53C, the Thole and Gabosha Rivers.

Table 3.13: Catchment information with regards to W53C, the Thole and Gabosha Rivers (taken from Mallory and Jacobs, 2015)

Catchment	Catchment Area (km^2) (incremental)	Mean Annual Evaporation (mm)	Mean Annual Precipitation (mm)	Mean Annual Runoff (million m^3/a) (1950 to 1993)	
				Natural (cumulative)	Present Day (present day)
W53C	316	1400	913	30.28	27.84
Thole	199.84			122.1	19.74
Gabosche	70.2			6.61	6.005

Source: WR2005 (Middleton and Bailey, 2008)

According to Mallory and Jacobs (2015), there is limited water use in the Thole and Gabosha River catchments. Afforestation however, reduces runoff (Table 3.14).

Table 3.14: Water use in the Thole and Gabosha catchments (taken from Mallory and Jacobs, 2015)

QUATERNARY CATCHMENT	WATER USE (million m^3/annum)		Streamflow reduction (million m^3/annum)	
	Domestic	Irrigation	Forestry	Invasive alien plants
W53C		0.905	2.11	1.8
Thole		0.905	1.33	0.77
Gabosha		0.000	0.47	0.19

Irrigation is an important water use in the Thole catchment (Table 3.13) with forestry and invasive alien plants contributing to streamflow reduction (Table 3.14).

In the Gabosha catchment, no irrigation takes place (Table 3.14) with very little streamflow reduction due to forestry and alien invasive plants.

The abstraction of water from the Dorps Dam in the Gabosha River is however not indicated in Table 3.14. The existing Amsterdam Water Supply Scheme allows for raw water abstraction from the Dorps Dam located in the Gabosha River (Afri-Infra, 2016). The yield of the river at this abstraction point is estimated at 0.33 Mm^3/a (WSDP, 2010). Raw water is treated at the existing Amsterdam Water Treatment Works (WTWs) with a capacity of approximately 7 Ml/day. Clean water is then distributed to the storage facilities of Amsterdam and KwaThandeka.

3.9.5 Thole River catchment

The proposed Dam Site A would be located within the Thole River catchment (Figure 2.1). Although the distribution pipeline would extend through the residential area of Amsterdam, it would extend across a tributary of the Thole River and the Gabosha River (Figure 2.1).

The Thole River originates on the farm Athole 392 IT, also in close proximity to the Westoe Dam (Figure 2.1). It then flows in a southeasterly direction across the farms Athole 392 IT, Forbes Athole 393 IT, Glenaggy 406 IT,

Sandbach 407 IT, Amsterdam 408 IT, and Sterkfontein 419 IT where it joins the Ngwempisi River ±6 km downstream of the proposed Dam Site A (Figure 2.1).

From the topographical map and Google aerial view, it is evident that cultivation and some afforestation affects the upper catchment area located on the farms Athole 392 IT, Forbes Athole 393 IT, Glenaggy 406 IT and Sandbach 407 IT (Figure 2.1). In close proximity of Amsterdam and proposed Dam Site A, cultivation, afforestation and urban development impacts on the Thole catchment (Figure 2.1). Downstream of Amsterdam, cultivation and agricultural activities (e.g. irrigation) impact on the Thole River catchment (Figure 2.1).

For a distance of approximately 11.2km upstream of the proposed Dam Site A, there are no physical barriers in the river system (i.e. weirs, dams, etc.) (Kotze, 2016). At 11.2km upstream of the dam site, it appears that a small weir is present. No other physical barriers are present in the remainder of the upstream Thole River reach (Kotze, 2016).

There appears to be no weirs/dams downstream (approximately 7.8km) of the proposed Dam Site A (Kotze, 2016). The Amsterdam Waste Water Treatment Works is located approximately 1.8km downstream of the proposed Dam A Site. Effluent from this WWTW could impact on the water quality of the Thole River and cause a chemical migration barrier to fish from time to time depending on how the WWTWs is managed (Kotze, 2016).

No large physical barriers (weirs/dams) are located in the downstream reaches of the Ngwempisi/Mhlatuze and Usuthu Rivers (Kotze, 2016).

3.9.6 Gabosha River catchment

The proposed Dam Site B and the bulk water pipeline would be located within the Gabosha River catchment (Figure 2.1) with numerous tributaries flowing into the Gabosha River (Figure 2.1).

The Gabosha River originates on the farm Westoe 394 IT, in close proximity to the Westoe Dam which is located on the Usutu River (Figure 2.1). It then flows in a southeasterly direction across the farms Westoe 394 IT, Glenaggy 406 IT, Sandbach 407 IT and Amsterdam 408 IT (Figure 2.1). It joins the Thole River just below the residential area of Amsterdam (Figure 2.1).

From the topographical map and Google aerial view, it is evident that afforestation occurs mostly on the farm Westoe 394 IT, in close proximity to the Westoe Dam (Figure 2.1). Limited cultivation takes place on the farm Westoe 394 IT and Glenaggy 406 IT, i.e. within the catchment area of the Gabosha River (Figure 2.1). Two small farm dams are located on the farm Westoe 394 IT (Figure 2.1) and one small farm dam on the farm Glenaggy 406 IT (Figure 2.1).

No cultivation or afforestation takes place on the farm Sandbach 407 IT, i.e. within the catchment area of the Gabosha River (Figure 2.1). No dams are present on this farm (Figure 2.1).

No cultivation or afforestation takes place within the proposed Dam Site B (Figure 2.1). No dams are present within this area (Figure 2.1).

The Tweelingspruit joins the Gabosha River in close proximity of the provincial R65 road (Figure 3.1).

Downstream of the proposed Dam Site B, the catchment is impacted in terms of afforestation, road building, residential development, roads, etc. (i.e. the built up area of Amsterdam; Figure 2.1). The Dorps Dam, the water abstraction point for Amsterdam, is located in the Gabosha River upstream of Amsterdam (Figure 2.1).

3.9.7 Wetlands associated with the Thole and Gabosha Rivers

The Thole and Gabosha Rivers are indicated as Critical Biodiversity Areas: Rivers (Figure 3.12) and the surrounding areas Ecological Support Areas (ESAs): Important subcatchments (Figure 3.12) in the freshwater assessment of Mpumalanga Biodiversity Sector Plan (2013).

It should be noted that the MBSP freshwater assessment includes information obtained from the National Freshwater Ecosystem Priority Areas (NFEPA) and threatened freshwater ecosystems databases (National Biodiversity Assessment 2011).

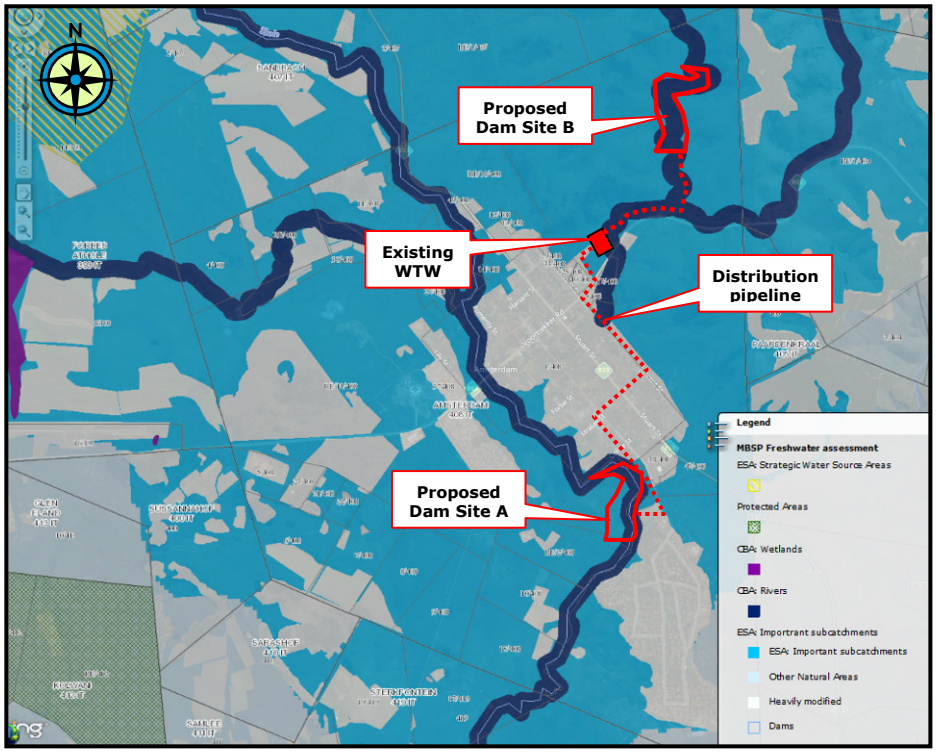


Figure 3.12: Mpumalanga Biodiversity Sector Plan freshwater assessment of the Amsterdam area (taken from MBSP, 2013).

Both the Thole and Gabosha catchment areas are this seen as important from an aquatic point of view.

For sub-quaternary reach W53C – 1679 of the Thole River in which the proposed Dam A Site would be located, the following is applicable:

- Present Ecological Status (PES) is estimated as moderately modified (Category C),
- Ecological Importance is High;
- Ecological Sensitivity is Very High (Kotze, 2016).

The Gabosha River is a tributary draining into sub-quaternary reach W53C-1679. Unfortunately this river was not included as a separate sub-quaternary reach in the DWS/SANBI process. It was therefore not assessed on desktop level and the PES, EI and ES information is currently not available. Based on the fact that this reach is less impacted it is anticipated that the PES could be much higher (e.g. Category A or B).

3.10 Groundwater

The Amsterdam area falls within an area identified as having a good potential for groundwater development (Task Team, 2008). The expected yields are high (0.5 – 2.0l/s) and the groundwater quality is predominantly good.

Task Team (2008) indicated that a very productive aquifer is present around the town of Amsterdam that could be used for higher demands. A detailed study is however required in order to quantify its characteristics and its role within the hydrological cycle of the area.

Groundwater is currently not used to supply the town of Amsterdam with water. However, groundwater could be used on smallholdings not supplied with municipal water and on farms in the surrounding area as a source of water. Sixty percent (60%) of the boreholes in and around Amsterdam are strong boreholes (3.5l/s).

The groundwater resource needs to be used with great care as groundwater is the main source of base flow for the whole basin (i.e. Maputo River Basin, Task Team, 2008).

Dam Site A:
Groundwater would be associated with the Thole River and associated wetlands where the proposed Dam Site A would be located. No boreholes are known to be present within this area. A fountain is present on the eastern side of the proposed dam wall site.

Potential sources of groundwater pollution within the surrounding area include:

- Contaminated runoff from the residential areas of Amsterdam and KwaThandeka (e.g. sewage, waste, etc.);
- The unrehabilitated Amsterdam Waste Disposal Site located on the western side of the proposed Dam Site A (Figure 3.7a);
- Effluent from the Amsterdam Waste Water Treatment Works (WWTW) located approximately 1.8km downstream.

Distribution pipeline:
The distribution pipeline would extend through the residential area of Amsterdam (Figure 3.7a) and would extend across the Gabosha River and a tributary of the Thole River. Groundwater would be associated with both the Gabosha River and the tributary of the Thole River.

Dam Site B:
Groundwater would be associated with the Gabosha River and associated wetlands where the proposed Dam Site B would be located. No boreholes are known to be present within this area.

Since the immediate area surrounding the proposed Dam Site B is located away from residential areas and no cultivation, afforestation, mining, etc. takes place the risk in terms of potential groundwater pollution is minimal.

Bulk water pipeline:
Groundwater would be associated with the Gabosha River and associated wetlands along which the proposed bulk water pipeline would extend. No boreholes are known to be present within this area.

3.11 Air quality

The air quality of the Amsterdam area in general is expected to be of good quality in view of the lack of major industrial and mining activities taking place. At times, the forestry industry could however, impact on the air quality of the area in view of cleared forestry areas being burnt.

Dam Site A:
As indicated in Figure 3.7a, the residential areas of Amsterdam and KwaThandeka occur in the immediate surrounding area of proposed Dam Site A (i.e. along the eastern side). Informal settlements and smallholdings are also present in this area. Old lands and areas of cultivation are also indicated to be present (Figure 3.7a).

The unrehabilitated Amsterdam Waste Disposal Site is located on the western side of the proposed Dam Site A (Figure 3.7a) while the Amsterdam Waste Water Treatment Works (WWTW) is located approximately 1.8km downstream.

The air quality of this area could therefore be impacted in terms of the above-mentioned activities.

Distribution pipeline:
The distribution pipeline would extend through the residential area of Amsterdam (Figure 3.7a). The air quality of this area could therefore be impacted in terms of the various activities taking place within this residential area.

Dam Site B:
As indicated in Figure 3.7b, no cultivation, afforestation, old lands or mining takes place within the immediate area surrounding the proposed Dam Site B. Afforestation is however present to the east of the dam site in the adjacent catchment area. The air quality of this area is therefore expected to be of good quality.

Bulk water pipeline:
As indicated in Figure 3.7b, no cultivation, afforestation, old lands or mining takes place within the immediate surrounding area of the proposed bulk water pipeline route. The provincial R65 road is however present to the south of the proposed route as indicated in Figure 3.7b.

3.12 Noise

Dam Site A:
As indicated in Figure 3.7a, the residential areas of Amsterdam and KwaThandeka occur in the immediate surrounding area of proposed Dam Site A (i.e. along the eastern side). Informal settlements and smallholdings are also present in this area. Old lands and areas of cultivation are also indicated to be present. Various activities thus take place within the surrounding area contributing to an elevated ambient noise level.

Distribution pipeline:
The distribution pipeline would extend through the residential area of Amsterdam (Figure 3.7a) where various activities would take place resulting in an elevated ambient noise level.

Dam Site B:
As indicated in Figure 3.7b, no cultivation, afforestation, old lands or mining takes place within the immediate area surrounding the proposed Dam Site B. Afforestation is however present to the east of the dam site in the adjacent catchment area. The ambient noise level of this area is therefore anticipated to be very low.

Bulk water pipeline:
As indicated in Figure 3.7b, no cultivation, afforestation, old lands or mining takes place within the immediate surrounding area of the proposed bulk water pipeline route. The provincial R65 road is however present to the south of the proposed route as indicated in Figure 3.7b and could contribute to the ambient noise of the area.

3.13 Sites of archaeological and cultural interest

3.13.1 Archaeology and cultural sensitivity:

According to van Vollenhoven (2017), this geographical area is not well-known as one containing many prehistoric sites. This could however be as a result of the lack of research in this area.

On the existing SAHRA Database three heritage reports are noted (Radford & Van Vollenhoven, 2012; Van der Walt, 2014; Van Schalkwyk 2016). Van Vollenhoven (2017) included information from these reports in the sections below.

3.13.1.1 Stone Age

The Stone Age is the period in human history when lithic material was mainly used to produce tools (Coertze & Coertze, 1996). In South Africa the Stone Age can be divided into three periods. It is however important to note that dates are relative and only provide a broad framework for interpretation.

The division for the Stone Age according to Korsman & Meyer (1999) is as follows:

- Early Stone Age (ESA) 2 million – 150 000 years ago;
- Middle Stone Age (MSA) 150 000 – 30 000 years ago;
- Late Stone Age (LSA) 40 000 years ago – 1850 - A.D.

The larger geographical region has been inhabited by humans since at least the Middle Stone Age (MSA). During this time people became more mobile,

occupying areas formerly avoided. They preferred open sites near watercourses and as a result, tools belonging to this period mostly occur in the open or in erosion dongas (Van Schalkwyk, 2016).

Late Stone Age (LSA) people had an even more advanced technology than the MSA people and therefore occupied more diverse habitats. Apart from stone tools, people now also used other material to produce ostrich eggshell beads, bone arrowheads and wood. These people occupied rock shelters and caves (Van Schalkwyk, 2016).

A number of Stone Age sites, including rock painting sites are known in the Ermelo, Chrissiesmeer and Carolina areas, but none in the Amsterdam area (Bergh, 1999). This provides evidence of Stone Age people being present in the wider geographical area. However no sites are known from Amsterdam.

3.13.1.2 Iron Age

The Iron Age is the name given to the period of human history when metal was mainly used to produce metal artefacts (Coertze & Coertze, 1996).

In South Africa it can be divided in two separate phases according to Van der Ryst & Meyer (1999), namely:

- Early Iron Age (EIA) 200 – 1000 A.D.
- Late Iron Age (LIA) 1000 – 1850 A.D.

Huffman (2007) however indicates that a Middle Iron Age should be included. His dates, which now seem to be widely accepted in archaeological circles, are:

- Early Iron Age (EIA) 250 – 900 A.D.
- Middle Iron Age (MIA) 900 – 1300 A.D.
- Late Iron Age (LIA) 1300 – 1840 A.D.

The Amsterdam area is not known for its Iron Age sites.

During the EIA people only cultivated cereals (sorghum, millet) that required summer rainfall. Therefore EIA people did not move outside this rainfall zone, and thus did not occupy the central interior Highveld area.

Iron Age people preferred to settle on the alluvial soils near rivers for agricultural purposes, but also for firewood and water. The occupation of the larger geographical area did not start much before the 1500s. This was due to climatic change, with the climate becoming warmer and wetter, creating conditions that allowed LIA farmers to occupy areas previously unsuitable, such as the Mpumalanga Highveld. At the same time, maize was introduced from Maputo and grown extensively. Maize crops yield far more than sorghum and millets. The increase in food production led to increased populations by the 19th century (Van Schalkwyk, 2016).

Late Iron Age people preferred to settle on the steep slopes of a mountain, possibly for protection, or for cultural considerations (such as grazing for their enormous cattle herds). Because of the lack of trees they built their settlements in stone (Van Schalkwyk, 2016).

A number of stone-walled archaeological sites, which date to the Late Iron Age (c. AD 1640 - AD 1830s), were identified west of the study area, and some of them have been excavated (Taylor, 1979; Pelser et al., 2007). These sites are conventionally associated with Tswana-speaking people. The

Tswana-speakers were located to the south and west in the study area, with the Ndzundza Ndebele (Nguni-speakers) to the north (Van Schalkwyk, 2016).

Radford & Van Vollenhoven (2012) identified an Iron Age site on the Remainder of Portion 11 of the farm Amsterdam 408 IT. This included a site consisting of two small circles with packed stones, either indicating a platform or possible graves.

3.13.1.3 Historical Age

The historical age started with the first recorded oral histories in the area. It includes the moving into the area of people that were able to read and write.

Between 1800 and 1820 a major drought must have caused an agricultural collapse on a large, subcontinental scale. It also was a period of great military tension. By 1821 the military tension spilled onto the Highveld. Various marauding groups of displaced Sotho-Tswana moved across the plateau in the 1820s and Mzilikazi raided the plateau extensively between 1825 and 1837 (Van Schalkwyk, 2016). This was called the Difaquane. It however seems as if the Amsterdam region was not affected much by the Difaquane. The geographical area towards the east of the study area was occupied by Swazi-speakers, also of Nguni origin (Bergh, 1999).

In addition, none of the known historical trade routes went through this area (Bergh, 1999). The first white settlers moved into this area in the late 1850's (Bergh, 1999). The area formed part of the Lydenburg District by 1845, but the town was only established in 1882 when it became part of the Ermelo District. During this time an international border with Swaziland was also established nearby (Bergh, 1999).

Amsterdam, like most towns in the vicinity have various buildings older than 60 years, giving it a latent heritage significance.

The various battles and skirmishes resulting from the conflict during the Anglo-Boer War (1899-1902) had a huge impact on heritage resources in the area, as many farms were burnt down. However, regarding large events during this war, the only one to be noted at Amsterdam is that the commando of C Botha retreated towards Amsterdam on 13 August 1900 during the British March of February-October 1900 (Bergh, 1999).

Graves were previously identified on the Remainder of Portion 11 of the farm Amsterdam 408 IT (Radford & Van Vollenhoven, 2012). Another site identified during the mentioned survey is a Shembe Circle which, at that time was still being used by the local community.

A fountain is present on the eastern side of the proposed dam wall site which could be of cultural significance.

3.13.1.4 Conclusion

Much of the heritage potential of the study area is therefore located within the many farmsteads in the area. Farmhouses and related structures (e.g. barns, sheds, etc.), as well as cemeteries, dot the landscape. Equally important, are the homesteads, related structures and cemeteries of the farm labourers living on these farms.

Industrial and mining activities also took place in the region, on an ever increasing scale. Coal mining dates to the beginning of the 20th century,

although there is written evidence that it was exploited by farmers prior to that. Forestry also became a big operation, going back as far as the early 1900s.

The possibility of finding Iron Age remains is real, as such features have previously been found. There is also always a chance that Stone Age tools might be found. It seems however, unlikely that a large site will be identified during the survey, due to the proposed dam being located within a valley.

From a heritage perspective, based on desktop data, it is impossible to indicate whether any of the proposed sites for the dam has a larger potential to contain such sites than the other. Field work will be conducted during the EIA phase to determine the presence and/or absence of any sites of archaeological and cultural interest (including graves).

3.13.2 Palaeontological sensitivity

The palaeontological sensitivity of a site is closely related to the underlying geology, since fossils mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature.

According to the 1:250 000 geology map (2630 Mbabane), the proposed Dam Site A, Dam Site B, bulk water pipeline route and distribution pipeline route are underlain by pyroclastic rocks and ash-flow tuff of the Gobasha Member, Amsterdam Formation (Rag; Figure 3.13). These rocks are of Randian Age and thus very old.

The southern section of Dam Site A is underlain by ultrabasic rocks, pyroxenite and norite of the Suite Thole, also of Randian Age (Rt; Figure 3.13).

The geology of the surrounding area includes tillite and shale of the Dwyka Group (Pd; Figure 3.13) and quartzite of the Skurwerant Formation (Rms; Figure 3.13).

Table 3.15 provides an indication of the underlying geology of the area, as well as the palaeontological sensitivity and recommended action should development be proposed within these areas.

Table 3.15: Underlying geology of the area and associated palaeontological sensitivity (taken from Fourie, 2017)

Geology (Figure 3.13)	Description	Sensitivity	Recommended action
Pd	Tillite and shale with dropstones, fluvioglacial sediment (grey). Dwyka Group, Karoo Supergroup. Permian.	Moderate	Desktop study required.
Rag	Pyroclastic rocks, ashflow tuff (khaki). Gobosha Member, Amsterdam Formation. Randian.	Very Low	No study required.
Rt	Ultrabasic rocks, pyroxenite, norite (green). Suite Thole. Randian.	Very Low	No study required.
Rms	Quartzite with interlayered shale (brown). Skurwerant	Low – fossils cannot be seen	No study required, however

Geology (Figure 3.13)	Description	Sensitivity	Recommended action
	Formation. Randian.	with the naked eye.	a protocol for finds is required.

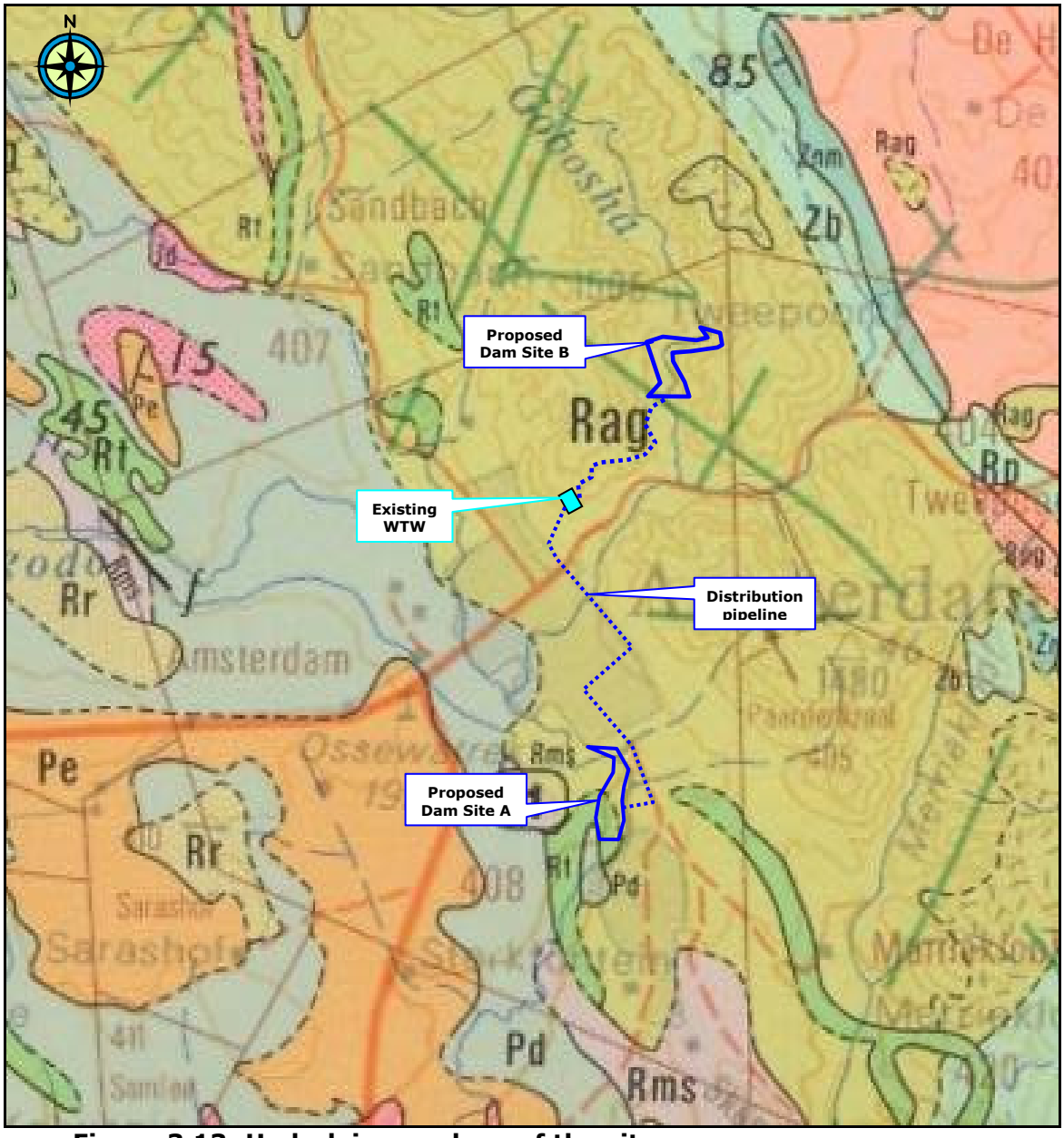


Figure 3.13: Underlying geology of the site.

According to the palaeontological map supplied by the South African Heritage Resources Agency (SAHRA, 2014), the palaeontological sensitivity of the proposed Dam Site A, Dam Site B, distribution pipeline and bulk water pipeline route is deemed low (grey area indicated in Figure 3.13) requiring no further study (Table 3.14).

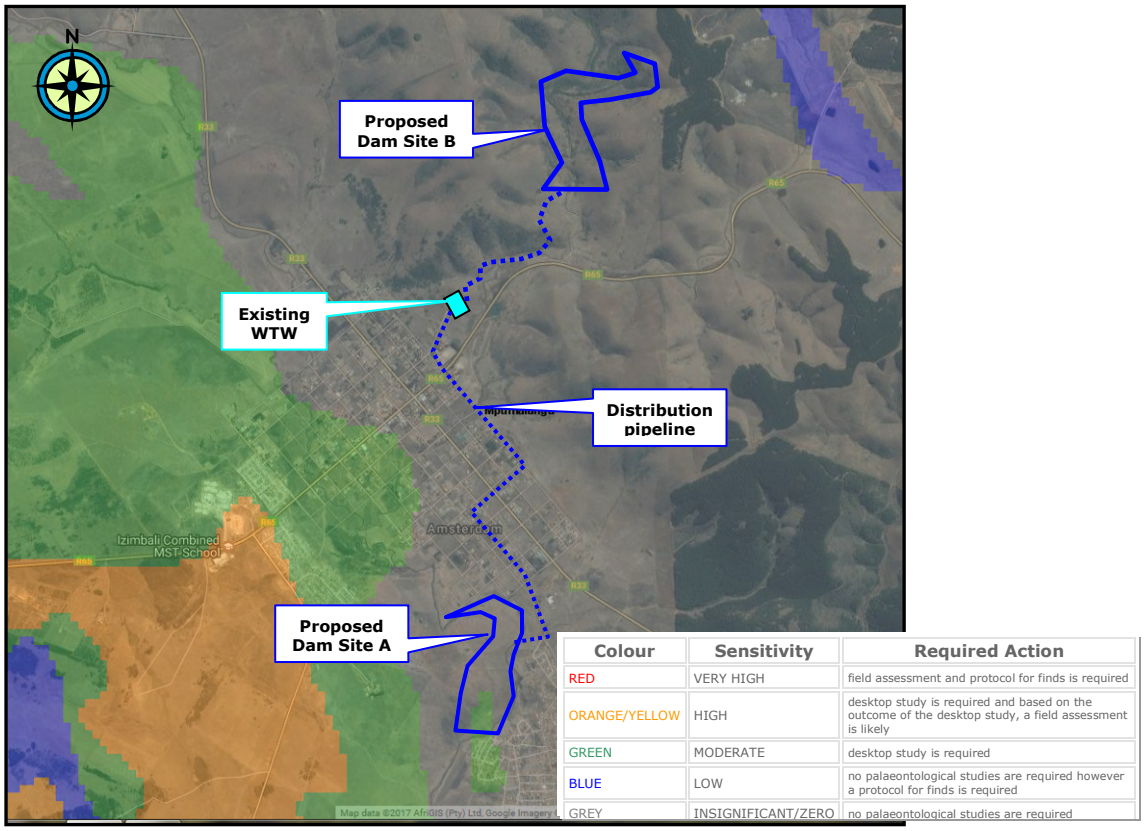


Figure 3.14: Requirement for palaeontological study w.r.t. the project area (taken from SAHRA, 2013).

The southern portion of the proposed Dam Site A is indicated as having a moderate palaeontological sensitivity (area indicated in green; Figure 3.13) requiring a desktop study that will be conducted during the EIA phase.

3.14 Sensitive landscapes

The Thole and Gabosha Rivers are indicated as Critical Biodiversity Areas: Rivers (Figure 3.12) and the surrounding areas Ecological Support Areas (ESAs): Important subcatchments (Figure 3.12) in the freshwater assessment of Mpumalanga Biodiversity Sector Plan (2013). The development of a dam within either the Thole River or the Gabosha River would thus impact on a sensitive landspace.

3.15 Visual aspects

Dam Site A

Dam Site A would be located adjacent to the residential area of KwaThandeka (Figure 3.7a) and downstream of the residential area of Amsterdam (Figure 3.7a).

The proposed site would be highly visible from the adjacent residential areas and the immediate surrounding area as well as from the various provincial and local roads.

Distribution pipeline
The distribution pipeline would be installed within the Amsterdam residential area and more specifically within the road reserve associated with the internal roads within this area.

The construction of the distribution pipeline would thus be highly visible from the various houses in the residential area as well as to the general public utilizing the R65 and the R33 provincial roads (Figure 3.7a).

Dam Site B
Dam Site B would be located to the north of the residential area of Amsterdam within an undeveloped area. It would be screened from Amsterdam and immediate surrounding areas by the high ridges located on either side of the valley in which the dam will be located. The proposed dam site would not be visible from the R65 provincial road (Figure 3.7b).

Bulk water pipeline
The proposed bulk water pipeline would be located to the north of the residential area of Amsterdam within an undeveloped area. The construction of the bulk water pipeline in close proximity to the R65 provincial road would be highly visible from this provincial road.

3.16 Traffic

Dam Site A
Dam Site A would be located adjacent to the residential area of KwaThandeka (Figure 3.7a) and downstream of the residential area of Amsterdam (Figure 3.7a). The dam site can indirectly be accessed from the tarred road between Amsterdam and KwaThandeka or from the internal roads of the KwaThandeka residential area. No gravel roads extend across the proposed dam site. Footpaths are however evident.

Distribution pipeline
The distribution pipeline will be installed within the Amsterdam residential area and more specifically within the road reserve associated with the internal roads within this area.

The said pipeline would however, extend across the R65 and the R33 provincial roads (Figure 3.7a).

Dam Site B
Dam Site B would be located to the north of the residential area of Amsterdam within an undeveloped area. A gravel road extends through the site and provides access from the R65 provincial road (Figure 3.7b).

Bulk water pipeline
The proposed bulk water pipeline would be located to the north of the residential area of Amsterdam within an undeveloped area.

A gravel road extending from the R65 provincial road (Figure 3.7b) would provide access to the route.

3.17 Sense of place

Dam Site A
Dam Site A would be located adjacent to the residential area of KwaThandeka (Figure 3.7a) and downstream of the residential area of Amsterdam (Figure 3.7a). This area is currently not zoned or included as part of the Amsterdam CBD Spatial Development Framework (Figure 3.15).

Distribution pipeline
The distribution pipeline will be installed within an urban area as indicated in the Amsterdam CBD Spatial Development Framework (Figure 3.15).

Dam Site B
Dam Site B would be located to the north of the residential area of Amsterdam in an area currently not zoned or included as part of the Amsterdam CBD Spatial Development Framework (Figure 3.15).

Bulk water pipeline
The proposed bulk water pipeline would be located to the north of the residential area of Amsterdam in an area currently not zoned or included as part of the Amsterdam CBD Spatial Development Framework (Figure 3.15).

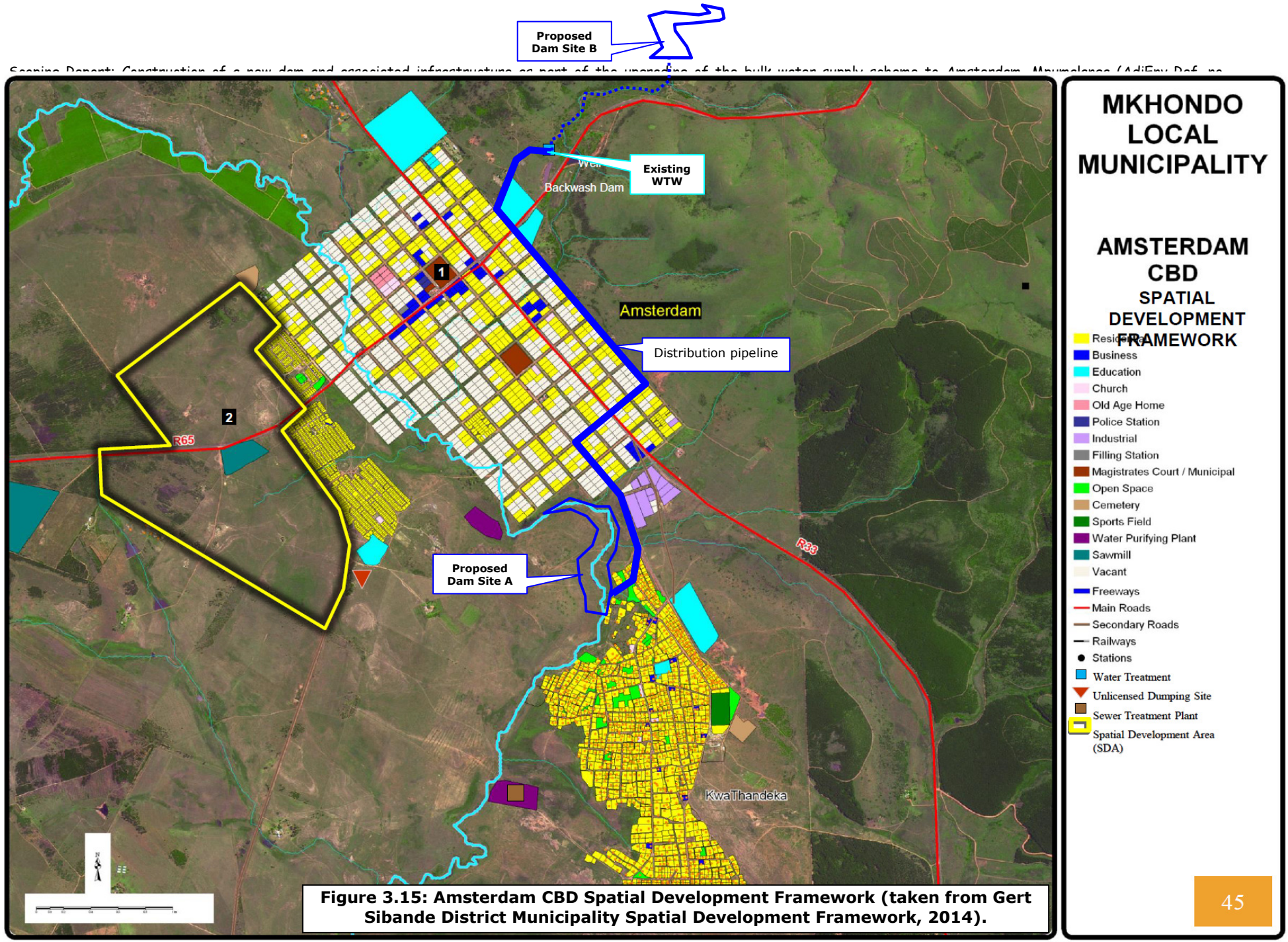


Figure 3.15: Amsterdam CBD Spatial Development Framework (taken from Gert Sibande District Municipality Spatial Development Framework, 2014).

4. DESCRIPTION OF PUBLIC PARTICIPATION PROCESS

4.1 Advertising of the project

4.1.1 Press advertising

A block advert (150mm x 95mm), according to the Environmental Impact Assessment Regulations, 2014, was placed in the Hoëvelder, on Friday, 24 February 2017. A copy of the advert is provided in Appendix 4.

4.1.2 On-site advertising

Notices according to the Environmental Impact Assessment Regulations, 2014, were placed at the following locations:

- On fence at existing Amsterdam Water Treatment (Purification) Works (A1; Photo 4.1 and Figure 4.1);
- Entrance to gravel road extending off the R65 provincial road providing access to the proposed Dam Site B (A1; Photo 4.2 and Figure 4.1);
- In Vincent Street in close proximity to where the distribution pipeline would extend across the Gabosha River (A1; Photo 4.3 and Figure 4.1);
- Adjacent to tar road between Amsterdam and KwaThandeka i.e. proposed Dam Site A (A1; Photos 4.4; Figure 4.1).
- At the offices of the Mkhondo Local Municipality (A3; Photo 4.5 and Figure 4.1);
- On the noticeboard at the Amsterdam Public Library (A3; Photo 4.6 and Figure 4.1).

A copy of the notice was also loaded onto the company website: www.adienvironmental.co.za.

These notices were displayed from Friday, 24 February 2017, for the duration of the scoping phase. A copy of the notice is provided in Appendix 4.

4.1.3 Informing I&APs via the internet

Interested and affected parties were also informed via the above-mentioned adverts and notices that a copy of the following documentation could be downloaded from the AdiEnvironmental cc website (www.adienvironmental.co.za) from Friday, 24 February 2017:

- Copy of the notice;
- Background Information Document (Appendix 5).

This information was available on the website for the duration of the scoping phase. A copy of the webpage printouts is provided in Appendix 4.

Photo 4.1: On fence at existing Amsterdam Water Treatment (Purification) Works.

Photo 4.2: Entrance to gravel road extending off the R65 provincial road providing access to the proposed Dam Site B.

Photo 4.3: In Vincent Street in close proximity to where the distribution pipeline would extend across the Gabosha River.

Photo 4.4: Adjacent to tar road between Amsterdam and KwaThandeka i.e. proposed Dam Site A.

Photo 4.5: On noticeboard at the offices of the Mkhondo Local Municipality.

Photo 4.6: On the noticeboard at the Amsterdam Public Library.

Figure 4.1: Location of notices.

4.1.4 Feedback from advertising process

Only one person registered as interested and affected party in terms of the advertising process (site and newspaper advertising) within the 30 day registration period provided as indicated in Table 4.1.

Table 4.1: Registration of I&APs in terms of the advertising process

Name	Date	Comment
Robert Smith	20 March 2017	Lives opposite Amsterdam Primary School (81 Vincent Street). Just bought the property and wants to renovate. Wanted to know if dam will impact on him? An email (dated: 20 March 2017; Appendix 6) with Background Information Document was forwarded.

4.1.5 Public meeting

As indicated in Section 4.1.4, only one interested and affected party registered in terms of the above-mentioned advertising process. A public meeting was therefore not required as part of the scoping phase of this project.

4.2 Directly affected landowners/users

Mkhondo Local Municipality
Dam Site A, the distribution line, the proposed bulk water pipeline and Dam Site B are all located on the Remaining Extent of Portion 11 of the farm Amsterdam 408 IT. This property belongs to the Mkhondo Local Municipality. A copy of the Windeed printout is provided in Appendix 1.

The Mkhondo Local Municipality was consulted as indicated in Section 4.5.3.

4.3 Surrounding landowners/users

Figure 4.2 provides an indication of the landowners/users in the immediate area surrounding the proposed Dam Site A and Dam Site B.

In order to determine the registered owners of the various properties, a Deeds Search was conducted via the WinDeed system of the Deeds Office of South Africa. The Deeds Search Template provides information pertaining to land ownership, size and land value of each of the properties.

As indicated in Table 4.2 and Figure 4.2, large portions of the surrounding properties belong to the provincial and national government. However, many private landowners also own property in the area.

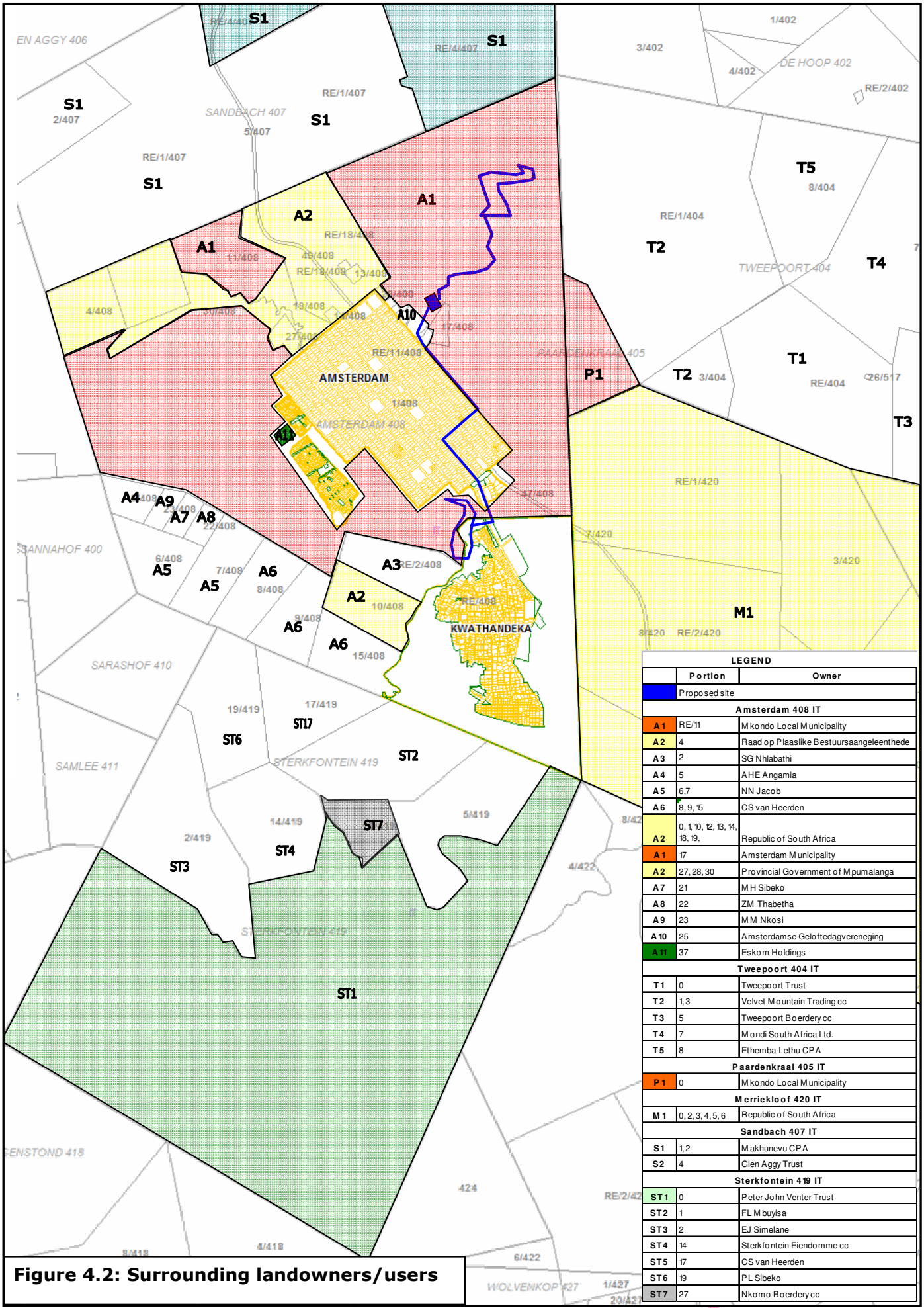
An e-mail and Background Information Document (BID) were forwarded to the landowners who could be traced during the scoping exercise, informing them of the proposed project.

Table 4.2 provides an indication of landowners identified to date, as well as comments received.

Table 4.2: Identified adjacent land owners/users who received BIDs

PROPERTY (FIGURE 4.2)	LANDOWNER/ CONTACT PERSON	CORRESPONDENCE	COMMENTS
AMSTERDAM 408 IT			
4 (A2)	Raad op Plaaslike Bestuursaangeleenthede	The property now falls under the jurisdiction of local government (i.e. Mkhondo Local Municipality).	See Section 4.5.3.
2 (A3)	SG Nhlabathi	Contact details to be obtained.	To be consulted during EIA phase.
5 (A4)	AHE Angamia	Contact details to be obtained.	To be consulted during EIA phase.
6, 7 (A5)	NN Jacob	Contact details to be obtained.	To be consulted during EIA phase.
8, 9, 15 (A6)	CS van Heerden	Contact details to be obtained.	To be consulted during EIA phase.
0, 1, 10, 12, 13, 14, 18, 19 (A2)	Republic of South Africa (National Department of Public Works - G Masuku)	E-mail with BID forwarded (dated: 14 March 2017; Appendix 6)	No.
17 (A1)	Amsterdam Municipality	Falls under Mkhondo Local Municipality.	See Section 4.5.3.
27, 28, 30 (A2)	Provincial Government of Mpumalanga	Contact details to be obtained.	To be consulted during EIA phase.

PROPERTY (FIGURE 4.2)	LANDOWNER/ CONTACT PERSON	CORRESPONDENCE	COMMENTS
21 (A7)	MH Sibeko	Contact details to be obtained.	To be consulted during EIA phase.
22 (A8)	ZM Thabetha	Contact details to be obtained.	To be consulted during EIA phase.
23 (A9)	MM Nkosi	Contact details to be obtained.	To be consulted during EIA phase.
25 (A10)	Amsterdamse Geloftedagvereneging	Contact details to be obtained.	To be consulted during EIA phase.
37 (A11)	Eskom Holdings - T Ludere	BID e-mailed (27 February 2017; Appendix 6)	No
TWEEPOORT 404 IT			
0 (T1)	Tweepoort Trust	Contact details to be obtained.	To be consulted during EIA phase.
1, 3 (T2)	Velvet Mountain Trading cc	Contact details to be obtained.	To be consulted during EIA phase.
5 (T3)	Tweepoort Boerdery cc	Contact details to be obtained.	To be consulted during EIA phase.
7 (T4)	Mondi South Africa Ltd.	Contact details to be obtained.	To be consulted during EIA phase.
8 (T5)	Ethemba-Lethu CPA	Contact details to be obtained.	To be consulted during EIA phase.
PAARDENKRAAL 405 IT			
0 (P1)	Mkhondo Local Municipality	BID e-mailed (28 February 2017; Appendix 6)	See Section 4.5.3.
SANDBACH 407 IT			
1, 2 (S1)	Makhunevu CPA	Contact details to be obtained.	
4 (S2)	Glenn Aggy Trust - A Grobbelaar	E-mail with BID forwarded (dated: 14 March 2017; Appendix 6)	No
MERRIEKLOOF 420 IT			
0, 2, 3, 4, 5, 6 (M1)	Republic of South Africa (National Department of Public Works - G Masuku)	E-mail with BID forwarded (dated: 14 March 2017; Appendix 6)	No.
STERKFONTEIN 419 IT			
0 (ST1)	Peter Johan Venter Trust - Peter Venter	E-mail with BID forwarded (dated: 14 March 2017; Appendix 6)	No.
1 (ST2)	FL Mbuyisa	Contact details to be obtained.	To be consulted during EIA phase.
2 (ST3)	EJ Simelane	Contact details to be obtained.	To be consulted during EIA phase.
14 (ST4)	Sterkfontein Eiendomme cc	Contact details to be obtained.	To be consulted during EIA phase.
17 (ST5)	CS van Heerden	Contact details to be obtained.	To be consulted during EIA phase.
19 9ST6)	PL Sibeko	Contact details to be obtained.	To be consulted during EIA phase.
27 (ST7)	Nkomo Boerdery cc - L Botha	E-mail forwarded (16 March 2017; Appendix 7)	Yes. Section 4.3.1.



LEGEND		
	Portion	Owner
	Proposed site	
Amsterdam 408 IT		
A1	RE/11	Mkondo Local Municipality
A2	4	Raad op Plaaslike Bestuursaangeleenthede
A3	2	SG Nhlabathi
A4	5	AHE Angamia
A5	6,7	NN Jacob
A6	8, 9, 15	CS van Heerden
A2	0, 1, 10, 12, 13, 14, 18, 19,	Republic of South Africa
A1	17	Amsterdam Municipality
A2	27, 28, 30	Provincial Government of Mpumalanga
A7	21	MH Sibeko
A8	22	ZM Thabetha
A9	23	MM Nkosi
A10	25	Amsterdamse Geloftedagvereneging
A11	37	Eskom Holdings
Tweepoort 404 IT		
T1	0	Tweepoort Trust
T2	1,3	Velvet Mountain Trading cc
T3	5	Tweepoort Boerdery cc
T4	7	Mondi South Africa Ltd.
T5	8	Ethemba-Lethu CPA
Paardenkraal 405 IT		
P1	0	Mkondo Local Municipality
Merriekloof 420 IT		
M1	0, 2, 3, 4, 5, 6	Republic of South Africa
Sandbach 407 IT		
S1	1,2	Makhunevu CPA
S2	4	Glen Aggy Trust
Sterkfontein 419 IT		
ST1	0	Peter John Venter Trust
ST2	1	FL Mbuyisa
ST3	2	EJ Simelane
ST4	14	Sterkfontein Eiendomme cc
ST5	17	CS van Heerden
ST6	19	PL Sibeko
ST7	27	Nkomo Boerdery cc

Figure 4.2: Surrounding landowners/users

4.3.1 Nkomo Boerdery cc - L. Botha

A completed comment sheet (dated: 15 March 2017; Appendix 7) was received from Mr. L. Botha of Nkomo Boerdery cc. The following was indicated:
'Nkomo Boerdery has water rights registered in the Thole River and we do irrigate from the river. The proposed dam could have an impact on the availability of irrigation water downstream.'

The above-mentioned concerns will be investigated and addressed during the EIA phase of the project.

4.4 Downstream water users

4.4.1 Swaziland and Mozambique

The proposed Dam Site A would be located within the Thole River and the proposed Dam Site B would be located within the Gabosha River (Figure 3.1).

The Thole and Gabosha Rivers are tributaries of the Ngwempisi River (W53 catchments), which is a tributary of the Usutu River (Figure 3.12). The Usutu River has its headwaters in South Africa and flows into Swaziland after which it joins the Pongola River to form the Maputo River just before the South Africa/Mozambique border. The catchment is thus an international water course, forming part of the Maputo River Basin (Mallory and Jacobs, 2014).

The Tripartite Agreement between the Republic of Mozambique, the Republic of South Africa and the Kingdom of Swaziland (referred to as the Interim IncoMaputo Agreement (2002), Appendix 3) specifies the minimum amount of water that must be released into Swaziland (Table 3.3).

The requirements in terms of the Interim IncoMaputo Agreement (2002) will be reviewed during the EIA phase and the applicability thereof on this project determined. In addition, the relevant parties with regards to this Agreement will also be determined and consulted.

4.4.2 Downstream farmers

The downstream farmers on the farms Amsterdam 408 It and Sterkfontein 419 IT were identified (Table 4.2; Figure 4.2) and will be consulted as part of the EIA process.

4.5 Identified local authorities/government departments and stakeholders

Table 4.3 provides an indication to which local authorities/government departments and stakeholders Background Information Documents (BIDs; Appendix 5) were forwarded in order to inform them of the proposed project and to obtain their issues of concern.

Table 4.3: Identified local authorities/government departments and stakeholders who received BIDs

AUTHORITY/ STAKEHOLDER	CONTACT PERSON	CORRESPONDENCE SENT	COMMENTS
Department of Agriculture, Forestry and Fisheries (DAFF)	F. Mashabela	BID e-mailed (27 February 2017; Appendix 6)	No
Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) - Directorate: Land Use and Soil Management – Ermelo	J. Venter	BID e-mailed (27 February 2017; Appendix 6)	No
Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) - Directorate: Environmental Management – Ermelo	S. Mbuyane; S. Marebane	BID e-mailed (27 & 28 February 2017; Appendix 6)	No
Department of Co-operative Governance and Traditional Affairs (COGTA)	M. Loock	BID e-mailed (27 & 28 February 2017; Appendix 6)	No
Department of Mineral Resources	S. Mathavela	BID e-mailed (27 & 28 February 2017; Appendix 6)	No
Department of Public Works, Roads and Transport	B. Viljoen	BID e-mailed (27 & 28 February 2017; Appendix 6)	Yes. Section 4.5.1.
Department of Rural Development and Land Reform (Commission on Restitution of Land Rights)	N.D. Nkambule	Claim enquiry (28 February 2017; Appendix 6)	No
Inkomati Usuthu Catchment Management Agency (IUCMA)	S. Shabangu	BID e-mailed (28 February 2017; Appendix 6)	Yes. Section 4.5.2.
Mkhondo Local Municipality (Water and Sanitation Manager)	A. Mazibuko	BID e-mailed (28 February 2017; Appendix 6)	Yes. See Section 4.5.3
Mkhondo Local Municipality (Senior Manager: Amsterdam)	N Ndlovu	BID e-mailed (28 February 2017; Appendix 6)	No
Mkhondo Local Municipality (Amsterdam Library)	R Nkambule	BID e-mailed (28 February 2017; Appendix 6)	No
Gert Sibande District Municipality (Senior Manager: Water and Sanitation)	M. Dondo	BID e-mailed (28 February 2017; Appendix 6)	Yes. Section 4.5.4.
Eskom Distribution (Land & Rights)	T. Ludere	BID e-mailed (27 February 2017; Appendix 6)	No
Eskom Transmission	L. Motsisi	BID e-mailed (12 February 2016; Appendix 6)	No
Mpumalanga Tourism and Parks Agency	K. Narasoo	BID e-mailed (27 February 2017; Appendix 6)	No
Mpumalanga Wetland Forum	H. Marais	BID e-mailed (27 February 2017; Appendix 6)	No
South African Heritage Resources Agency (SAHRA)	SAHRA website	BID loaded onto website (28 February 2017; Appendix 6)	No
Telkom	J. Smit	BID e-mailed (27 February 2017; Appendix 6)	No
Transvaalse Landbou Unie	D. du Plessis	BID e-mailed (27 February 2017; Appendix 6)	No
Piet Retief Agricultural Union	H. Kusel	BID e-mailed (27 February 2017; Appendix 6)	No
Ward 19 Community Development	S. Sukazi	BID e-mailed (27 February 2017; Appendix 6)	No
Ward Councillor (Ward 19)	D.L. Ngobeza	BID faxed (27 February 2017; Appendix 6)	No

AUTHORITY/ STAKEHOLDER	CONTACT PERSON	CORRESPONDENCE SENT	COMMENTS
Wildlife and Environment Society of South Africa	L. Betha; J. Wesson	BID e-mailed (27 February 2017; Appendix 6)	No
Birdlife	D. Marnewick	BID e-mailed (27 February 2017; Appendix 6)	No

4.5.1 Department of Public Works, Roads and Transport

An e-mail (dated: 28 February and 1 March 2017; Appendix 7) was received from Mr. B. Viljoen indicating that the Department of Public Works, Roads and Transport (DPWRT) (Ermelo) should be consulted. Contact details were provided. To date, the Ermelo office could not be reached. The Department will thus be consulted during the EIA phase.

4.5.2 Inkomati Usuthu Catchment Management Agency (IUCMA)

An email (dated: 1 March 2017; Appendix 7) was received from the IUCMA (Mr. S. Shabangu) in which the following was indicated:

- *The IUCMA is an interested stakeholder on the said project and will be responsible for processing of the water use authorization.*
- *Please note the following:*
  - *All documentation related to the project shall be received by the IUCMA for commenting.*
  - *The said activities of the project triggers some water uses like the storing of water in a form of a dam, the taking of water to supply the community, the desilting of the Dorps Dam, the planting of bulk pipeline across water courses.*
  - *Hence authorization shall be obtained prior commencement of the project.*
- *Moreover, the following specialist studies ought to be done to support the water use authorization application:*
  - *Water resources situation analysis and availability (water demand and balance);*
  - *Ecological assessment of all wetlands to be impacted by the project development footprint including the bulk pipeline infrastructure routes and alternatives;*
  - *The Dam design studies and registration with Department of Water and Sanitation Dam Safety Office;*
  - *The method statement for each river crossing.*

The above-mentioned concerns will be investigated and addressed during the EIA phase of the project.

4.5.3 Mkhondo Local Municipality

An e-mail (dated: 2 March 2017; Appendix 7) was received from the Mkhondo Local Municipality (Ms. A. Mazibuko) in which the following was indicated:
'I will look into it and respond'.

4.5.4 Gert Sibande District Municipality

An email (dated: 2 March 2017; Appendix 7) was received from the Gert Sibande District Municipality (Mr. M. Dondo) in which the following was indicated:
'Thank you for the email. Let me go through the document and if I have comments/queries I will revert back to you. I have also forwarded it to three of my Colleagues who are working in our Water and Sanitation Section'.

4.6 Department of Agriculture, Rural Development, Land and Environmental Affairs

Letters (dated: 14 December 2016; Appendix 8) were submitted to the Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) regarding the applicability of the Environmental Impact Assessment Regulations (2014) in terms of the following:

- The upgrading/refurbishment of the Amsterdam Water Treatment Works and upgrading of existing bulk water supply infrastructure;
- The installation of a new bulk water pipeline from the Amsterdam Water Treatment Works to the proposed new pumpstation.

A site meeting was held with an official from the Department (Ms. S. Mbuyane) on 2 February 2017 regarding the said letters. In addition, the overall Amsterdam project as detailed in this Scoping Report was discussed and the location of Dam Site A, Dam Site B and the proposed bulk water pipeline route visited.

Subsequently, a letter (dated: 14 March 2017; Appendix 8) was received from the Department indicating that an Environmental Impact Assessment must be conducted for the installation of the proposed bulk water pipeline since the following listed activities would be triggered:

- Listed Activities 12 and 19 of Listing Notice 1;
- Listed Activity 6 of Listing Notice 2;
- Listed Activity 12 of Listing Notice 3.

A letter (dated: 28 March 2017; Appendix 8) from AdiEnvironmental cc was forwarded to the Department indicating that the company disagrees with the Department's conclusion that an Environmental Impact Assessment is required for the entire pipeline. This is in view of the fact that the pipeline is smaller than the specifications indicated in Listing Notice 1 and is mostly located within a road reserve. A Basic Assessment must only be conducted where the pipeline crosses the Gabosha River.

To date, a response letter from the Department regarding the upgrading of the Amsterdam Water Treatment Works is still outstanding.

The project will be registered (submission of application form) with DARDLEA at the beginning of April 2017.

4.7 List of Interested and Affected Parties

From the above public participation process, the following list of Interested and Affected Parties was compiled:

INTERESTED AND AFFECTED PARTY LIST	
Organisation	**Name**
Government Departments	
Department of Agriculture, Forestry and Fisheries	F Mashabela
Department of Agriculture, Rural Development, Land and Environmental Affairs – Directorate: Environmental Management – Ermelo	S Mbuyane S Marebane
Department of Agriculture, Rural Development, Land and Environmental Affairs - Directorate: Land Use and Soil	J Venter

INTERESTED AND AFFECTED PARTY LIST	
Management – Ermelo	
Department of Co-Operative Governance and Traditional Affairs	M Loock
Department of Mineral Resources	S Mathavela
Department of Public Works, Roads and Transport	Ermelo
Department of Rural Development and Land Reform	ND Nkambule
Department of Water and Sanitation: Dam Safety	Responsible official to be determined
Department of Water and Sanitation: National Water Resource Planning (East)	Responsible official to be determined
Inkomati Usuthu Catchment Management Agency (IUCMA)	S Shabangu
Other Organisations	
Eskom Distribution	T Ludere
Eskom Transmission	L Motsisi
Mpumalanga Tourism and Parks Agency	K Narasoo
Mpumalanga Wetland Forum - Inventory	H Marais
South African Heritage Resources Agency	Website
Telkom	J Smit
Transvaalse Landbou Unie	D du Plessis
Piet Retief Agricultural Union	H Kusel
Wildlife and Environment Society of South Africa	L Betha; J Wesson
Birdlife	D Marnewick
Local Municipality and Municipal Councillor	
Councillor (Ward 19)	DL Ngobeza
Ward 19 Community Development	S Sukazi
Mkhondo Local Municipality	A Mazibuko; N Ndlovu; R Nkambule
Gert Sibande District Municipality	M Dondo
Directly affected landowners	
Mkhondo Local Municipality	A Mazibuko; N Ndlovu
Surrounding landowners/land users/downstream water users	
Property (Figure 4.2)	**Landowner/Contact person**
Amsterdam 408 IT	
4 (A2)	Raad op Plaaslike Bestuursaangeleenthede (Mkhondo Local Municipality)
2 (A3)	SG Nhlabathi
5 (A4)	AHE Angamia
6, 7 (A5)	NN Jacob
8, 9, 15 (A6)	CS van Heerden

INTERESTED AND AFFECTED PARTY LIST	
0, 1, 10, 12, 13, 14, 18, 19 (A2)	Republic of South Africa (National Department of Public Works - G Masuku)
17 (A1)	Amsterdam Municipality (Mkhondo Local Municipality)
27, 28, 30 (A2)	Provincial Government of Mpumalanga
21 (A7)	MH Sibeko
22 (A8)	ZM Thabetha
23 (A9)	MM Nkosi
25 (A10)	Amsterdamse Geloftedagvereneging
37 (A11)	Eskom Holdings - T Ludere
TWEEPOORT 404 IT	
0 (T1)	Tweepoort Trust
1, 3 (T2)	Velvet Mountain Trading cc
5 (T3)	Tweepoort Boerdery cc
7 (T4)	Mondi South Africa Ltd.
8 (T5)	Ethemba-Lethu CPA
PAARDENKRAAL 405 IT	
0 (P1)	Mkhondo Local Municipality
SANDBACH 407 IT	
1, 2 (S1)	Makhunevu CPA
4 (S2)	Glenn Aggy Trust - A Grobbelaar
MERRIEKLOOF 420 IT	
0, 2, 3, 4, 5, 6 (M1)	Republic of South Africa (National Department of Public Works - G Masuku)
STERKFONTEIN 419 IT	
0 (ST1)	Peter Johan Venter Trust - Peter Venter
1 (ST2)	FL Mbuyisa
2 (ST3)	EJ Simelane
14 (ST4)	Sterkfontein Eiendomme cc
17 (ST5)	CS van Heerden
19 9ST6)	PL Sibeko
27 (ST7)	Nkomo Boerdery cc - L Botha

4.8 Conclusion

As indicated in Table 4.2 and Figure 4.2, large portions of the surrounding properties belong to the provincial and national government. However, many private landowners also own property in the area. These private landowners were identified and will be consulted as part of the EIA phase as indicated in Table 4.2.

Additional stakeholders/government departments (e.g. Department of Water and Sanitation: Dam Safety) will also be identified and consulted as part of the EIA phase as indicated in the preceding sections.

In summary, the following issues of concern were recorded through this scoping phase:

- Requirements in terms of the Interim IncoMaputo Agreement (i.e. agreement between South Africa, Swaziland and Mozambique regarding water resource management);
- Potential impact on local resident residing in Vincent Street, Amsterdam;
- Potential impact on downstream water users in terms of water availability for irrigation;
- Water use licence application required;
- Water resources situation analysis and availability (water demand and balance) study required;
- Ecological assessment of all wetlands to be conducted;
- Dam design studies required;
- Dam registration with the Department of Water and Sanitation: Dam Safety Office required.

These issues of concern will be investigated and addressed during the EIA phase of the project. More information in this regard is provided in Section 7 (Plan of Study for EIA) of this report.

5. DESCRIPTION OF ALTERNATIVES IDENTIFIED

5.1 Introduction

According to Afri Infra (2016), the objective of this project is to upgrade and refurbish the Bulk Water Supply Infrastructure to Amsterdam, situated in the jurisdiction area of the Mkhondo Local Municipality (MLM).

The Amsterdam Regional Water Supply Scheme currently serves a population of approximately 14 500 people who reside within the boundaries of the scheme. These residents are reliant on the scheme to provide a sustainable water supply.

The scheme currently abstracts water from a single location (Dorps Dam) within the catchment of the Gabosha River, a tributary of the Ngwempisi River. It relies on run-of-river abstraction only. It is not connected to any National Bulk Water Infrastructure.

The future water requirement of Amsterdam is estimated at 1.09 million m^3/annum (Mallory and Jacobs, 2014).

Various options were considered with regards to supplying the Amsterdam area with a sustainable water supply and is documented in this section. The following was considered as part of this investigation, namely source of supply, capital cost, operation and maintenance cost for next 20 years, etc.

5.2 Water Treatment Works (WTWs)

5.2.1 Amsterdam Water Treatment Works (WTWs)

The existing Amsterdam Water Supply Scheme allows for raw water abstraction from the Dorps Dam located in the Gabosha River (Figure 5.1). This water is treated at the existing Amsterdam Water Treatment Works located on the north eastern side of the town, Amsterdam (Figure 5.1). This WTW is registered as a Class D works and has a reported capacity of 7Ml/day. On average, 2.4 Ml/day is treated (WSDP, 2010). Potable water is provided to Amsterdam and KwaThandeka by the Mkhondo Local Municipality who is in charge of the said works.

Photo 5.1: View of Amsterdam Water Treatment Works (WTW)

Preliminary investigations confirmed that the capacity of the Amsterdam Water Treatment Works (WTWs) is sufficient in terms of the 2034 demand requirements (Afri-Infra, 2016).

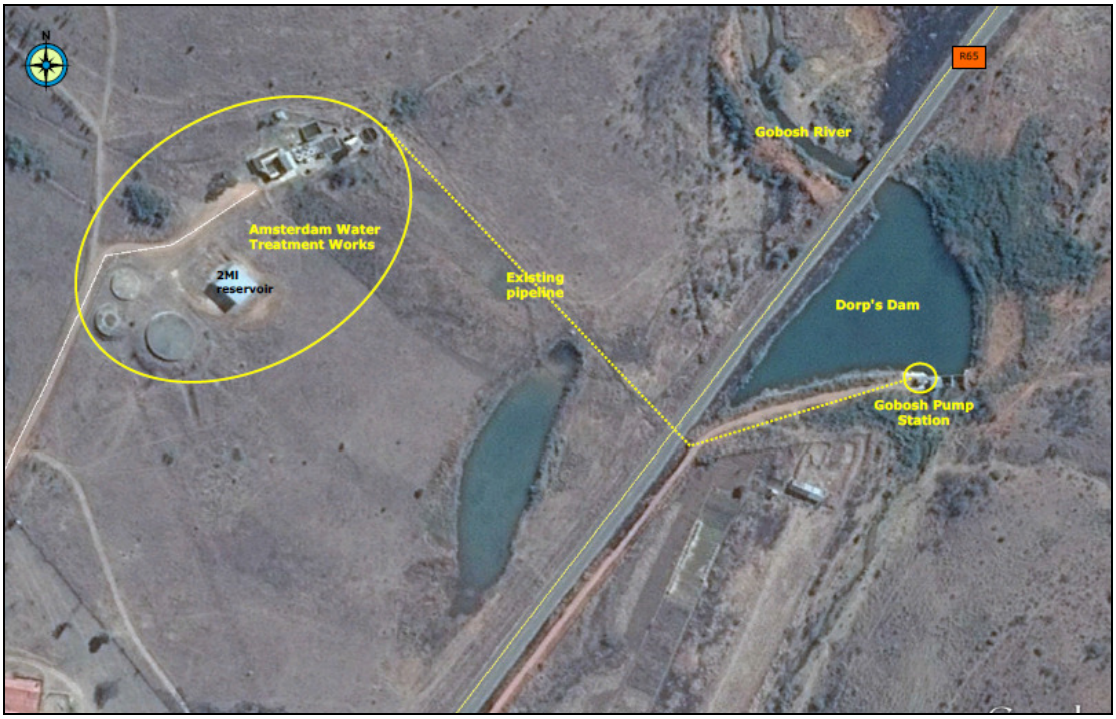


Figure 5.1: Amsterdam Water Treatment Works and associated infrastructure

However, the WTWs requires refurbishment and/or replacement of the following existing equipment housed within the existing WTW buildings:

- The refurbishment of valves and pumps:
  - Replace desludging vales with 150mm NB hand operated knife gate valves complete with extended spindles, etc.
- The refurbishment of the chlorination equipment:
  - Removal of existing equipment where refurbishment is required or new equipment will be supplied and installed.
- The refurbishment of sedimentation and filtration equipment:
  - Provide new filter media (various gradings);
  - Inspect filter floors and nozzles once media has been removed and determine if refurbishment is required;
  - Replace 'lamella' plate/membrane installations;
  - Removal of existing equipment where refurbishment is required or new equipment will be supplied and installed.
- The refurbishment of the chemical dosing equipment:
  - Refurbish existing powder lime feeder;
  - Removal of existing equipment where refurbishment is required or new equipment will be supplied and installed.
- Recommissioning of existing infrastructure:
  - Isolate, drain, high pressure wash, desludge, clean and recommission the following: inlet splitter tower; flocculation channels, sedimentation tanks, filter channels, filters, clear water tanks.
- The refurbishment of the WTW building – general maintenance activities (e.g. new doors, re-glazing of windows, painting, plumbing, etc.);

- The refurbishment of the inlet works building – general maintenance activities (e.g. new polycarbonate roof sheets to enclose the chemical dosing house at the inlet works, etc.).

In addition to the above-mentioned, the following infrastructure also needs to be upgraded:

- Gabosha River Abstraction Pump Station;
- The existing rising main from the Gabosha River Abstraction Pump Station to the inlet works at the Amsterdam WTW;
- Storage facilities.

Upgrading of the Gabosha River Abstraction Pump Station

The Gabosha River Abstraction Pump Station is located on the wall of the Dorps Dam as indicated in Figure 5.1. It has an estimated pumping capacity of 36 l/s.

According to Afri-Infra (2016) the refurbishment of the said pump station would involve:

- The refurbishment of the pump station building i.e. general maintenance to existing pump station building.
- The upgrading of the pumps and Motor Control Centre (MCC) i.e. replacing/refurbishing existing pumps and MCC.

Upgrading of the existing rising main

The existing rising main consists of a 160 mm diameter uPVC Class 9 pipeline extending from the Gabosha River Abstraction Pump Station to the inlet works at the Amsterdam WTW (i.e. a distance of 500m; existing pipeline - Figure 5.1). According to the information provided, air valves, chambers, etc. associated with this pipeline would be refurbished. No new pipeline would be installed and thus there will be no increase in footprint or capacity.

Upgrading of storage facilities

Afri-Infra (2016) indicated that the storage facilities need to be upgraded by approximately 2 Ml.

A 2Ml reservoir has already been constructed on site as indicated in Photo 5.2 and Figure 5.1. This reservoir was unfortunately installed at the incorrect level resulting in the said reservoir not being able to be filled to capacity with water.

Photo 5.2: View of 2Ml reservoir adjacent to the existing reservoirs at the Amsterdam WTW

Afri-Infra indicated that the said reservoir would be decommissioned (i.e. broken down) and re-installed at the correct level (i.e. the site will be excavated until the correct level). There would thus be no increase in footprint area or in capacity. All construction would thus take place within the existing footprint area and within the existing fenced area.

5.2.2 New Water Treatment Works (WTWs)

A new Water Treatment Works (WTWs) was not investigated since the existing Amsterdam WTWs has sufficient capacity in terms of the 2034 demand requirements (Afri-Infra, 2016). The upgrading of the facilities as indicated in Section 5.2.1 is however required.

5.3 Weir sites

Three weir sites were assessed namely:

- Weir W5H025 located in the Usuthu River (Figure 5.2);
- Current abstraction weir (Dorps Dam) in Gabosha River (Figure 5.2);
- Weir in Thole River located upstream of Amsterdam (Figure 5.2).

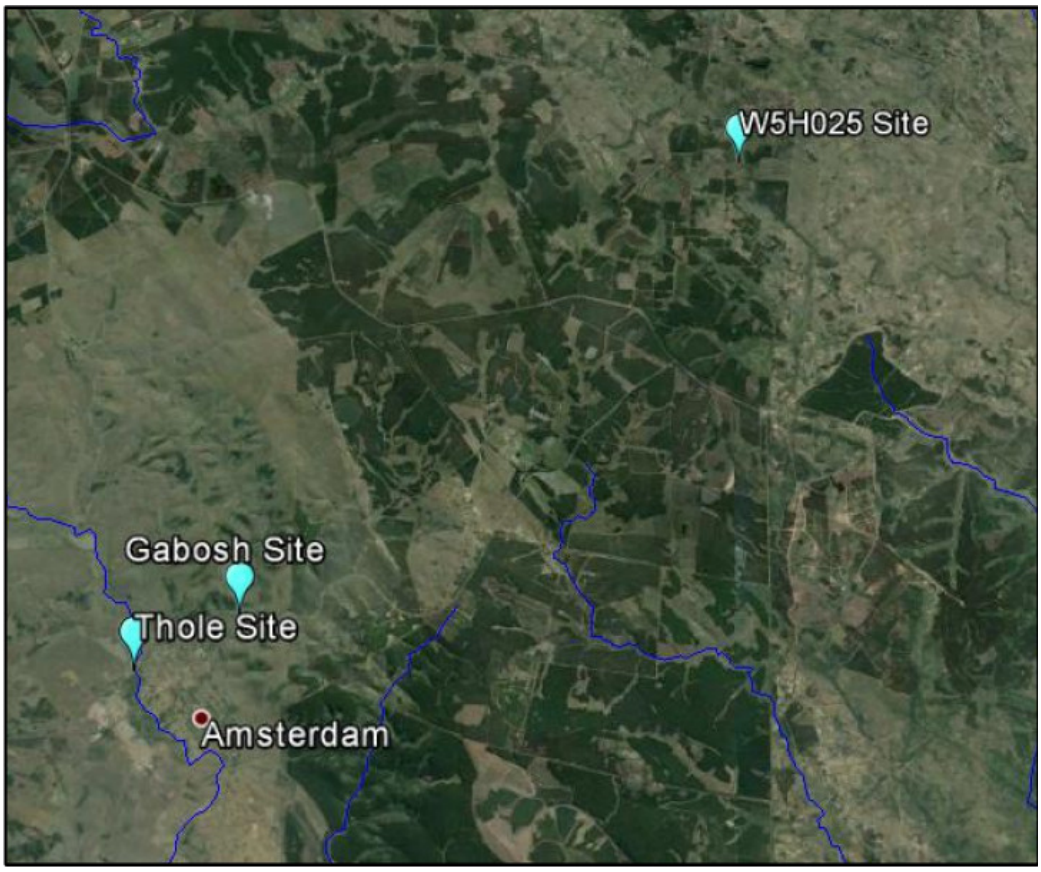


Figure 5.2: Location of the three weirs investigated (taken from Mallory and Jacobs, 2014)

The current abstraction weir in the Gabosha River (Dorps Dam; Figure 5.1) has a gross capacity of 220 000m^3 but is silted up. This affects the water supply to Amsterdam as run-of-river water is relied upon. The desilting of the Dorps Dam is proposed as an activity to be undertaken as part of the upgrading of the Amsterdam Regional Water Supply Scheme.

The natural and present day Mean Annual Runoff (MAR) at the 3 weir sites are indicated in Table 5.1.

Table 5.1: Runoff at the 3 weir sites (taken from Mallory and Jacobs, 2014)

SITE	MEAN ANNUAL RUNOFF (million m^3/a)	
	Natural	Present Day
Gabosha	6.66	6.01
Thole	30.28	23.84
W5H025	69.11	22.93

Mallory and Jacobs (2014) modelled two scenarios (Table 5.2) to assess the impact of increased domestic abstraction while allowing for the Interim IncoMaputo Agreement (IIMA) minimum cross-border flows of 0.1 m^3/a into Swaziland.

Table 5.2: Historical yields at abstraction points for Scenario 1 & 2 (taken from Mallory and Jacobs, 2014)

WEIR SITE	SCENARIOS (million m^3/annum)	
	1: No weir & no EWR	2: No weir with EWR
W5H025	0.347	0
Gabosha	0.242	0
Thole	0.790	0

Legend: EWR = Ecological Water Requirements

As indicated in Table 5.2, **the future water demand of Amsterdam (i.e. 1.9 million m^3/annum) cannot be met by any of the proposed weir sites without providing storage (i.e. Scenario 1 – no provision for EWR).**

Scenario 2 included the Ecological Water Requirements being released from the 3 weir sites. As indicated in Table 5.2, **no water will be available for abstraction if the EWR is met as first priority.**

It is a requirement of the National Water Act, 1998 (Act 56 of 1998) to leave some water in the river to sustain the ecological functioning of the river. This is referred to as the Ecological Reserve or the Ecological Water Requirement (EWR).

The W53C catchment in which the Amsterdam area falls only contributes 19% of the runoff at the border with Swaziland (Mallory and Jacobs, 2015a). The remaining 81% is derived from the W53A and W53D catchments. Mallory and Jacobs (2015a) was therefore of the opinion that the W53C catchment should only contribute 19% to the minimum cross-border flows.

Table 5.3 provides an indication of the run-of-river yield at the Gabosha and Thole Sites where no EWR was allowed and only 19% of the cross-border flow. This was done with no EWR as there is no yield available at 98% assurance when allowing for EWR.

Table 5.3: Run-of-river yield in the Thole and Gabosha Rivers – no EWR and only 19% of minimum cross-border flow (taken from Mallory and Jacobs, 2015a)

SITE	YIELD AT 98% ASSURANCE (million m^3/annum)
Thole	0.16
Gabosha	0.15

Based on the above-mentioned, the 3 weir sites were excluded since there is insufficient water from run-of–river yield if the EWR and the minimum cross-border flows are to be included.

5.4 Construction of weirs/small dams

The possible construction of weirs/small dams at the 3 sites indicated in Figure 5.2 was investigated. Mallory and Jacobs (2014) modelled various dam sizes for each site until the yield was sufficient to meet Amsterdams's future demand (i.e. after meeting the Ecological Water Requirements (EWR)). In addition, modelled cross-border flows were also checked for compliance and, where necessary, releases from the dams were made to meet this.

5.4.1 Gabosha Site

Table 5.4 provides the historical yields at the Gabosha Site (Figure 5.2) for different weir sizes and the EWR.

Table 5.4: Historical yields at the Gabosha Site for different weir sizes with EWR (taken from Mallory and Jacobs, 2014)

GABOSHA SITE (Dorps Dam; Figure 5.2)	
WEIR SIZE (million m^3)	**YIELD (million m^3/annum)**
2.2	1.1
2.5	**1.2**
3.0	1.25
3.5	1.30

The 2.5 million m^3 weir (Table 5.4) provides a 98% assurance of supply for the urban demand (based on a historical analysis) and can meet the cross border flow requirements acceptably.

The smaller sized weirs cannot meet the urban demand and the cross border flow requirements acceptably (Mallory and Jacobs, 2014).

5.4.2 Thole Site

Table 5.5 provides the historical yields at the Thole Site (Figure 5.2) for different weir sizes and the EWR.

Table 5.5: Historical yields at the Thole Site for different weir sizes with EWR (taken from Mallory and Jacobs, 2014)

THOLE SITE (Figure 5.2)	
WEIR SIZE (million m^3)	**YIELD (million m^3/annum)**
1.6	0.8
1.8	**1.2**
2.0	1.5
2.5	2.3
3.0	3.1

The 1.8 million m^3/annum sized weir (Table 5.5) is the smallest weir that can provide a 98% assurance of supply for urban demand and the minimum cross-border flows.

5.4.3 W5H025 Site

Mallory and Jacobs (2014) conducted a similar exercise with regards to the W5H025 Site located in the Usuthu River (Figure 5.2). It was however found that a very large dam would be required at this point to produce any yield. This is due to the large upstream dams (Westoe and Churchill) that retain all the water upstream of this site with little or no compensation releases (Mallory and Jacobs, 2014).

5.4.4 Conclusion

The W5H025 site located in the Usuthu River (Figure 5.2) was excluded from any further investigation as it is not suitable for a dam due to the massive upstream abstractions.

From a hydrological perspective, the Thole Site (Figure 5.2) would be the best option (Mallory and Jacobs, 2014). However, Mallory and Jacobs (2014) indicated that the terrain of the Gabosha Site (Figure 5.2) is better suited to the construction of a weir as the valley sides are much steeper than those found in the Thole River valley. It was further indicated that a larger dam at the Gabosha Site could be more cost effective than a smaller dam at the Thole Site.

5.5 Type of dam construction

Based on the above-mentioned, Mallory and Jacobs (2014) indicated that building a larger weir or small dam at the Gabosha Site (Figure 5.2) would only provide temporary relief in view of the current problem experienced at the Dorps Dam (i.e. the dam is silted up).

Mallory and Jacobs (2014) indicated two options to solve this problem namely:

- Building a much larger dam to accommodate for example 20 years of silt;
- Building a so-called sand dam.

5.5.1 Dam with 20 years of sediment/silt

Two options at both the Thole and Gabosha Sites (Figure 5.2) were investigated namely:

- Option 1: assumes 1.09 million m^3/annum water being supplied – future water requirement of Amsterdam;

- Option 2: assumes 0.74 million m^3/annum water being supplied – it was assumed that the water requirement will not be constant throughout the year but vary with a higher demand being place on the system in summer (Mallory and Jacobs, 2015).

Table 5.6 provides the dam sizes required allowing for 20 years of sediment/silt.

Table 5.6: Yield results with regards the Dam with 20 years silt options (taken from Mallory and Jacobs, 2015a)

DAM WITH 20 YEAR SILT/SEDIMENT			
SITE	**YIELD AT 98% ASSURANCE (million m^3/annum)**	**20 YEAR SILT VOLUME (m^3)**	**FULL SUPPLY CAPACITY (million m^3)**
Thole (Figure 5.2)	1.09	131 000	0.97
	0.74	100 000	0.55
Gabosha (Figure 5.2)	1.09	116 000	1.60
	0.74	95 000	0.51

Alternative 1a: A 20 year silt dam in the Thole River
Alternative 1a allows for a new dam and abstraction facility at a new abstraction point in the Thole River (Figure 5.2).

The dam would have a full supply capacity of 0.55 M m^3 allowing for a 20 year silt volume estimated to be 100 000 m^3 (Table 5.6). This option allows for 0.15M m^3/a (0.41 Ml/d) of the Thole River to be augmented with 0.74Mm^3/a (2.03Ml/d) from the new storage dam. This will entail the provision of a new water abstraction pump station from where raw water will be pumped to the Amsterdam WTW.

ALTERNATIVE 1a: A 20 YEAR SILT DAM IN THOLE RIVER		
Infrastructure requirements	**Size**	**Quantity**
New Dam with 20 years of silt	0.55M m^3	1
Raw Water Pipeline (Rising Main) – Usutu River to Amsterdam WTW (PLa)	315mm uPVC Class 12	4100m
Raw Water Pumpstation – Thole River to Amsterdam WTW (PS1)	61 l/s @ 108m	86 Kw
Refurbish weir/Dorps Dam	2 Ml/day	1
Upgrade existing Raw Water Pipeline – Gabosha River to Amsterdam WTW (PL2)	160mm uPVC Class 9	500m
Raw Water Pumpstation – Gabosha River to Amsterdam WTW (PS2)	11 l/s @ 48m	6 kW
Amsterdam WTW – 7 Ml/day	Existing sufficient	0
Amsterdam Storage Facility – upgrade from current 2.25 Ml/d to 4 Ml/d	2 Ml Concrete	2000 kl

Alternative 1b: A 20 year silt dam in the Gabosha River
Alternative 1b is similar to Alternative 1a with the new dam and abstraction facility at the new abstraction point in the Gabosha River. The dam will have

a full supply capacity of 0.51Mm^3 allowing for a 20 year silt volume estimated to be 95 000m^3 and a 98% yield assurance of 0.74Mm^3/a (Table 5.6).

ALTERNATIVE 1b: THOLE RIVER/GABOSHA RIVER		
Infrastructure requirements	**Size**	**Quantity**
New Dam with 20 years of silt – Gabosha River	0.51M m^3	1
Realign Provincial Road – R65	3.6 lane widths	1000m
Refurbish weir/Dorps Dam	2 Ml/day	1
Upgrade existing Raw Water Pipeline – Gabosha River to Amsterdam WTW (PL2)	160mm uPVC Class 9	500m
Raw Water Pumpstation – Gabosha River to Amsterdam WTW (PS2)	61 l/s @ 48m	38 kW
Amsterdam WTW – 7 Ml/day	Existing sufficient	0
Amsterdam Storage Facility – upgrade from current 2.25 Ml/d to 4 Ml/d	2 Ml Concrete	2000 kl

Alternative 1b was discarded as the proposed dam site would have resulting in the flooding of the existing R65 provincial road requiring the re-routing of this road.

5.5.2 Sand dam

Mallory and Jacobs (2014) recommended the Sand Dam concept in view of the high silt load in the Usuthu catchment and the relatively small size of storage envisaged. This concept works well where the sediment consists mostly of sand, as in the case of the Usuthu catchment.

Sand dam concept (Mallory and Jacobs, 2014): During construction, abstraction pipes with specially designed inlet nozzles are laid in the river bed within the dam basin. Water will then be abstracted from the sand in the same way as a sand filter. Since sand is relatively porous, with approximately 35% voids, significant volumes of water will still be stored in a sand dam. The added advantage is that water abstracted from such a dam will already have a very low turbidity and only chloriation will be required.

Table 5.7 provides an indication of the recommended dam sizes (allowing for full sediment accumulation) at both the Thole and Gabosha Sites (Figure 5.2).

Table 5.7: Required Sand Dam size at the Thole and Gabosha sites – with EWR and minimum cross-border flows (taken from Mallory and Jacobs, 2014)

DAM	DAM SIZE (million m^3)
Gabosha	7.5
Thole	5.4

As indicated in Table 5.7, the construction of larger dams will be required but this will ensure a long-term sustainable solution. An alternative is to allow for the raising of the dam wall in future.

Two sand dam options at both the Thole and Gabosha Sites (Figure 5.2) were investigated namely

- Option 1: assumes 1.09 million m^3/annum water being supplied;

- Option 2: assumes 0.74 million m^3/annum water being supplied.

Table 5.8 provides the yield results with regards to the above-mentioned options.

It should be noted that Mallory and Jacobs (2015) made the following assumptions in modelling the sand dam options:

- The porosity of the sand is 30%;
- Evaporation from the surface of the dam decreases linearly from full evaporation when the dam is full down to zero evaporation when the water level in the dam is 8m or less than the full supply level. The reduced evaporation loss is one of the benefits of a sand dam.

Table 5.8 provides an indication of the sand dam size required when the EWR and only 19% of the minimum cross-border flows are taken into account.

Table 5.8: Sand Dam Size with regards to Option 1 and Option 2 (taken from Mallory and Jacobs, 2015a)

SITE	YIELD AT 98% ASSURANCE (million m^3/annum)	FULL SUPPLY CAPACITY (million m^3)
Thole River	1.09	2.0
	0.74	1.1
Gabosha River	1.09	3.0
	0.74	1.2

5.5.3 Conclusion

Mallory and Jacobs (2015) indicated that allowing for 20 years of sediment is more favourable than constructing a sand dam as this will result in a smaller and less costly dam as indicated in Table 5.6. The disadvantage is however the reduced lifespan of the smaller dam.

As indicated in Table 5.8, the sand dam options at both sites require a significantly larger structure to be built and will thus be much more costly options.

Mallory and Jacobs (2015b) indicated that it will be more cost effective to allow for 20 years sediment accumulation than to construct a sand dam.

5.6 Additional 20 year silt/sediment dam sites

Two additional sites with regards to the 20 year silt/sediment dam were investigated namely:

- Thole dam site located downstream of the confluence of the Thole and Gabosha Rivers (Figure 5.3) i.e. Dam Site A;
- Gabosha dam site located on the Gabosha River about 1.3 km north of the R65 road and upstream of the Dorps Dam (Figure 5.3) i.e. Dam Site B.

Table 5.9 provides the dam sizes required allowing for 20 years of sediment/silt at Dam Site A and Dam Site B.

Mallory and Jacobs (2016) indicated that Dam Site B had the following advantages:

- it is located upstream of Amsterdam;
- less water use upstream of the dam site;
  - water use upstream appears to be limited to a small area of forestry which is estimated to reduce the natural runoff into the dam by 0.49 million m^3/annum;
  - irrigation upstream of the site appears to be negligible;
- smaller catchment less prone to sedimentation;
- smaller dam size: 510 000m^3;
- less costly to construct;
- water can be supplied under gravity hence saving on pumping costs.

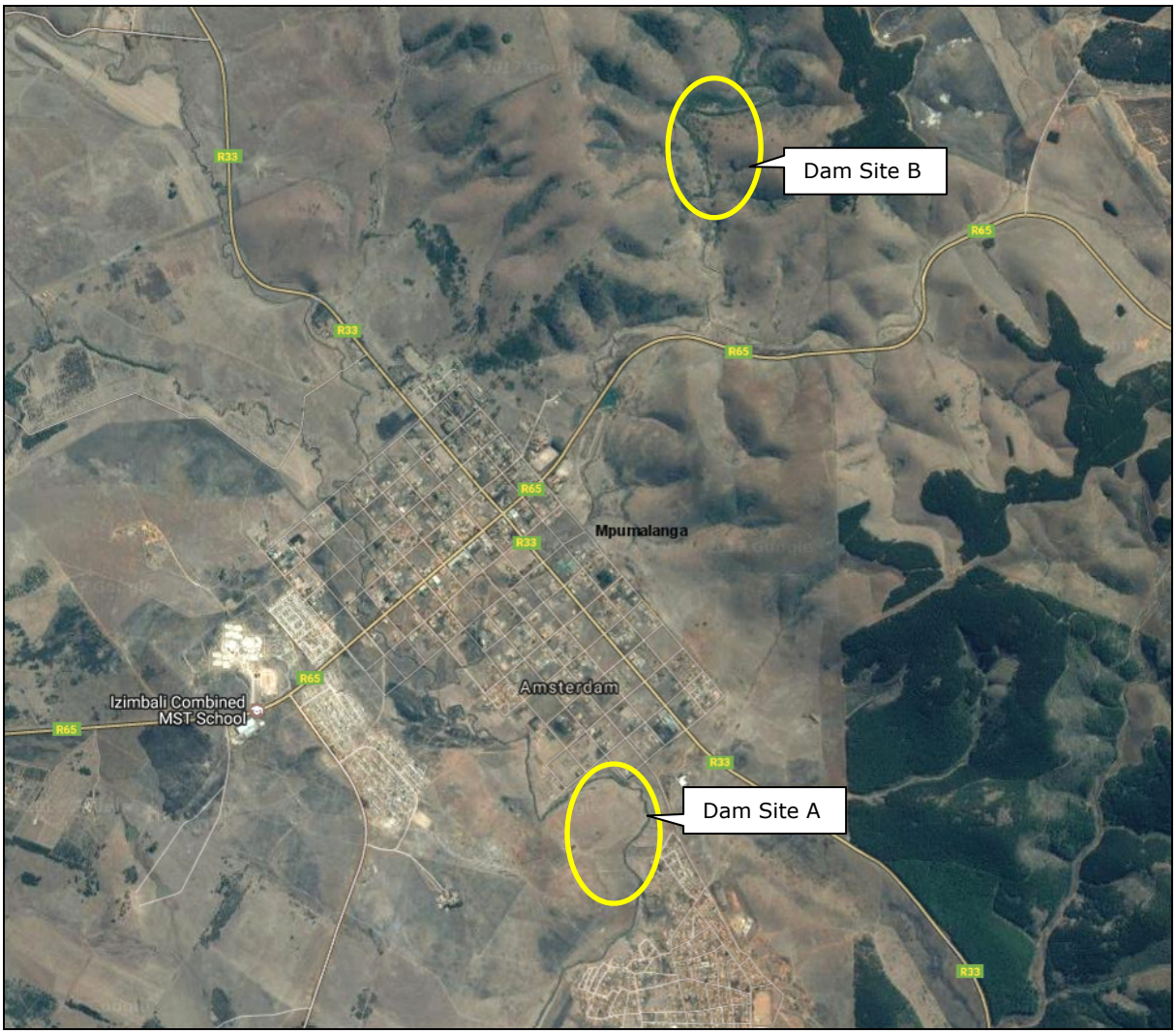


Figure 5.3: Dam Site A in the Thole River and Dam Site B in the Gabosha River

Table 5.9: Dam sizes at Dam Site A and Dam Site B (taken from Mallory and Jacobs, 2015a)

SITE	YIELD AT 98% ASSURANCE (million m^3/annum)	FULL SUPPLY CAPACITY (m^3)	ALLOWANCE FOR SILT/SEDIMENT INCLUDED (m^3)
Thole River (Dam Site A)	0.74	465 000	105 000
Gabosha River (Dam Site B)	0.74	680 000	80 000

It was decided that Dam Site A and Dam Site B would be further investigated as part of this Environmental Impact Assessment.

5.7 Alternatives in terms of pipelines

The following pipelines form part of the overall project:

- Pipeline from the existing Amsterdam Water Treatment Works (WTWs) to the proposed Dam Site A (Figure 5.4);
- Pipeline from the proposed Dam Site B to the existing Water Treatment Works (WTWs) (Figure 3.7b).

5.7.1 Pipeline from the existing Amsterdam WTWs to the proposed Dam Site A

Afri-Infra (2016) indicated that a new raw water pipeline will be installed from the Amsterdam Water Treatment Works (Point A) to Point L (located within Kwathandeka) as indicated in Figure 5.4. At a later stage the said water pipeline will be extended to the proposed new raw water pump station to be located in close proximity of the new dam (Dam Site A) to be constructed. This pipeline will consist of a 315mm diameter uPVC Class 12 pipe and will extend over a distance of 4100m as indicated in Figure 5.4. This pipeline would thus be a pump line.

Figure 5.4: New bulk water pipeline route in Amsterdam (Point A to Point L)

If Dam Site A is not developed and Dam Site B is developed, then the pipeline would become a distribution pipeline providing potable water from the existing Amsterdam WTWs to the residential areas of Amsterdam and KwaThandeka. It would thus be a gravity line.

5.7.2 Pipeline from the proposed Dam Site B to the existing Amsterdam WTWs

A pipeline from the proposed Dam Site B to the existing Amsterdam WTWs (Figure 3.7b) was indicated as an alternative.

However, the project engineers subsequently indicated that the water will be released directly into the Gabosha River downstream of the Dam Site B and abstracted at the existing Dorps Dam abstraction point.

Both these options will be investigated as part of the EIA phase.

5.8 Integration with other water supply schemes

The following alternatives with regards to integrating the Amsterdam Regional Water Supply Scheme with other water supply schemes were investigated:

- Alternative 1: Gabosha River/Morgenstond Dam;
- Alternative 2: Gabosha River/Usuthu Vaal Scheme;
- Alternative 3: Usuthu River/Usuthu Vaal Scheme;

5.8.1 Alternative 1: Gabosha River/Morgenstond Dam

According to Afri-Infra (2016), this option allows for raw water abstraction (through a raw water pump station) from the Morgenstond Dam for the communities of Amsterdam and KwaThandeka.

The Amsterdam Pump Station would pump raw water via a 200mm diameter pipeline to a high level reservoir from where water would gravitate to the existing Amsterdam Water Treatment Works (WTW). Clean water would then be supplied from the Amsterdam WTW to the storage facilities of Amsterdam and KwaThandeka.

ALTERNATIVE 1: GABOSHA RIVER/MOREGENSTOND DAM		
Infrastructure requirements	**Size**	**Quantity**
Raw water pipeline (Rising Main) – Morgenstond Dam to Amsterdam WTW (PL1)	250mm uPVS Class 9	5000 m
Raw water pumpstation – Morgenstond Dam to High Level Reservoir (PS1)	47 l/s @ 67m	40 kW
Amsterdam WTW – 7 Ml/day	Existing sufficient	0
Amsterdam Storage Facility – upgrade from current 2.25 Ml/d to 4 Ml/d	2 Ml Concrete	2000 kl
Upgrade existing raw water pipeline – Gabosha River to Amsterdam WTW (PL3)	160 mm uPVC Class 9	500 m
Upgrade Existing Raw Water Pumpstation – Gabosha River to Amsterdam WTW (PS2)	11 l/s @ 48m	7 kW

Alternative 1 was discarded as Morgenstond Dam is committed to supply water for national energy needs and were therefore not considered a favourable option (Afri-Infra, 2016).

5.8.2 Alternative 2: Gabosha River/Usuthu Vaal Scheme

Alternative 2 involved augmenting the yield of the Gabosha River from the bulk link between Jericho and Westoe Dams. In essence, this entailed the following:

- Upgrading of the existing scour facility to a formalized facility in the pipeline to discharge into the Gabosha River;
- Upgrading of the existing raw water pump station in the Gabosha River from where raw water will be pumped to the Amsterdam WTW.

ALTERNATIVE 2: GABOSHA RIVER/USUTU VAAL SCHEME		
Infrastructure requirements	**Size**	**Quantity**
Upgrade Weir/Dorps Dam	3 Ml/day	1
Upgrade Scour Facility in Jericho/Westoe Dams Bulk Link	2.1 Ml/day	1
Upgrade existing raw water pipeline – Gabosha River to Amsterdam WTW (PL1)	315 mm uPVC Class 9	500m
Raw Water Pumpstation – Gabosha River to Amsterdam WTW (PS1)	61 l/s @ 48m	38 kW
Amsterdam WTW – 7 Ml/day	Existing sufficient	0
Amsterdam Storage Facility – upgrade from current 2.25 Ml/d to 4 Ml/d	2 Ml Concrete	2000 kl

In the Amsterdam Reconciliation Strategy Report, it is recorded that in times of water shortages the yield of the Gabosha River is augmented from Westoe Dam via the bulk link pipeline between Westoe Dam and Jericho Dam. This augmentation is not governed by an official agreement between the Department of Water and Sanitation (DWS) and the Mkhondo Local Municipality. Water releases only take place after lengthy negotiations at elevated VRESAP (Vaal River Eastern Sub-system Augmentation Project) tariffs.

Although functional as an emergency back-up, this action cannot be considered as a sustainable long term solution to the area's water resource planning (Afri-Infra, 2016). **Alternative 2 was thus discarded.**

5.8.3 Alternative 3: Usuthu River/Usuthu Vaal Scheme

Alternative 3 allows for the raw water abstraction from the Usuthu River at an existing measuring station (station number W05H25) as primary raw water source for Amsterdam. From the abstraction point raw water would be pumped via a new bulk water link to the existing Amsterdam WTW.

The hydrology and water resource assessment however indicated that the W5H025 weir site is not suitable for abstraction as primary source due to the high upstream abstractions (see Section 5.4.3 & 5.4.4). **Alternative 3 was thus discarded.**

ALTERNATIVE 3: USUTU RIVER/USUTU VAAL SCHEME		
Infrastructure requirements	**Size**	**Quantity**
Raw Water Pumpstation – Usutu River to Amsterdam WTW	43 l/s @ 177m	141 kW
Raw Water Pipeline (Rising Main) – Usutu River to Amsterdam WTW (PLa)	315mm uPVC Class 16	5500m
Raw Water Pipeline (Gravity Main) – Usutu River to Amsterdam WTW (PL2)	2000mm uPVC Class 9	12 300m
Amsterdam WTW – 7 Ml/day	Existing sufficient	0
Amsterdam Storage Facility – upgrade from current 2.25 Ml/d to 4 Ml/d	2 Ml Concrete	2000 kl
Upgrade storage capacity at existing measuring station	Suitable for 3Ml/day	1

5.8.4 Conclusion

Afri-Infra (2016) indicated that during preliminary planning it was envisaged that the Amsterdam Water Supply Scheme would be integrated with the Empuluzi/Methula, Lusushwana and Sheepmoor Water Supply Scheme as a Regional Bulk Water Supply Scheme with Westoe and Morgenstond Dams as primary source. These dams are however committed to supply water for national energy needs and were therefore not considered as favourable options (Afri-Infra, 2016).

Subsequent discussion with stakeholders resulted in the decision being taken to deal with the Amsterdam Water Supply Scheme as a stand-alone scheme supplying water to the communities of Amsterdam and KwaThandeka (Afr-Infra, 2016). **The idea of integrating the Amsterdam Regional Water Supply Scheme with another water supply scheme was thus discarded.**

5.9 'No Project Option'

The 'No Project Option' is the alternative of not going ahead with the proposed upgrading of the Amsterdam Regional Water Supply Scheme. The 'No Project Option' is only considered if it is found that the proposed construction of a dam and associated infrastructure will have significant negative impacts on the environment, which cannot be mitigated or managed.

The Amsterdam Scheme currently abstracts water from a single location (Dorps Dam) within the catchment of the Gabosha River, a tributary of the Ngwempisi River. It relies on run-of-river abstraction only. It is not connected to any National Bulk Water Infrastructure.

The current abstraction weir in the Gabosha River (Dorps Dam; Figure 5.1) has a gross capacity of 220 000m^3 but is silted up. This affects the water supply to Amsterdam as run-of-river water is relied upon.

If the 'No Project Option' is implemented it would mean that the residents of Amsterdam and KwaThandeka would not be provided with a sustainable source of potable water and potable supply interruptions could continue.

In addition, it would mean that the following objectives in terms of the project would not be met:

- Eradicate Backlogs (access to basic infrastructure);
- Serve housing and settlement infrastructure;
- Support and stimulate economic growth and development;
    - Improve water service quality (e.g. drinking water quality (WTW); address Operation & Maintenance (O&M) challenges, etc.)
- Improve reliability of supply;
- Optimize cost/appropriate technology;
- Support integrated resource planning and management;
- Promote cooperation between authorities with regards to sharing of resources, responsibilities and risks; and
- Increase sustainability (Afri Infra, 2016).

If the 'No Project Option' in terms of the proposed dam site locations as well as the associated infrastructure was exercised, it would mean that other dam sites and the provision of associated infrastructure would have to be investigated, the potential impacts on the environment determined, the interested and affected parties consulted.

This would ultimately impact on the residents of Amsterdam and KwaThandeka in terms of the provision of potable water.

5.10 Conclusion

Based on the above-mentioned, it was decided to proceed with the following alternatives namely:

- 20 year silt/sediment dam at one of the following locations:
    - Dam Site A - located downstream of the confluence of the Thole and Gabosha Rivers in Thole River;
    - Dam Site B - located in the Gabosha River about 1.3 km north of the R65 road and upstream of the Dorps Dam.
- Pipeline alternatives:
    - Pipeline from the existing Amsterdam Water Treatment Works (WTWs) to the proposed Dam Site A i.e. a pump line or gravity line;
    - Pipeline from the proposed Dam Site B to the existing Amsterdam WTWs i.e. bulk water supply pipeline.
    - No pipeline from the proposed Dam Site B to the existing Amsterdam WTWs: water to be released directly into the Gabosha River downstream of the Dam Site B and abstracted at the existing Dorps Dam abstraction point.

The above-mentioned alternatives will thus be investigated as part of the EIA phase of this project.

6. DISCUSSION AND CONCLUSION

6.1 Introduction

As indicated in Section 5, various options/alternatives were considered with regards to supplying the Amsterdam area with a sustainable water supply.

A new Water Treatment Works (WTWs) was not investigated since the existing Amsterdam WTWs has sufficient capacity in terms of the 2034 demand requirements (Afri-Infra, 2016). The upgrading of the facilities as indicated in Section 5.2.1 is however required. The upgrading activities are classified as maintenance activities i.e.

> ***'maintenance'*** *means actions performed to keep a structure or system functioning or in service or on the same location, capacity or footprint (EIA Regulations, 2014).*

No listed activities in terms of Listing Notice 1 (R983 of 2014), Listing Notice 2 (R984 of 2014) or Listing Notice 3 (R985 of 2014) are applicable. No Basic Assessment and/or Environmental Impact Assessment is required. In view of the above-mentioned, an Environmental Authorisation would not be required with regards to the upgrading of the existing Amsterdam WTWs.

The idea of integrating with existing water supply schemes was also discarded as indicated in Section 5.8.4.

As indicated in Section 5.10, the following alternatives are to be investigated in further detail:

- 20 year silt/sediment dam at one of the following locations:
  - Dam Site A - located downstream of the confluence of the Thole and Gabosha Rivers in Thole River;
  - Dam Site B - located in the Gabosha River about 1.3 km north of the R65 road and upstream of the Dorps Dam.
- Pipeline alternatives:
  - Pipeline from the existing Amsterdam Water Treatment Works (WTWs) to the proposed Dam Site A i.e. a pump line or gravity line;
  - Pipeline from the proposed Dam Site B to the existing Amsterdam WTWs i.e. bulk water supply pipeline.
  - No pipeline from the proposed Dam Site B to the existing Amsterdam WTWs: water to be released directly into the Gabosha River downstream of the Dam Site B and abstracted at the existing Dorps Dam abstraction point.

This section provides an indication of potential environmental impacts that could take place as a result of the above-mentioned alternatives.

6.2 Dam Site A and Dam Site B

Based on the desktop information provided in this scoping report, the following desktop comparison between Dam Site A and Dam Site B was made highlighting potential impacts:

DAM SITE A (Thole River)		DAM SITE B (Gabosha River)	
GEOLOGY/GEOTECHNICAL ASPECTS			
The construction of Dam A would impact on ultrabasic rocks, pyroxenite and norite of the Suite Thole. These rocks are of Randian Age and thus very old. The site is not affected by dolomites or mining (i.e. opencast or underground). A strong spring is present on the eastern flank of the Thole River almost on the proposed dam wall axis – this could affect the stability of the embankment dam.	X	The construction of Dam B would impact on pyroclastic rocks and ash-flow tuff of the Gobasha Member, Amsterdam Formation. These rocks are of Randian Age and thus very old. Dykes might be present in areas. The said site is not affected by dolomites or mining (i.e. opencast or underground). According to the engineers, a large rock face and rocky outcrops are present where a dam wall can be constructed making it a more natural dam.	√
TOPOGRAPHY			
The construction of Dam A would impact on a valley located between low hills (i.e. terrain type Level Plains with some relief). In view of this flatter topography, a much larger dam (full supply capacity of 550 000m^3) will be required which will result in a greater area being inundated. This could result in the flooding of the surrounding areas namely the residential area of KwaThandeka, agricultural activities (cultivated lands), excavations, roads, etc.	X	The construction of Dam B would impact on a valley surrounded by very rugged topography (i.e. terrain type Open High Hills or Ridges). The terrain of the Gabosha River is better suited as the valley sides are much steeper than those found in the Thole River valley. A smaller dam (full supply capacity of 510 000m^3) would thus be required within this system which would result in the inundation of a smaller area (Mallory and Jacobs, 2015). Very little, if any, impact on topography has taken place within the proposed Dam Site B area due to the ruggedness of the topography.	√
SOILS/LAND CAPABILITY/AGRICULTURAL POTENTIAL			
The construction of Dam A would impact on red and yellow soils with low to medium base status, land type Ac and **Moderate potential arable land**. It would also impact on an area used for grazing (grazing potential of less than 4ha/animal unit) and cultivation purposes (fenced vegetable gardens) by local residents. Increased upstream activity results in greater sedimentation within the Thole River that will impact on the proposed dam. In addition, wetland soils associated with the Thole River would be impacted upon.	X	The construction of Dam B would impact on shallow soils (Glenrosa and/or Mispah soil forms) with minimal development potential and indicated as **Non-arable with low to moderate potential grazing land** (less than 4ha/animal unit). No cultivation would be impacted upon in view of the rocky nature of the area. Less sedimentation of the Gabosha River due to less upstream activities. Wetland soils would be associated with the Gabosha River and could be impacted in terms of the construction of the dam.	√

DAM SITE A (Thole River)		DAM SITE B (Gabosha River)	
LAND USE			
Dam Site A property ownership: Re/11/408IT - belongs to the Mkhondo Local Municipality.	√	Dam Site B property ownership: Re/11/408IT - belongs to the Mkhondo Local Municipality.	√
Proposed Dam Site A is located downstream of the residential area of Amsterdam and adjacent to the residential area of KwaThandeka. The construction of Dam A would impact on the following: • An existing sewer line (sewer line will have to be relocated, which may not be possible or would result in added costs and the installation of pump stations, etc.). • Existing houses resulting in residents having to be relocated and compensated (long process to be followed and added costs). • Existing informal settlements and smallholdings; • Existing approved residential areas (areas not developed to date). • Agricultural activities – cultivated lands, communal grazing lands, vegetable gardens, etc. • Access roads and footpaths used by the community to cross the Thole River.	X	Proposed Dam Site B is located upstream of the Dorps Dam and the residential area of Amsterdam. The construction of Dam B would not impact on any infrastructure or servitudes. The construction of Dam B would not impact on the following: • Existing sewer lines; • Existing houses; • Approved residential areas; • Agricultural activities: cultivated lands and communal grazing land (if any, limited impact). • Afforestation; • Mining areas; • Footpaths may be present but are not used on a daily basis. There is a road located along the river of which the use is not known.	√
NATURAL VEGETATION			
The construction of Dam A would impact on KaNgwane Montane Grassland (GM16), classified as Vulnerable in terms of the National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004). In addition, the construction of Dam A would impact on the Thole River, associated wetlands and aquatic environment.	X	The construction of Dam B would impact on KaNgwane Montane Grassland (GM16), classified as Vulnerable in terms of the National List of Ecosystems that are Threatened and in need of protection (GN1002 of 2011), published under the National Environmental Management: Biodiversity Act (Act No. 10, 2004). In addition, the construction of Dam B would impact on the Gabosha River, associated wetlands and aquatic environment.	X
Dam Site A occurs within a: • Critical Biodiversity Area (CBA) (C-Plan, 2006); • Critical Biodiversity Area (CBA) Optimal (Mpumalanga Biodiversity Sector Plan, 2013); • Critical Biodiversity Area (CBA) - Aquatic Rivers	X	The proposed Dam B site occurs within a: • Critical Biodiversity Area (CBA) (C- Plan, 2006); • Critical Biodiversity Area (CBA) Irreplaceable and CBA Optimal (Mpumalanga Biodiversity Sector Plan, 2013);	X

DAM SITE A (Thole River)		DAM SITE B (Gabosha River)	
(Mpumalanga Biodiversity Sector Plan, 2013).		• Critical Biodiversity Area (CBA) - Aquatic Rivers (Mpumalanga Biodiversity Sector Plan, 2013).	
In addition, the grassland areas could provide possible habitat for 7 Red data plant species.	X	In addition, the grassland areas could provide possible habitat for 7 Red data plant species.	X
The construction of Dam A could impact on the following vegetation units: Grassland; Wetland; Rocky outcrop; Old lands; Transformed. These vegetation units would however be impacted to varying degrees due to the close proximity of the residential area of Amsterdam and KwaThandeka and the use of the area for agricultural purposes (e.g. grazing, cultivation, etc.) and would not be seen as pristine.		The construction of Dam B could impact on the following vegetation units: Grassland; Wetland and/or riparian; Woodland; Rocky outcrop. It is possible that the said vegetation units may be close to pristine in view of the lack of activities taking place within this area and being located away from the residential area of Amsterdam and KwaThandeka.	
In view of the disturbance, the Ecological Sensitivity would range from low (old lands; transformed) to moderate to high in places (i.e. depending on level of disturbance).	√	From an ecological point of view, the Dam Site A is seen as having a High Ecological Sensitivity.	X
ANIMAL LIFE			
Red data fauna species: Possible habitat provided by the grassland areas and the Thole River for 8 near threatened and threatened mammal species.	X	Red data fauna species: Possible habitat provided by the grassland areas (including surrounding hilly grassland), the Gabosha River and wooded kloofs for 8 near threatened and threatened mammal species.	X
Bird species: 21 threatened and near threatened bird species, 5 of which could be directly impacted.	X	Bird species: 21 threatened and near threatened bird species, 5 of which could be directly impacted.	X
Does not occur in an Important Bird and Biodiversity Area but it does provide for a number of biome-restricted species with high affinities to the Afrotropical highlands. Occurrence of Biome-restricted bird species: High	X	Does not occur in an Important Bird and Biodiversity Area but it does provide for a number of biome-restricted species with high affinities to the Afrotropical highlands. Occurrence of Biome-restricted bird species: High	X
Fish species: 11 fish species known to occur in the Thole River of which 1 is rare, 1 near threatened, 1 endemic becoming rare.	X	Fish species: Currently no information is available regarding fish species present in the Gabosha River.	X
The construction of Dam A could impact on the following vegetation units – grassland, wetland, rocky outcrop, old lands, transformed – that could provide natural animal habitats (terrestrial and aquatic) for the above-mentioned animal species. However, these vegetation units could be impacted to varying degrees due to the close proximity of	√	The construction of Dam B could impact on the following vegetation units – grassland, wetland and/or riparian, woodland and rocky outcrop – that could provide natural animal habitats (terrestrial and aquatic) for the above-mentioned animal species. It is possible that the said vegetation units may be close to pristine in view of the	X

DAM SITE A (Thole River)		DAM SITE B (Gabosha River)	
the residential area of Amsterdam and KwaThandeka and the use of the area for agricultural purposes (e.g. grazing, cultivation, etc.). In addition, the animal life could be impacted in terms of poaching, etc. In view of the disturbance, the Ecological Sensitivity would range from low (old lands; transformed) to moderate to high in places (i.e. depending on level of disturbance).		lack of activities taking place within this area and being located away from the residential area of Amsterdam and KwaThandeka. The necessary natural habitats for a number of animal species could thus be provided. From an ecological point of view, the Dam Site A is seen as having a High Ecological Sensitivity.	
SURFACE WATER/SENSITIVE LANDSCAPES			
The construction of Dam A would impact directly on the Thole River, associated wetland and aquatic environment.	X	The construction of Dam B would impact directly on the Gabosha River, associated wetland and aquatic environment.	X
The Thole River is indicated as Critical Biodiversity Areas: Rivers and the surrounding areas Ecological Support Areas (ESAs): Important subcatchments in the freshwater assessment of Mpumalanga Biodiversity Sector Plan (2013). It is thus seen as important from an aquatic point of view.	X	The Gabosha River is indicated as Critical Biodiversity Areas: Rivers and the surrounding areas Ecological Support Areas (ESAs): Important subcatchments in the freshwater assessment of Mpumalanga Biodiversity Sector Plan (2013). It is thus seen as important from an aquatic point of view.	X
For sub-quaternary reach W53C – 1679 of the Thole River in which the proposed Dam A Site would be located, the following is applicable: • Present Ecological Status (PES) is estimated as moderately modified (Category C), • Ecological Importance is High; • Ecological Sensitivity is Very High (Kotze, 2016).	X	The Gabosha River is a tributary draining into sub-quaternary reach W53C-1679 and is anticipated to have a much higher PES (Category A or B) than the Thole River in view of less impacts.	X
The construction of the dam will impact on the Thole River and its downstream environment where irrigation is the major water use (Mallory and Jacobs, 2015). Irrigation farmers could object to the proposed dam construction.	X	The construction of the dam will impact on the Gabosha River and its downstream environment which is already impacted in terms of the Dorps Dam, residential area of Amsterdam, etc. No irrigation from the Gabosha River takes place.	√
The Thole River has a larger catchment with more upstream water use and stream flow reduction activities making it more prone to sedimentation (Mallory and Jacobs, 2015) which would impact on the proposed dam.	X	Gabosha River has a smaller catchment and less upstream water use and stream flow reduction activities making it less prone to sedimentation (Mallory and Jacobs, 2015) and result in less impact on a proposed dam.	√

DAM SITE A (Thole River)		DAM SITE B (Gabosha River)	
In the long term, Dam A could be impacted in terms of the following emanating from the surrounding area: • Contaminated runoff from the residential areas of Amsterdam and KwaThandeka (e.g. sewage, waste, etc.); • The unrehabilitated Amsterdam Waste Disposal Site located on the western side of the proposed Dam Site A. This would impact on the water quality of the dam and the operational costs in terms of the WTWs. The potential risk in terms of pollution of Dam A is thus High.	X	Dam Site B is located away from residential areas and no cultivation, afforestation, mining, etc. takes place. The risk in terms of potential pollution is therefore minimal.	√
GROUNDWATER:			
The construction of Dam A would impact on groundwater associated with the Thole River and associated wetlands. It would also impact on a fountain/spring present on the eastern side of the proposed dam wall site. Potential sources of groundwater pollution within the surrounding area which in the long term could impact on Dam A include: • Contaminated runoff from the residential areas of Amsterdam and KwaThandeka (e.g. sewage, waste, etc.); • The unrehabilitated Amsterdam Waste Disposal Site located on the western side of the proposed Dam Site A. The potential risk in terms of pollution of Dam A is thus High.	X	The construction of Dam B would impact on groundwater associated with the Gabosha River and associated wetlands. Since the immediate area surrounding the proposed Dam Site B is located away from residential areas and no cultivation, afforestation, mining, etc. takes place the risk in terms of potential groundwater pollution that would in the long term impact on Dam A is minimal.	√
SITES OF ARCHAEOLOGICAL AND/OR CULTURAL INTEREST			
It is possible that the construction of Dam A could impact on Iron Age remains and Stone Age tools.	X	It is possible that the construction of Dam B could impact on Iron Age remains and Stone Age tools.	X
No graves are known to be present. Graves could be impacted in view of close proximity of the proposed site to residential areas.	X	The presence of graves and historic farmstead/ruins to be determined.	X
A spring on the eastern flank of Thole River could be of	X	The presence of sites of cultural significance to be	X

DAM SITE A (Thole River)		DAM SITE B (Gabosha River)	
cultural significance to the community and the destruction thereof could result in objections from the community.		determined.	
PALAEONTOLOGICAL SENSITIVITY			
The southern portion of the proposed Dam Site A is indicated as having a moderate palaeontological sensitivity.	X	Dam Site B is indicated as having a low palaeontological sensitivity.	√
SOCIO-ECONOMIC ISSUES			
Located adjacent to KwaThandeka residential area - safety risk in terms of people and animals drowning due to the presence of the water body.	X	No residential areas located near site and therefore a very low risk of people and animals drowning due to the presence of the water body.	√
Located adjacent to KwaThandeka residential area - risk in terms of theft and vandalism of infrastructure (e.g. pump station, etc.)	X	Located away from residential areas and therefore a reduced risk of theft and vandalism of infrastructure.	√
The dam and the water resource could be affected by activities associated with the existing developed areas namely, storm water runoff, sewage overflows, dumping of waste, etc. This could result in a negative impact on the water quality and result in greater costs in terms of treating the said water. In addition, the quality of the water could also be affected in terms of seepage/runoff from the existing landfill site located within the catchment of the proposed dam. This could have a long term impact on the water quality and thus the water supply dam.	X	No residential development is located in close proximity thereof or upstream of the proposed site and therefore the dam and the resultant water resource will not be negatively impacted in terms of storm water runoff, sewage overflows/runoff, dumping of waste, etc. The water quality of this dam will thus be of a much better quality. No landfill site is known to be located within the upstream area of the proposed dam site which could impact on the water quality of the proposed dam. In the long term, the water quality should not be impacted resulting in reduced operational costs in terms of the Amsterdam Water Treatment Works.	√
Agricultural activities located 4.5 km downstream, which could be impacted in terms of reduced water flow during filling of dam and future abstraction (especially irrigation farmers).	X	No agricultural activities located directly downstream of site (closest = 12km downstream; fed by additional water from other tributaries).	√

Legend: X = Negative; √ = Positive.

From this desktop assessment, it is apparent that Dam Site B would have a much higher Ecological Sensitivity than Dam Site A in view of less impacts and the location away from the residential areas of Amsterdam and KwaThandeka. From an ecological point of view, Dam Site B is thus not preferable as indicated by Niemand and Venter (2017).

However, it is apparent that the proposed Dam Site A (located in the Thole River) would have a greater socio-economic impact on the local community than the proposed Dam Site B (located in the Gabosha River). The construction of the dam within the Thole River could also impact on the downstream users (e.g. irrigation farmers; etc.). In addition, in the long term the water quality could be impacted in view of its close proximity to residential areas, an existing landfill site, etc. This could ultimately impact on water treatment costs and the provision of potable water to the residents of Amsterdam. It is therefore felt that Dam Site A is not suitable for a long term water supply dam in view of the potential pollution risk.

Proposed Dam Site B would provide the more natural dam site in view of the topography of the site resulting in a reduced area being inundated by the proposed dam and thus a reduced impact on the natural environment. In view of the lack of activities taking place in the upstream area, the said site would be less prone to sedimentation and potential impacts on water quality in the long term. The downstream area has however already been impacted in terms of the existing Dorps Dam, existing abstraction from the Dorps Dam and the residential area of Amsterdam and is thus not pristine. In addition, a much shorter raw water pipeline (approximately 2175m in length) to the existing Amsterdam Water Treatment Works would be required thus reducing overall costs. An alternative is to release water directly into the Gabosha River downstream of Dam Site B and to abstract water at the existing Dorps Dam abstraction point.

In view of the above-mentioned and from a water resource management perspective, the proposed Dam Site B would at this stage be more preferable and should be further investigated. A detailed Environmental Impact Assessment (with specialist studies) is required in order to determine the overall impact of the dam in view of the ecological sensitivity of the site (as indicated in the above-mentioned table) and to ensure that the Ecological Water Requirements (EWR) and cross border flows (i.e. to Swaziland) of the overall system are maintained (a requirement in terms of the National Water Act, 1998).

6.3 Pipelines

6.3.1 Pipeline from the existing Amsterdam WTWs to the proposed Dam A Site

Afri-Infra (2016) indicated that a new raw water pipeline (pump line) will be installed from the Amsterdam Water Treatment Works to KwaThandeka. At a later stage the said water pipeline will be extended to the proposed new raw water pump station to be located in close proximity of the new dam (Dam Site A) to be constructed. This pipeline will consist of a 315mm diameter uPVC Class 12 pipe and will extend over a distance of 4100m. The majority of the pipeline would be installed within a road reserve and within an urban area.

If Dam Site A is not developed and Dam Site B is developed, then the pipeline would become a distribution pipeline providing potable water from the existing Amsterdam WTWs to the residential areas of Amsterdam and KwaThandeka. The only difference would be that the said pipeline would become a gravity pipeline.

In view of the above-mentioned, the installation of a 315mm diameter bulk water pipeline would not trigger any listed activities in terms of Listing Notice 1 (R983 of 2014), Listing Notice 2 (R984 of 2014) or Listing Notice 3 (R985 of 2014). No Basic Assessment and/or Environmental Impact Assessment is thus required for the majority of the pipeline.

The installation of the said new bulk water pipeline will however, impact on a watercourse namely the Gabosha River (Figure 5.4). A trench will be excavated, the pipeline installed and then backfilled. This would result in impacts on the water course (surface water environment), its associated aquatic environment and wetlands. This would trigger listed activity 12 and 19 of Listing Notice 1 requiring a Basic Assessment to be conducted. The potential impact on the said watercourse, associated wetland and aquatic environment will be assessed during the EIA phase of this project.

Watercourses are also present between Point G and H (Figure 5.4) and between Point I and Point J (Figure 5.4). However, the engineers have indicated that a trench will not be excavated through the said watercourses into which the pipeline will be installed. According to the engineers, the new bulk water pipeline will be attached to the existing bridge structures and will thus not impact on the said watercourses. In view of the above-mentioned, it is felt that the installation of a 315mm diameter bulk water pipeline attached to existing bridge structure would not trigger any listed activities in terms of Listing Notice 1 (R983 of 2014), Listing Notice 2 (R984 of 2014) or Listing Notice 3 (R985 of 2014). No Basic Assessment and/or Environmental Impact Assessment is thus required.

A Water Use Licence in terms of the National Water Act, 1998 would be required with regards to where the new bulk water pipeline will impact on a water course and/or will be located within 500m of a wetland.

6.3.2 Pipeline from the proposed Dam B Site to the existing Amsterdam WTWs

As indicated the proposed pipeline from the proposed Dam Site B to the existing Amsterdam WTWs would extend through an area of High Ecological Sensitivity and is thus not a preferred option. However, this alternative will be assessed in further detail as part of the EIA phase.

The alternative of releasing water directly into the Gabosha River downstream of the Dam Site B and abstracting at the existing Dorps Dam abstraction point would impact on the aquatic environment associated with the Gabosha River in terms of increased flows, etc. The Gabosha River is indicated as Critical Biodiversity Areas: Rivers and the surrounding areas Ecological Support Areas (ESAs): Important subcatchments in the freshwater assessment of Mpumalanga Biodiversity Sector Plan (2013). The Gabosha River is a tributary draining into sub-quaternary reach W53C-1679 and is anticipated to have a much higher PES (Category A or B) than the Thole River in view of less impacts. It is thus seen as important from an aquatic point of view. This alternative will be assessed in further detail during the EIA phase.

6.4 Issues recorded through public participation

As indicated in Table 4.2 and Figure 4.2, large portions of the surrounding properties belong to the provincial and national government. However, many private landowners also own property in the area. These private landowners were identified and will be consulted as part of the EIA phase as indicated in Table 4.2.

Additional stakeholders/government departments (e.g. Department of Water and Sanitation: Dam Safety) will also be identified and consulted as part of the EIA phase as indicated in the preceding sections.

In summary, the following issues of concern were recorded through this scoping phase:

- Requirements in terms of the Interim IncoMaputo Agreement (i.e. agreement between South Africa, Swaziland and Mozambique regarding water resource management);
- Potential impact on local resident residing in Vincent Street, Amsterdam;
- Potential impact on downstream water users in terms of water availability for irrigation;
- Water use licence application required;
- Water resource situation analysis and availability (water demand and balance) study required;
- Ecological assessment of all wetlands to be conducted;
- Dam design studies required;
- Dam registration with the Department of Water and Sanitation: Dam Safety Office required.

The above-mentioned issues of concern will be investigated and addressed during the EIA phase of the project.

6.5 Conclusion

Through the scoping phase, it is evident that various issues require further investigation before the proposed development can be approved. The project is thus to proceed to the Environmental Impact Assessment phase.

Section 7 of the scoping report provides an indication of the tasks to be completed and the specialist studies to be commissioned during the Environmental Impact Assessment (EIA) phase in order to address the above-mentioned.

7. PLAN OF STUDY FOR EIA

The aim of the environmental impact assessment phase will be as follows:

- To supplement information contained in the Scoping Report regarding the natural and social environments of the site to be affected by the proposed development;
- To assess the potential impacts of the proposed development on the environment;
- To identify and recommend mitigation measures to minimize the potential impact of the development on the environment;
- To compile an Environmental Management Plan (EMP), which will include the recommended mitigation measures;
- To provide the Department of Agriculture, Rural Development, Land and Environmental Affairs with sufficient information to make an informed decision regarding the proposed development.

7.1 Evaluation of the Scoping Report

The draft Scoping Report (dated: March 2017) will be submitted to the Department of Agriculture, Rural Development, Land and Environmental Affairs for evaluation purposes. A hard copy of the document will also be forwarded to the following authorities for evaluation (30-day period):

- Inkomati Usuthu Catchment Management Agency;
- Department of Water and Sanitation;
- Mpumalanga Tourism and Parks Agency;
- Mkhondo Local Municipality.

An electronic copy of the draft Scoping Report will be made available during the above-mentioned period to the interested and affected parties and stakeholders consulted and/or registered as part of the scoping process (see Section 4 of this report).

The various departments, stakeholders and interested and affected parties will be requested to forward any comments on the report to the consultant within the 30 day period provided. A register will be kept of all comments received in terms of the evaluation of the report. These comments will then be included and addressed in a final Scoping Report.

A hard copy of the draft Scoping Report will be left at the Amsterdam Public Library. An electronic version will be made available on the company website (www.adienvironmental.co.za) and on cd (on request).

An advertisement in this regard will also be placed in the local newspapers – Hoëvelder and Excelsior - in order to inform I&APs of availability of the draft Scoping Report for evaluation purposes.

The final Scoping Report (including the comments received) will be submitted to the Department of Agriculture, Rural Development, Land and Environmental Affairs for decision making.

The Environmental Impact Report will be compiled once the final Scoping Report has been approved by the Department of Agriculture, Rural Development, Land and Environmental Affairs.

7.2 Additional public participation during EIA phase

As indicated in Table 4.2 and Figure 4.2, large portions of the surrounding properties belong to the provincial and national government. However, many private landowners also own property in the area. These private landowners were identified and will be consulted as part of the EIA phase as indicated in Table 4.2.

Additional stakeholders/government departments (e.g. Department of Water and Sanitation: Dam Safety) will also be identified and consulted as part of the EIA phase as indicated in the preceding sections.

In summary, the following issues of concern were recorded through the scoping phase and will be investigated and addressed during the EIA phase:

- Requirements in terms of the Interim IncoMaputo Agreement (i.e. agreement between South Africa, Swaziland and Mozambique regarding water resource management);
- Potential impact on local resident residing in Vincent Street, Amsterdam;
- Potential impact on downstream water users in terms of water availability for irrigation;
- Water use licence application required;
- Water resources situation analysis and availability (water demand and balance) study required;
- Ecological assessment of all wetlands to be conducted;
- Dam design studies required;
- Dam registration with the Department of Water and Sanitation: Dam Safety Office required.

7.3 Specialist studies (aspects to be addressed by specialists)

Through the scoping phase, it is evident that various issues require further investigation before the proposed development can be approved.

The following specialist studies will thus be commissioned:

- Heritage Impact Assessment;
- Palaeontological Impact Assessment;
- Vegetation and plant species assessment;
- Faunal (animal life) assessment;
- Wetland assessment;
- Aquatic assessment;
- Water resource situation and availability analysis.

7.3.1 Heritage Impact Assessment

A Heritage Impact Assessment (as required in terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999)) will be conducted in order to determine whether any sites of archaeological and/or cultural interest are located at or near the proposed dam site and/or pipeline route. Dr. Anton van Vollenhoven, an accredited archaeologist, will conduct the assessment.

The scope of work will entail the following:

- Identify objects, sites, occurrences and structures of an archaeological or historical nature (cultural heritage sites) located on the property.
- Study background information on the area to be developed.
- Assess the significance of the cultural resources in terms of their archaeological, historical, scientific, social, religious, aesthetic and tourism value.
- Describe the possible impact of the proposed development on these cultural remains, according to a standard set of conventions.
- Recommend suitable mitigation measures to minimize possible negative impacts on the cultural resources by the proposed development.
- Review applicable legislative requirements.

Comments obtained through the EIA public participation process will be addressed as part of this study.

7.3.2 Palaeontological Impact Assessment

A Palaeontological Impact Assessment (as required in terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999)) will be conducted. Dr. Heidi Fourie, an accredited palaeontologist, will conduct the assessment.

The scope of work will entail the following:

- Document palaeontological resources in the area to be developed by utilizing geological maps, scientific literature, institutional fossil collections, satellite images, aerial maps and topographical maps;
- Provide an assessment of observed or inferred palaeontological heritage within the proposed development site;
- Make recommendations (if any) for protection, mitigation or monitoring of palaeontological resources identified.

Comments obtained through the EIA public participation process will be addressed as part of this study.

7.3.3 Vegetation and plant species assessment

A vegetation and plant species assessment in order to determine the status of the vegetation of the proposed dam site and along the proposed pipeline route will be undertaken by Ina Venter of Kyllinga Consulting.

The scope of work will include the following:

- Identification of plant communities/habitat types;
- Compilation of species lists of the plant communities identified;
- Determining if the vegetation is primary or secondary and identifying disturbances;
- Compilation of a list of medicinal and invasive plant species;
- Searching for Red Data plant species and species of conservation importance;
- Determining the sensitivity and conservation importance of the vegetation;
- Impact assessment and proposed mitigation measures.

Comments obtained through the EIA public participation process will also be incorporated as part of this study.

7.3.4 Fauna (animal life) assessment

A fauna (animal life) assessment in order to determine the status of the fauna (animal life) at the proposed dam site and along the proposed pipeline route will be undertaken by Ina Venter and her team of Kyllinga Consulting.

The scope of work will include the following:

- An avifaunal (bird) study based on random transect walks and point counts (to estimate dominance and associations);
- A mammal study based on random transect walks and visual indicators such as spoor, burrows, tracks and scats (excluding trapping due to the possibility of theft and vandalism);
- An overview of the herpetofauna based on active searching and vocalisations (for amphibians);
- A dragonfly assessment (at suitable habitat) based on point counts and the estimation of an DBI (dragonfly biotic index) for the area (excluding detailed sampling methods);
- Verification of the occurrence or potential occurrence of threatened, near-threatened, endemic or rare bird, mammal, herpetofauna or invertebrate species;
- A sensitivity and habitat map (including buffer zones if applicable)
- Recommendations and mitigation measures where applicable.

Comments obtained through the EIA public participation process will also be incorporated as part of this study.

7.3.5 Wetland assessment

A wetland assessment to determine the status and importance of wetlands within the proposed dam site and along the proposed pipeline route will be conducted by Ina Venter of Kyllinga Consulting.

The scope of work will include the following:

- Field delineation of the wetlands within the dam site and along the pipeline routes according to the Department of Water Affairs (DWA) delineation guidelines;
- Desktop delineation of the wetlands within 500m thereof on aerial photographs;
- Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) assessments;
- Diatom assessment;
- Buffer zone recommendations;
- Impact assessment and proposed mitigation measures.

Comments obtained through the EIA public participation process will also be incorporated as part of this study.

7.3.6 Aquatic assessment

A specialist aquatic assessment will be undertaken with regards to the potential impact of the proposed dam site and pipeline routes on the aquatic environment. This specialist aquatic assessment will be conducted by Dr. Pieter Kotze and his team from Clean Stream Biological Services (Pty) Ltd.
The scope of work will include the following:

- Baseline assessment of the present status of the aquatic fauna (fish and macroinvertebrates) and their relevant habitats of the lotic ecosystems (streams/rivers).
- An impact assessment to identify the potential impact of the proposed project on the aquatic fauna and its relevant habitats.
- Recommendations regarding possible mitigation strategies that may reduce or prevent the identified risks.

Comments obtained through the EIA public participation process will also be incorporated as part of this study.

7.3.7 Geotechnical study

A geotechnical study will be conducted with regards to the suitability of the sites for dam construction. This study will be undertaken by Engeolab cc.

The scope of work will include the following:

- Determine the site soils and depth to bedrock where possible;
- Evaluate the engineering properties of the site soils;
- Assess the groundwater conditions;
- Evaluate the workability of the site soils with regards to their excavatability and compactability;
- Determine the overburden soil properties such as permeability, dispersiveness, grading and plasticity;
- Determine the characteristics and distribution of site soils;
- The suitability of on-site materials for use as dam construction materials;
- Determine the availability of the required materials.

Comments obtained through the EIA public participation process will also be incorporated as part of this study.

7.3.8 Water situation and availability analysis

The final terms of reference with regards to this study will be determined in consultation with the Inkomati Usuthu Catchment Management Agency (IUCMA). Once this had been determined, a suitable service provider will be appointed.

In essence, this study would involve the following:

- Review of the hydrology and water resource assessment studies previously undertaken with regards to the project;
- Determine the yield at the proposed dam sites and whether the future water requirement of Amsterdam can be met taking into account the Ecological Water Requirements (EWR) and the minimum cross border flows;
- Determine the potential impact on downstream water users especially irrigation farmers;
- Determine whether or not the requirements in terms of the Interim IncoMaputo Agreement (i.e. agreement between South Africa, Swaziland and Mozambique regarding water resource management) can be met;
- An overall assessment of the water availability and whether or not the project can proceed.

Comments obtained through the EIA public participation process will also be incorporated as part of this study.

7.4 Method of assessing issues and alternatives

7.4.1 Issues

Issues of concern will be identified by way of objections/concerns received, approvals granted (subject to certain conditions) and by consultation with various authorities and interested and affected parties as detailed in the preceding sections.

The identified 'environmental issues' will be defined as either:

- Definable issues e.g. air pollution
- The cause of an impact e.g. impacts as a result of construction; operational or decommissioning phases.
- A generally expressed concern e.g. social disruption of communities.

The relevant and important issues will be focused on.

Issues concerning the following project phases will also be identified:

- Construction phase
- Operational phase
- Decommissioning phase

7.4.2 Impacts

Potential impacts that could take place during both the construction and the operational phases will be identified by overlaying the proposed layout plans on the environmental sensitivity map for the site.

Evaluation of impacts

The evaluation of impacts will be conducted in terms of the following criteria:

- **Nature of impact** e.g. impact on surface water; groundwater; natural vegetation; etc.

- **Extent of impact**

Site	Effect limited to the site and its immediate surroundings
Local	Effect limited to within 3-5 km of the site
Regional	Effect will have an impact on a regional scale

- **Duration of impact**

Short	Effect lasts for a period 0 to 5 years
Medium	Effect continues for a period between 5 and 10 years
Long	Effect will cease after the operational life of the activity either because of natural process or by human intervention
Permanent	Where 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

- **Intensity of impact**

Low	The impact affects the environment in such a way that natural, cultural and social functions and processes are not affected
Medium	Where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way
High	Where natural, cultural or social functions or processes are altered to the extent that it will temporarily or permanently cease

- **Probability**

Improbable	Less than 33% chance of occurrence
Probable	Between 33 and 66% chance of occurrence
Highly probable	Greater than 66% chance of occurrence
Definite	Will occur regardless of any prevention measures

- **Significance of impact**

Low	Where the impact will have a relatively small effect on the environment and will not have an influence on the decision
Medium	Where the impact can have an influence on the environment and the decision and should be mitigated
High	Where the impact definitely has an impact on the environment an the decision regardless of any possible mitigation

- **Status**

Positive	Impact will be beneficial to the environment
Negative	Impact will not be beneficial to the environment
Neutral	Positive and negative impact

- **Confidence**

Low	It is uncertain whether the impact will occur
Medium	It is likely that the impact will occur
High	It is relatively certain that the impact will occur

It must be noted that many of the potential negative consequences can be mitigated successfully. It will however, be necessary to make a thorough assessment of all possible impacts in order to ensure that environmental considerations are taken into account, in a balanced way, as far as possible, supporting the aim of creating a healthy and pleasant environment.

7.4.3 Alternatives

As indicated in Section 5, various alternatives in terms of the project will be investigated in order to determine which alternative will have the least impact on the natural, social and economic environment.

If necessary, additional alternatives will be identified by way of discussion with authorities, interested and affected parties and the client.

Alternatives will also be identified by overlaying the proposed plans on the environmental sensitivity map for the site (i.e. once the specialist studies have been conducted).

The 'No Project Option' will be included in the assessment. Not all alternatives will be investigated in the same degree of intensity – only the feasible ones. The EIA report will include a description of each alternative for the project as well as the advantages and disadvantages of each.

7.5 Evaluation of the Environmental Impact Report (EIR)

A copy of the Draft Environmental Impact Report will be made available for evaluation purposes. A period of 30 days will be provided for the evaluation of the said report. The Final Environmental Impact Report (including the

comments received) will then be submitted to the DARDLEA for final decision making.

7.6 Informing Interested and Affected Parties of the Record of Decision

On receipt of the Environmental Authorisation and Record of Decision (positive or negative decision), all identified interested and affected parties (see Section 4 of this report) will be informed by means of facsimile, e-mail or telephonically that the Environmental Authorisation and Record of Decision with regards to the project have been issued. Information w.r.t. the appeal procedure will also be provided.

An advertisement in this regard will also be placed in the local newspapers – Hoëvelder and Excelsior - in order to inform I&APs of the decision.

A copy of the Environmental Authorisation and Record of Decision will be made available on the company website (www.adienvironmental.co.za).

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- **Tripartitie Interim Agreement between the Republic of Mozambique and the Republic of South Africa and the Kingdom of Swaziland for co-operation on the protection and sustainable utilization of the water resources of the Incomati and Maputoe watercourses** (als referred to as the Interim IncoMaputo Agreement, 2002).

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APPENDIX 1:

APPLICATION FORM

APPENDIX 2:

CURRICULUM VITAE

- Mrs. A. Erasmus *Pr. Sci. Nat.*
- Ms. R. Janse van Rensburg
- List of projects

APPENDIX 3:

TRIPARTITE AGREEMENT

- **Tripartitie Interim Agreement between the Republic of Mozambique and the Republic of South Africa and the Kingdom of Swaziland for co-operation on the protection and sustainable utilization of the water resources of the Incomati and Maputoe watercourses** (als referred to as the Interim IncoMaputo Agreement, 2002).

APPENDIX 4:

ADVERTISING OF THE PROJECT

- A copy of the notice published in the Hoëvelder, 24 February 2017.
- A copy of the on-site notice.
- Printout of company website pages www.adienvironmental.co.za.

APPENDIX 5:

BACKGROUND INFORMATION DOCUMENT

APPENDIX 6:

CORRESPONDENCE WITH THE DIRECTLY AFFECTED LANDOWNERS/USERS

- E-mail from AdiEnvironmental cc (dated: 20 March 2017) to Mr. R. Smith.
- E-mail from AdiEnvironmental cc (dated: 27 February 2017) to the following:

F Mashabela	Department of Agriculture, Forestry and Fisheries
J Venter	Department of Agriculture, Rural Development and Land Administration
S Mbuyane	Department of Agriculture, Rural Development, Land and Environmental Affairs
S Marebane	Department of Agriculture, Rural Development, Land and Environmental Affairs
M Loock	Department of Co-operative Governance and Traditional Affairs
S Mathavhela	Department of Mineral Resources
B Viljoen	Department of Public Works, Roads and Transport
T Ludere	Eskom Distribution
L Motsisi	Eskom Transmission
N Ndlovu	Mkhondo Local Municipality
R Nkambule	Mkhondo Local Municipality
K Knarasoo	Mpumalanga Tourism and Parks Agency
H Marais	Mpumalanga Wetland Forum
H Kusel	Piet Retief Agricultural Union
J Smit	Telkom
D du Plessis	Transvaal Landbou Unie
S Sukazi	Ward 19 Community Development
L Betha	Wildlife and Environment Society of South Africa
K Marx	Wildlife and Environment Society of South Africa

- E-mail from AdiEnvironmental cc (dated: 27 February 2017) to Mr. H. Marais.
- E-mail from AdiEnvironmental cc (dated: 28 February 2017) to A Mazibuko (Mkhondo Local Municipality) and M Dondo (Gert Sibande District Municipality).
- E-mail from AdiEnvironmental cc (dated: 28 February 2017) to S Mbuyane (Department of Agriculture, Rural Development, Land and Environmental Affairs).
- E-mail from AdiEnvironmental cc (dated: 28 February 2017) to S Mathavhela (Department of Mineral Resources), B Viljoen (Department of Public Works, Roads and Transport), S Marebane (Department of Agriculture, Rural Development, Land and Environmental Affairs) and J Wesson (Wildlife and Environment Society of South Africa).
- E-mail from AdiEnvironmental cc (dated: 28 February 2017) to S Shabangu (Inkomati Usuthu Catchment Management Agency (IUCMA)).
- E-mail from AdiEnvironmental cc (dated: 28 February 2017) to N Nkambule (Department of Rural Development and Land Reform).
- Printout of South African Heritage Resources Agency (SAHRIS) website.
- Facsimile from AdiEnvironmental cc (dated: 27 February 2017) to Councilor Ngobeza**.**
- E-mail from AdiEnvironmental cc (dated: 14 March 2017) to Mr. D. Marnewick (Birdlife South Africa).
- E-mail from AdiEnvironmental cc (dated: 14 March 2017) to Mr. G. Masuku (National Department of Public Works).
- E-mail from AdiEnvironmental cc (dated: 14 March 2017) to Mr. A. Grobbelaar.
- E-mail from AdiEnvironmental cc (dated: 14 March 2017) to Mr. P. Venter.

APPENDIX 7:

COMMENTS RECEIVED

- E-mail from B. Viljoen (Department of Public Works, Roads and Transport) (dated: 1 March 2017) to AdiEnvironmental cc.
- E-mail from S. Shabangu (Inkomati Usuthu Catchment Management Agency) (dated: 1 March 2017) to AdiEnvironmental cc.
- E-mail from A. Mazibuko (Mkhondo Local Municipality) (dated: 2 March 2017) to AdiEnvironmental cc.
- E-mail from M. Dondo (Gert Sibande District Municipality) (dated: 2 March 2017) to AdiEnvironmental cc.
- Completed comment sheet (dated: 15 March 2017) from L. Botha.
- E-mail from AdiEnvironmental cc (dated: 16 March 2017) to L. Botha.

APPENDIX 8:

CORRESPONDENCE WITH DEPARTMENT OF AGRICULTURE, RURAL DEVELOPMENT, LAND AND ENVIRONMENTAL AFFAIRS (DARDLEA)

- Letter from AdiEnvironmental cc (dated: 14 December 2016) to Mr. S. Marebane (DARDLEA) regarding the water pipeline.
- Letter from AdiEnvironmental cc (dated: 14 December 2016) to Mr. S. Marebane (DARDLEA) regarding the upgrading of the Amsterdam WTWs.
- Letter from DARDLEA (dated: 14 March 2017; Ref: 1/3/1/16/3 G-85) to AdiEnvironmental cc.
- Letter from AdiEnvironmental cc (dated: 28 March 2017) to Mr. S. Marebane (DARDLEA).