

**Proposed 23 km Bulk Water Reticulation Pipeline:
Cannon Rocks to Alexandria, Ndlambe Local Municipality, Eastern Cape Province**

VEGETATION IMPACT ASSESSMENT

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1. INTRODUCTION

1.1. Project description

Amatola Water has been appointed by the Department of Water Affairs (DWA), on behalf of Ndlambe Municipality, to upgrade the existing bulk water reticulation from Cannon Rocks to Alexandria within the Ndlambe Municipality in the Eastern Cape Province of South Africa (Figure 1.1)

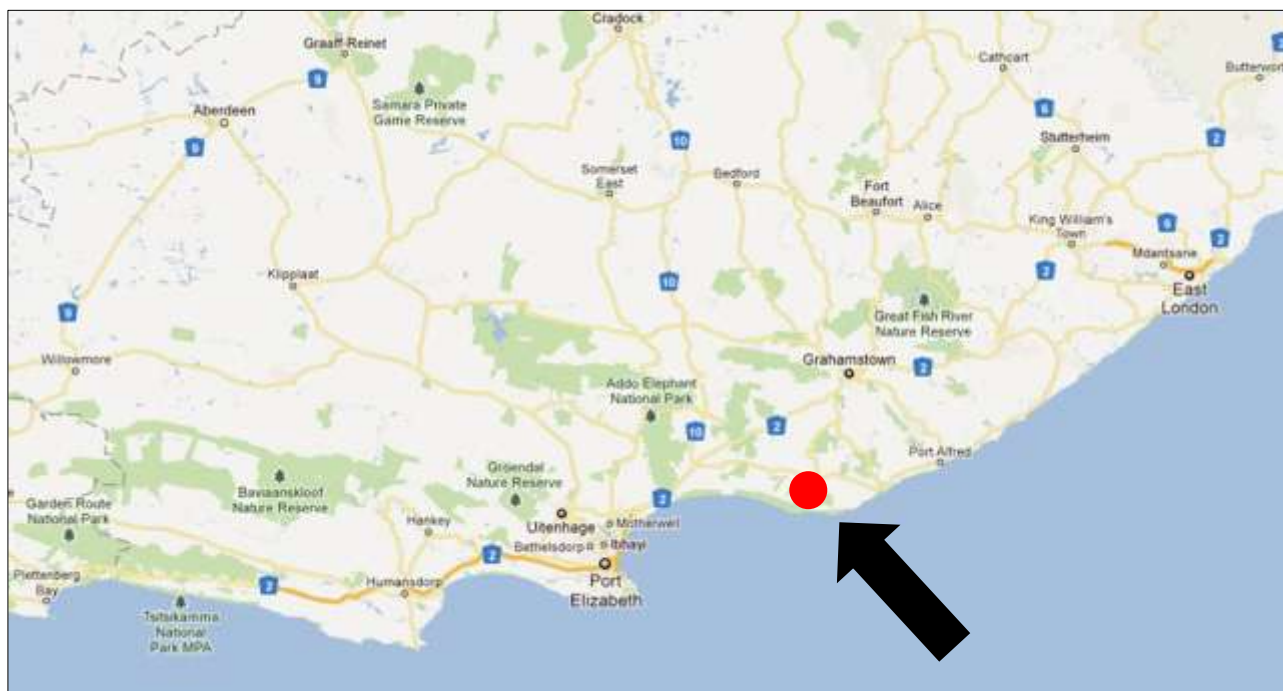


Figure 1.1. The location of the proposed Bulk Water Services upgrade within the Eastern Cape Province.

This project entails replacing the existing water supply pipeline with a new pipe with a total length of 23.2 km. The pipeline will supply the town of Alexandria with bulk water.

1.2. Development description

The development consists of (also see Figure 1.2 below):

- Replacing an existing pipeline between the Water Treatment Works (WTW) reservoirs in Alexandria and a beach wells water abstraction point at “The Springs” near Cape Padrone, and;
- Installing a new pipeline to join the existing pipeline (above) to the existing reverse osmosis (RO) water treatment works (WTW) at Cannon Rocks.

The existing pipeline runs through farm lands (Called Section A in this report), the Woody Cape section of the Addo Elephant National Park (called Section B in this report), and then through farm lands again before reaching the WTW reservoir in Alexandria (called Section C in this report). The new pipeline will traverse a public road bordered by farm lands and forms part of Section A in this report. An additional 1.14 km section from the existing beach well abstraction reservoir at “The Springs” forms Section D in this report.

It is anticipated that once the RO plant at Cannon Rocks has been upgraded, and the groundwater well-field increased (**NOT THE SUBJECT OF THIS ASSESSMENT**), the existing supply at “The Springs” will be decommissioned.

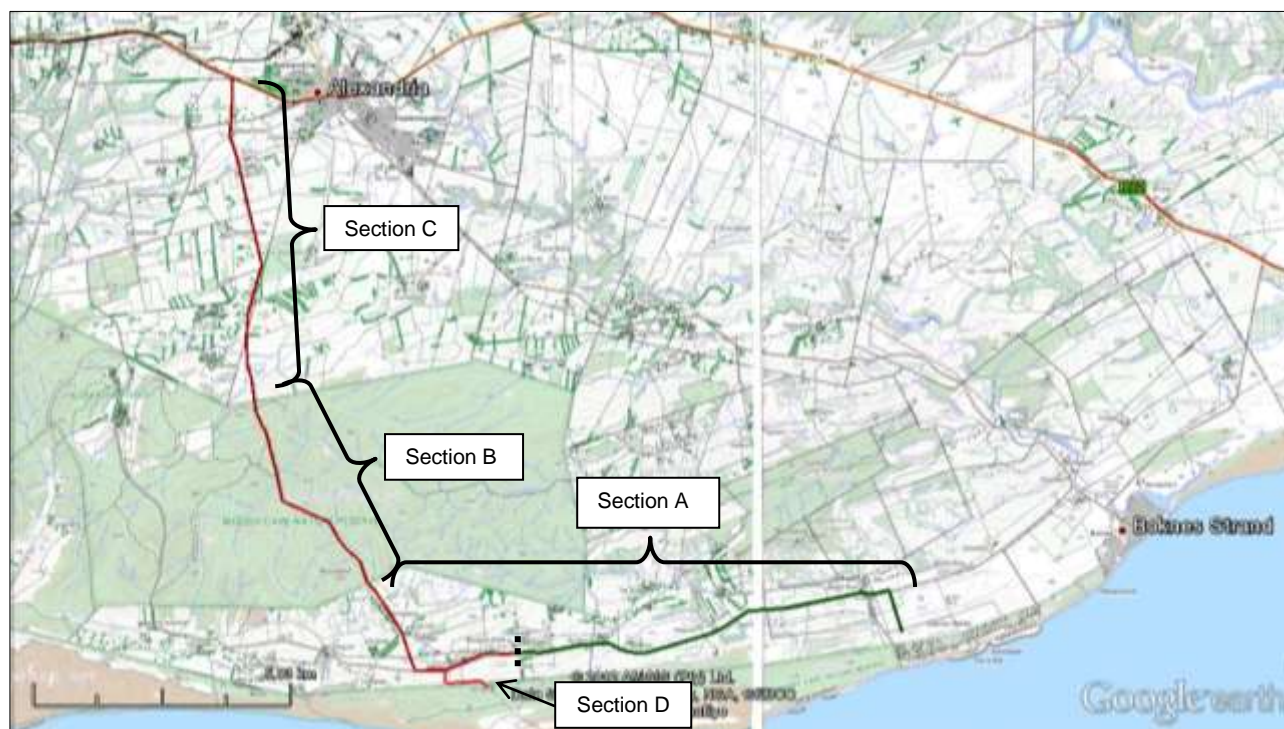


Figure 1.2. The location of the existing Bulk Water pipeline (shown in red) proposed to be upgraded between Cannon Rocks and Alexandria in the Eastern Cape Province. The green line represents a new pipeline section to be built.

1.3. Terms of reference

The following objectives were derived for the Cannon Rocks to Alexandria Bulk Water Reticulation Vegetation assessment:

1. Describe the vegetation along the proposed route.
2. Determine the presence of any species of special concern, rare or protected species.
3. Conduct a desktop assessment of the conservation status of the area along the preferred/alternative routes.
4. Determine and describe sensitive areas along the preferred/alternative routes.
5. Identify the impacts of the preferred/alternative pipeline routes.
6. Provide mitigation measures where necessary.

1.4. Legislation framework

1.4.1. National Environmental Management Act (107 of 1998)

The objective of NEMA is: *“To provide for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state; and to provide for matters connected therewith.”*

A key aspect of NEMA is that it provides a set of environmental management principles that apply throughout the Republic to the actions of all organs of state that may significantly affect the environment. The proposed development has been assessed in terms of possible conflicts or compliance with these principles. Section 2 of NEMA contains principles (see Box 1) relevant to the proposed project, and likely to be utilised in the process of decision making by DEA.

BOX 1: NEMA ENVIRONMENTAL MANAGEMENT PRINCIPLES

(2)	Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.
(3)	Development must be socially, environmentally and economically sustainable.
(4)(a)	Sustainable development requires the consideration of all relevant factors including the following: <ul style="list-style-type: none"> i. That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; ii. That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied; iii. That waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner.
(4)(e)	Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.
(4)(i)	The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.
(4)(j)	The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.
(4)(p)	The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.
(4)(r)	Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

As these principles are utilised as a guideline by the competent authority in ensuring the protection of the environment, the proposed development should, where possible, be in accordance with these principles. Where this is not possible, deviation from these principles would have to be very strongly motivated.

NEMA introduces the duty of care concept, which is based on the policy of strict liability. This duty of care extends to the prevention, control and rehabilitation of significant pollution and environmental degradation. It also dictates a duty of care to address emergency incidents of pollution. A failure to perform this duty of care may lead to criminal prosecution, and may lead to the prosecution of managers or directors of companies for the conduct of the legal persons.

Employees who refuse to perform environmentally hazardous work, or whistle blowers, are protected in terms of NEMA.

In addition NEMA introduces a new framework for environmental impact assessments, the EIA Regulations (2010) discussed previously.

Relevance to the proposed Cannon Rocks to Alexandria Bulk Water Reticulation:

- The developer must be mindful of the principles, broad liability and implications associated with NEMA and must eliminate or mitigate any potential impacts.
- The developer must be mindful of the principles, broad liability and implications of causing damage to the environment.

1.4.2. National Environmental Management Act: Biodiversity Act (10 of 2004)

This Act provides for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act 107 of 1998 (see Box 2). In terms of the Biodiversity Act, the developer has a responsibility for:

1. The conservation of endangered ecosystems and restriction of activities according to the categorisation of the area (not just by listed activity as specified in the EIA regulations).
2. Application of appropriate environmental management tools in order to ensure integrated environmental management of activities thereby ensuring that all developments within the area are in line with ecological sustainable development and protection of biodiversity.
3. Limit further loss of biodiversity and conserve endangered ecosystems.

The objectives of this Act are –

- To provide, within the framework of the National Environmental Management Act, for –
 - The management and conservation of biological diversity within the Republic;
 - The use of indigenous biological resources in a sustainable manner.

The Act's permit system is further regulated in the Act's Threatened or Protected Species Regulations, which were promulgated in February 2007.

Relevance to the proposed Cannon Rocks to Alexandria Bulk Water Reticulation:

- The proposed reticulation pipeline must conserve endangered ecosystems and protect and promote biodiversity;
- Must assess the impacts of the proposed development on endangered ecosystems;
- No protected species may be removed or damaged without a permit;
- The proposed site must be cleared of alien vegetation using appropriate means

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

In terms of Section 21 of the Water Act, certain activities trigger the need for water-use licenses. It is likely that the proposed bridges, culverts or major drainage structures will trigger the need for water use license applications in terms of the following:

- Sec 21 (c) - impeding or diverting the flow of water in a watercourse, and
- Sec 21 (i) - altering the bed, banks, course or characteristics of a watercourse

Relevance to the proposed Cannon Rocks to Alexandria Bulk Water Reticulation:

- If any development will take place in or within 32 meters of a water course, the developer will require a water use licence from the DWA to perform any of the above-listed activities.

1.4.4. The National Forests Act (84 of 1998)

The objective of this Act is to monitor and manage the sustainable use of forests. In terms of Section 12 (1) (d) of this Act and GN No. 1012 (promulgated under the National Forests Act), no person may, except under licence:

- Cut, disturb, damage or destroy a protected tree; or
- Possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any forest product derived from a protected tree.
- of any protected tree or any forest product derived from a protected tree.

Relevance to the proposed Canno Rocks to Alexandria Bulk Water Reticulation:

- If any protected trees in terms of this Act occur on site, the developer will require a licence from the DAFF to perform any of the above-listed activities.

1.5. Background to ecological assessment

1.5.1. Biological elements

The “*natural environment*” and the state thereof are defined by the quality of the environment and can be described by measures of the following parameters:

- Vegetation type
- Plant biodiversity
- Rare, endangered and protected plant species
- Endemism of plant species
- Diversity of plant biomes
- Animal and insect biodiversity
- Overall species richness and abundance within population
- Quality of the environment (degree of impact degradation or level of transformation, if present), determined by soil exposure and plant species present (pioneer vs. late stage).

The *Sensitivity* of a particular ecological system can be further described as the value of a particular environment in terms of rarity of a set of populations or the fragility (easily destroyed) of a particular environment. There are a number of programmes that can be used to guide a desktop assessment of the value and sensitivity of a particular vegetation type, based on previous studies e.g. South African National Biodiversity Institute: Vegetation Map (Mucina and Rutherford (eds), 2006), the Subtropical Thicket Ecosystem Plan (Pearce S.M., 2003), and Eastern Cape Biodiversity Conservation Plan (Berliner and Desmet, 2007). However, ground-truthing of these studies is required for higher resolution accuracy.

1.5.2. Physical elements and ecological systems

Sensitive ecological systems can also be identified by physical landscape features. Three main factors contribute towards characterising ecological sensitivity and include:

- Slope
- Soil type and geology
- Water sources
 - Presence of diverse land or water features

1.6. Methodology

1.6.1. Desktop Analysis: Literature review

The following desktop procedures were employed:

1. Assessment of biodiversity reference material and conservation planning frameworks (SANBI Vegetation, ECBCP, STEP, NPAEP) in context of proposed development.
2. Quality of vegetation determined from aerial images.
3. Analysis of contour maps to determine slope gradient
4. Investigate published data available on the geology, soil structure and hydrology of the area

1.6.2. Site observations

A site visit was undertaken on the 13-17 February 2012. The route was investigated in terms of plant species, vegetation structure and degree of disturbance. The state of the localised environment was also described.

2. DESCRIPTION OF THE AFFECTED ENVIRONMENT: LITERATURE REVIEW

The following environmental sections procure an assessment of the biodiversity and conservation planning in respect to the current project.

2.1. South African National Biodiversity Institute: The Vegetation of South Africa, Lesotho and Swaziland (Mucina and Rutherford, 2006).

In terms of SANBI, the proposed Cannon Rocks to Alexandria Bulk Water pipeline will be located in 3 vegetation types namely: Albany Coastal Belt, Southern Coastal Forest and Albany Dune Strandveld.



Figure 2.1. SANBI Vegetation Map. Route of the proposed pipeline upgrade indicated with a red line. AT9 = Albany Coastal Belt, FOz6 = Southern Coastal Forest, AZs2 = Albany Dune Strandveld .

2.1.1. Albany Coastal Belt (AT9)

Albany Coastal Belt is an Albany Thicket Biome vegetation type that is found on gently sloping to moderately undulating landscapes and dissected hilltop slopes found as patches in a matrix of typical valley thicket between 15 – 30- km of the Indian Ocean coastline. It is dominated by short grasslands punctuated by scattered bush clumps or solitary *Acacia natalitia* trees. Other species present are a mixture of Fynbos, Grassland, and Succulent Karoo elements. Albany Coastal Belt is considered “**LEAST THREATENED**” by SANBI although up to 60% of this vegetation type is considered degraded.

Unlike other SANBI vegetation types, Albany Coastal Belt represents current-state vegetation rather than potential vegetation. This is because it is assumed that Albany Coastal Belt is a creation of man and the original (pre-settlement) vegetation was dominated by non-seasonal, dense thicket.

Untransformed Albany Coastal Belt vegetation occurs in the southern section of the pipeline route that runs parallel to the coastline. The remainder of the pipeline runs through degraded/transformed Albany Coastal Belt vegetation.

2.1.2. Southern Coastal Forest (FOz6)

Southern Coastal Forests are considered as intrazonal forests found at low altitudes (20 – 340 m) in patches on coastal plains between Alexandria and Van Stadens River and on coastal dunes in the Eastern Cape. It is dominated by *Celtis africana* (white stinkwood), *Sideroxylon inerme* (white milkwood), *Mimusops caffra* (red milkwood) and *Dovyalis rotundifolia* (coastal silver oak). Southern Coastal forests have well developed low-tree, shrub and herb layers.

Southern Coastal Forests in the Eastern Cape are well protected under statutory conservation since most of the frontal dune cordons along the Province fall largely on state-owned land. The Alexandria Woody Cape forest forms part of the Greater Addo Elephant National Park.

This Forest Biome vegetation type is considered “**LEAST THREATENED**” by SANBI, but do contain protected plant species like *Encephalartos altensteinii* and *Sideroxylon inerme*. It is also a protected vegetation type under the NFA (see Section 2.4).

2.1.3. Albany Dune Strandveld (AZs2)

Albany Dune Strandveld is classified by SANBI as an Eastern Strandveld Coastal Vegetation vegetation type. It is found as a narrow coastal strip of vegetation situated between the Sundays River to just south of the Kei River in the Eastern Cape. Vegetation consists of dense shrubby thicket composed of 2-4 m high sclerophyllous shrubs accompanied by woody and herbaceous vines. It also consists of a sparse grassy understory. The occurrence of bulbous geophytes and succulent herbs is an important feature of this vegetation type.

SANBI considers this vegetation type as “**LEAST THREATENED**” with some 25% statutorily conserved in various National Parks and Nature Reserves. The largest threat to this vegetation type is the Australian *Acacia* species that have already invaded large stretches of coastal thicket and are dominant in places. These plants are currently targeted for eradication by the Working for Water Programme managed by DWA.

2.2. Eastern Cape Biodiversity Conservation Plan (ECBCP)

The ECBCP is an attempt at detailed, low-level conservation mapping for land-use planning purposes. Specifically, the aims of the Plan were to map critical biodiversity areas through a systematic conservation planning process. The current biodiversity plan includes the mapping of priority aquatic features, land-use pressures, critical biodiversity areas and develops guidelines for land and resource-use planning and decision-making.

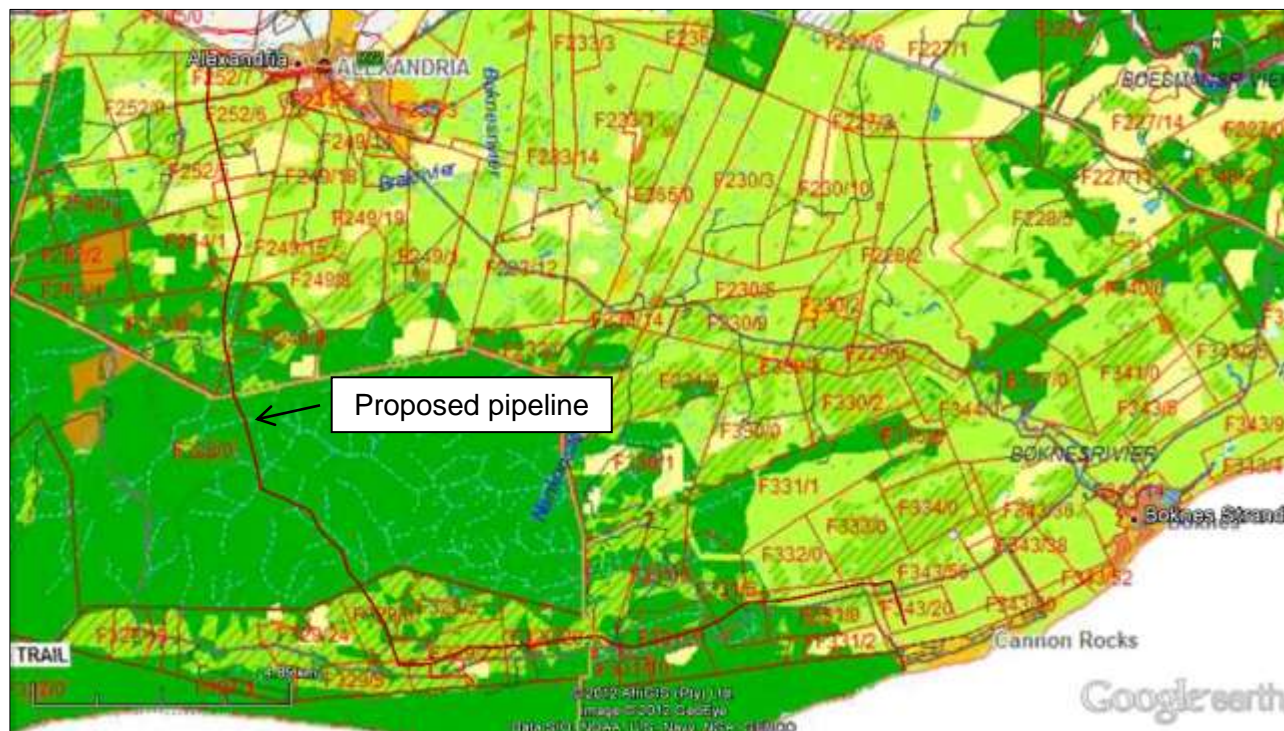


Figure 2.2. Eastern Cape Biodiversity Conservation Plan. The proposed route is indicated in Red.

The main outputs of the ECBCP are “critical biodiversity areas” or CBAs, which are allocated the following management categories:

- CBA 1: Maintain in a natural state
- CBA 2: Maintain in a near-natural state
- CBA 3: Functional landscapes
- CBA 4: Towns & settlements
- CBA 4: Cultivated land
- CBA 4: Plantation/woodlots

The ECBCP maps CBAs based on extensive biological data and input from key stakeholders. The ECBCP, although mapped at a finer scale than the National Spatial Biodiversity Assessment (Driver *et al.*, 2005) is still, for the large part “coarse”. Therefore it is imperative that the status of the environment, for any proposed development MUST first be verified before the management recommendations associated with the ECBCP are considered (Berliner and Desmet, 2007).

Large areas through which the Cannon Rocks to Alexandria pipeline is routed are identified as CBA1 in Figure 2.2. the management recommendations of the ECBCP state that these areas should be maintained as natural areas with no development allowed. The most prominent of these are the Alexandria and Woody Cape forests (See Figure 2.2 above). Both these forests form part of the Greater Addo Elephant National Park and as such are formally protected. The existing pipeline already claims a reserve footprint in the Alexandria Woody Cape forest, so there should be no additional footprints outside the existing cleared pipeline route.

The remainder of the pipeline route falls within CBA2 areas which require that the land is to be maintained in a “near natural state”. However, most of the land is transformed by Kikuyo pastures

and grazing crops for dairy farming, and as such is not considered as natural or near natural. Small pockets may be considered as ‘near natural’ and it is recommended that no transformation of these natural habitats should be permitted.

2.3. Subtropical Thicket Ecosystem Plan (STEP)

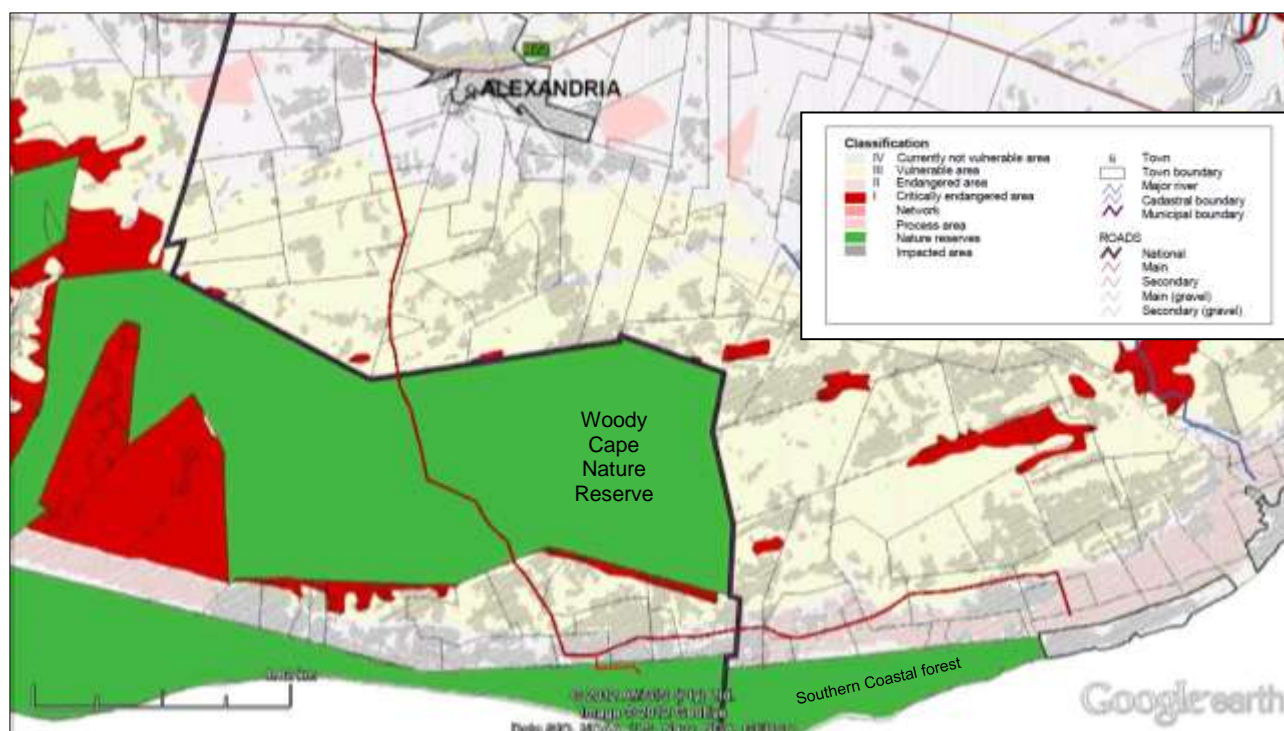


Figure 2.3. STEP: Ndlambe Municipality Conservation Priority Map

The STEP Conservation Priority Map classifies areas into a number of categories, based on plant and animal biodiversity of the planning domain, with emphasis on Thicket biomes (Pierce, 2003). The Conservation Priority map for the study area is presented in Figure 2.3. above. The proposed pipeline will not impact on any endangered thicket vegetation type but will run through a Nature reserve (now falls under the Greater Addo Elephant National Park). The entire pipeline route is classified as “**Currently not vulnerable**”. The land-use management (Table taken from STEP) for the areas marked as “Currently not vulnerable” require that, as far as possible, development is placed in areas that are already disturbed or impacted.

2.4. National forests (NFA)

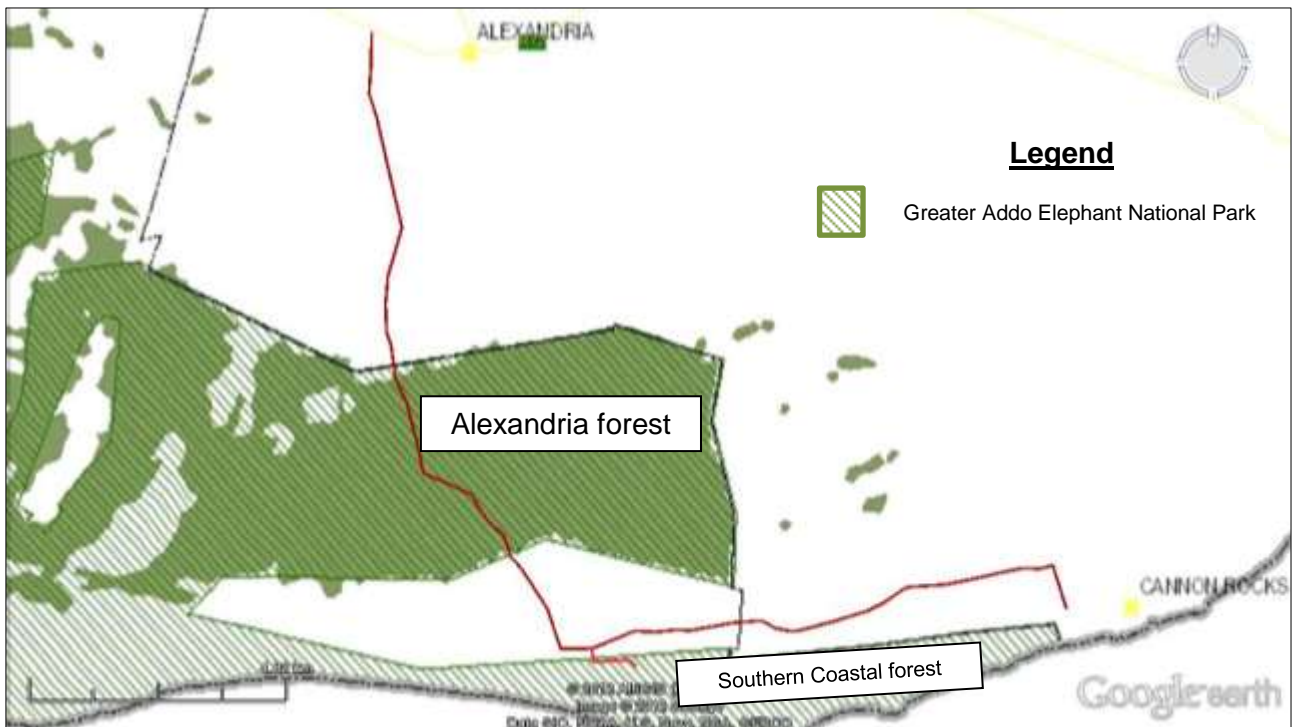


Figure 2.4. National forests and protected areas in the surrounding environment (Source: SANBI).

Indigenous forest can be found from the Soutpansberg Mountains in the far north to the Cape Fold Mountains in the south of South Africa. They occur as fragmented patches of varying size, on the eastern and southern seaboard and along the south and southeast facing slopes of the Escarpment. The tremendous spatial variation in climate, altitude, latitude and topography across this region has resulted in a diversity of forest types. Forests typically occur in the moist areas of the country, but specialised forest types are also found fringing rivers or within protected valleys in more arid areas.

Currently, a number of categories of protected areas include forests. These include areas that have been declared as protected areas under municipal, provincial and national legislation. Section 8 of the NFA permits the Minister to declare a state forest (or part of it), and to declare it to be a protected area in one of the following categories:

- forest nature reserve
- forest wilderness area
- any other type of protected area recognised in international law or practice.

Two forests in the Greater Addo Elephant National Park (namely the Alexandria and the Coastal forests) in the area are recognised by the NFA.

The proposed pipeline will be located within in an existing cleared pipeline route varying in width of 3-4 meters through The Southern Coastal forest and the Alexandria forest (Figure 2.4). There will be minimum impact to the forests if the existing footprint will not be increased (by widening the existing cleared pipeline route through the forests) from 4 m to 6 m.

It is important to note that both these forests forms part of a National Park (Greater Addo Elephant National Park) and as such is protected and conserved. Approval from SANParks will be required for any intention to widen the existing cleared pipeline route. Licence applications are required if any protected plant species will be destroyed, trimmed or removed. Furthermore, a license will be needed from DAFF for any widening of the existing cleared pipeline route.

2.5. Wetlands and rivers

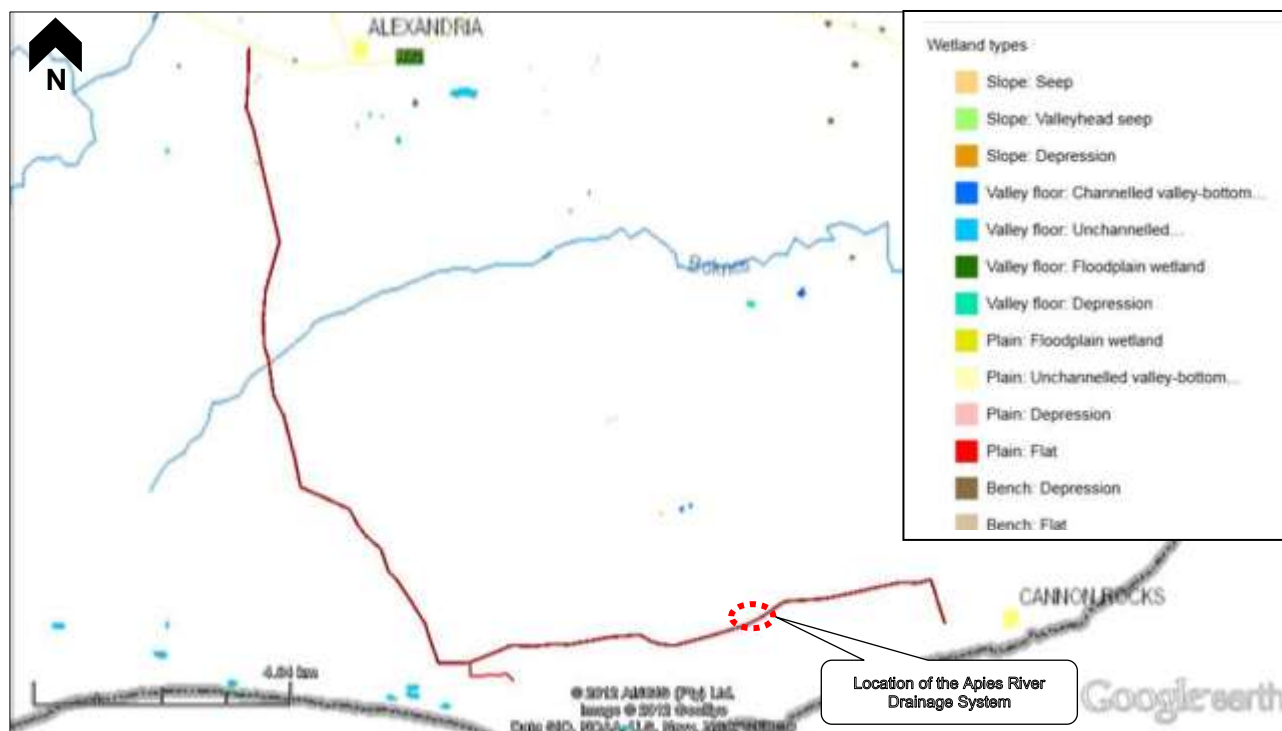


Figure 2.5. SANBI Working for Wetland map of the surrounding area.

The South African National Biodiversity Institute (SANBI) is currently in the process of compiling a National Wetland Inventory, which aims to map and classify (i.e. type) the major wetlands and water bodies in the country at a coarse spatial scale.

No wetland will be affected by the proposed pipeline upgrade but the Boknes River will be crossed by the pipeline and does require comment from the DWA as prescribed in Section 21 of the National Water Act (No. 36 of 1998).

An inactive river (called the Apies River by the local community) currently acting as a drainage system was also identified in Section A (discussed later). A General Authorisation (GA) from the DWA will be required if the proposed pipeline crosses this system.

3. DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1. Pipeline route description

The route of the proposed pipeline has been drawn on Google Earth for the purposes of describing the surrounding ecological environment. The entire route is provided for reference (Figure 3.1). The route has been divided into sections A, B, C & D and discussed separately below.

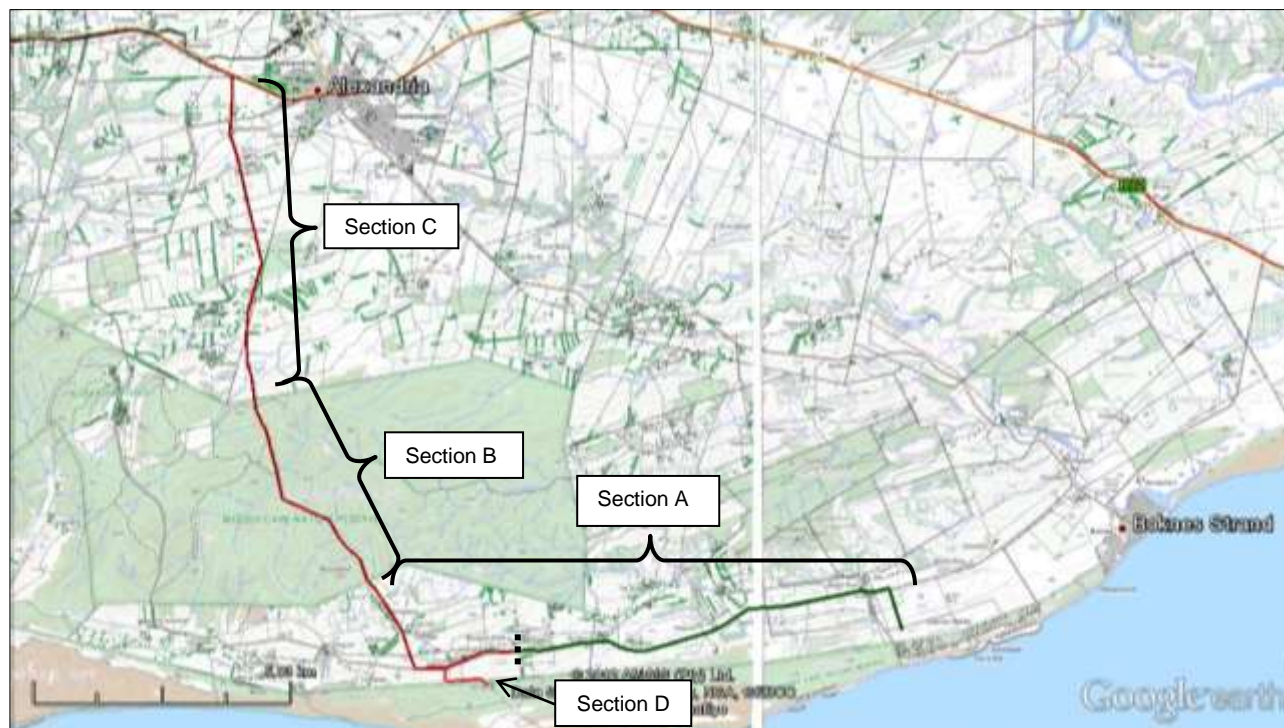


Figure 3.1. Proposed route for the pipeline. The line is divided into 4 sections namely Section A, Section B, Section C & Section D.

No pipeline alternatives are assessed in any of the Sections as this is merely an upgrade of an existing pipeline.

3.1.1. Section A

Section A is located between the Cannon Rocks RO plant and the Alexandria Woody Cape forest and is situated on various farms.

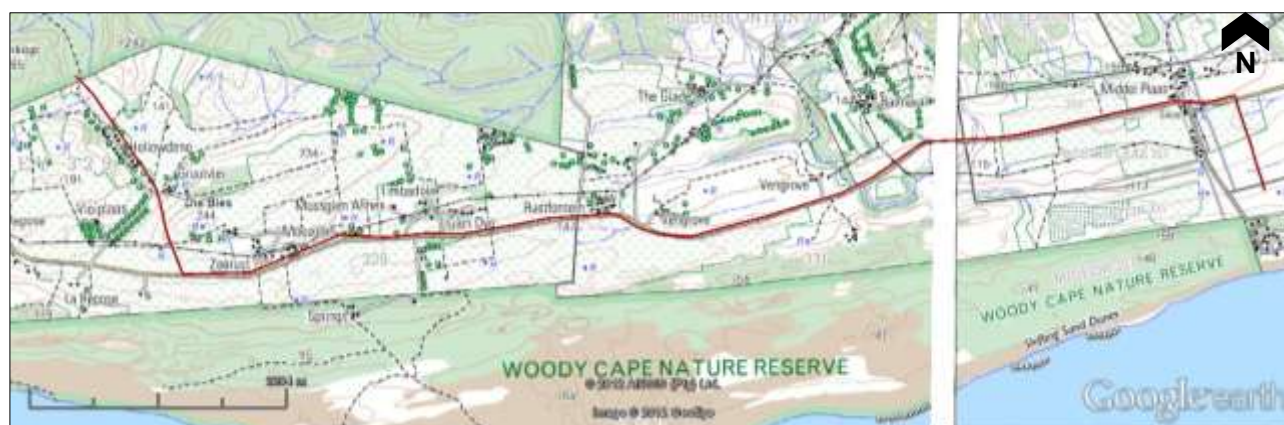


Figure 3.2. Layout of the proposed pipeline upgrade within Section A

The entire affected area within this section consists of dairy farms. Individual site sampling was not undertaken. A desktop approach was applied and an attempt was made to identify areas of various sensitivity (see Chapter 4) within this section.

Slope

The elevation profile of the proposed pipeline layout in Section A shows a total increase in elevation of 110m from the start point (Cannon Rocks) to the endpoint (Alexandria Woody Cape forest). The average increase was only 77m spiking at 10.8 km indicating a steep slope of 1:5 in the area (shown as S6 in Figure 3.6). The rest of the proposed pipeline maintains an average slope of between 1:50 and 1:15.



Figure 3.3. Elevation profile of the proposed pipeline upgrade within Section A from Cannon Rock (left) to the Alexandria Woody Cape forest (right).



Plate 3.1. Photo showing the steep slope with the proposed pipeline traversing it along Section A.

Geology and soils

The area consists of Cenozoic tertiary deposits consisting of limestones (Alexandria Fm) and overlain by Aeolian deposits consisting of dune rock and semi-consolidated and loose sand (Nanaga Fm).

Water bodies

One inactive river (called the Apies River by the local community) was identified (GPS: 33° 44.846'S 26° 29.926'E; Figure 3.5 & Plates 3.2 & 3.3 below) that will be traversed by the proposed pipeline along Section A. This inactive river does not currently transport any flowing water but may have historically done so. It may also act as a drainage system especially during 20 & 50 year flood events. The inactive riverbed is currently used as grazing by the landowner as it is overgrown with various grass species (mostly kikuyu). The riparian zone consists of some Woody Cape and Coastal forest shrubs interspersed with alien invasives. The riparian vegetation will not be majorly affected by the proposed pipeline development as a road reserve is maintained through the vegetation that the proposed pipeline will follow. Some trimming may be required. A General Authorisation (GA) will be required from the DWA if any construction takes place in or within 50m of the Apies River Drainage system.



Figure 3.4. Aerial photo of the Apies River drainage system that the proposed pipeline will traverse.



Plate 3.2. Photo of the Apies River drainage system taken from the road.



Plate 3.3. Showing the culverts on both sides of the road within the Apies River drainage system.

There is one existing water body (shown as S1 in Figure 3.6 below) (man-made farm dam) within 500 m of the proposed pipeline (Plate 3.4). GPS coordinate: S33° 44.464' E26°31.475'.

Mitigation is required to minimise any impacts on this dam during the construction phase.



Plate 3.4. Farm dam within 500 m of the proposed pipeline upgrade along Section A.

Vegetation

Small pockets (shown as S2 – S5 in Figure 3.6 below) of vegetation were identified that should be conserved, and damage minimised, during the construction phase.

Discussion

Most of the affected and surrounding area is considered degraded due to large scale agriculture development within Section A. A few sensitive areas were identified (see Chapter 4) along the proposed line that will require mitigation. Figure 3.6 below shows the location of identified sensitive areas within Section A.

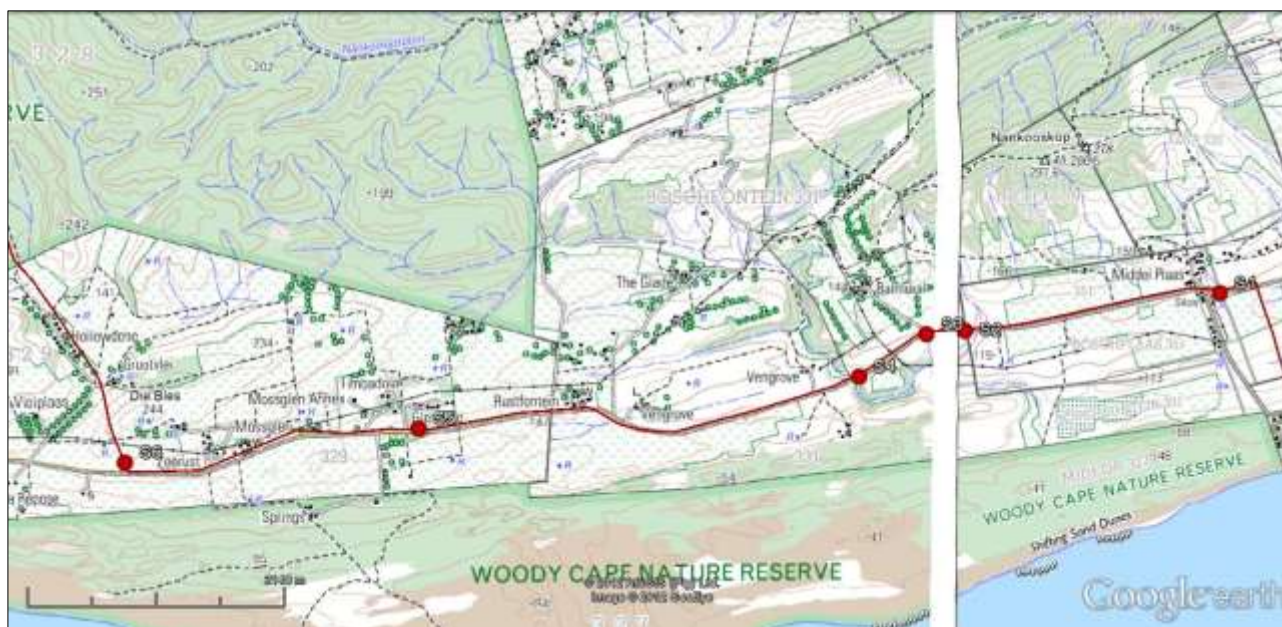


Figure 3.6. Location of identified sensitive areas within Section A (Discussed in detail in Chapter 4)

Recommendations

Mitigation measures during the construction and post-construction phases are required in the sensitive areas as shown in Figure 3.6 above. These include:

- avoiding long and short term erosion on steep slopes (S6),
- minimising development footprints in pockets of natural and near natural vegetation (S1-S5),
- no construction camps in the Apies River drainage system of within 100m of the system (S4),
- no construction camps in the Coastal forest south of the proposed pipeline route.
- comment required from DWA (Dept. of Water Affairs) on all construction within 32 meters of any water body,
- GA required from DWA if any construction takes place in or within 50m of the Apies River drainage system.

3.1.2. Section B

Section B has only 1 alternative pipeline route. The pipeline traverses the Alexandria forest within the cleared pipeline route with an existing width of 3-4 meters (see Figure 3.7 below).

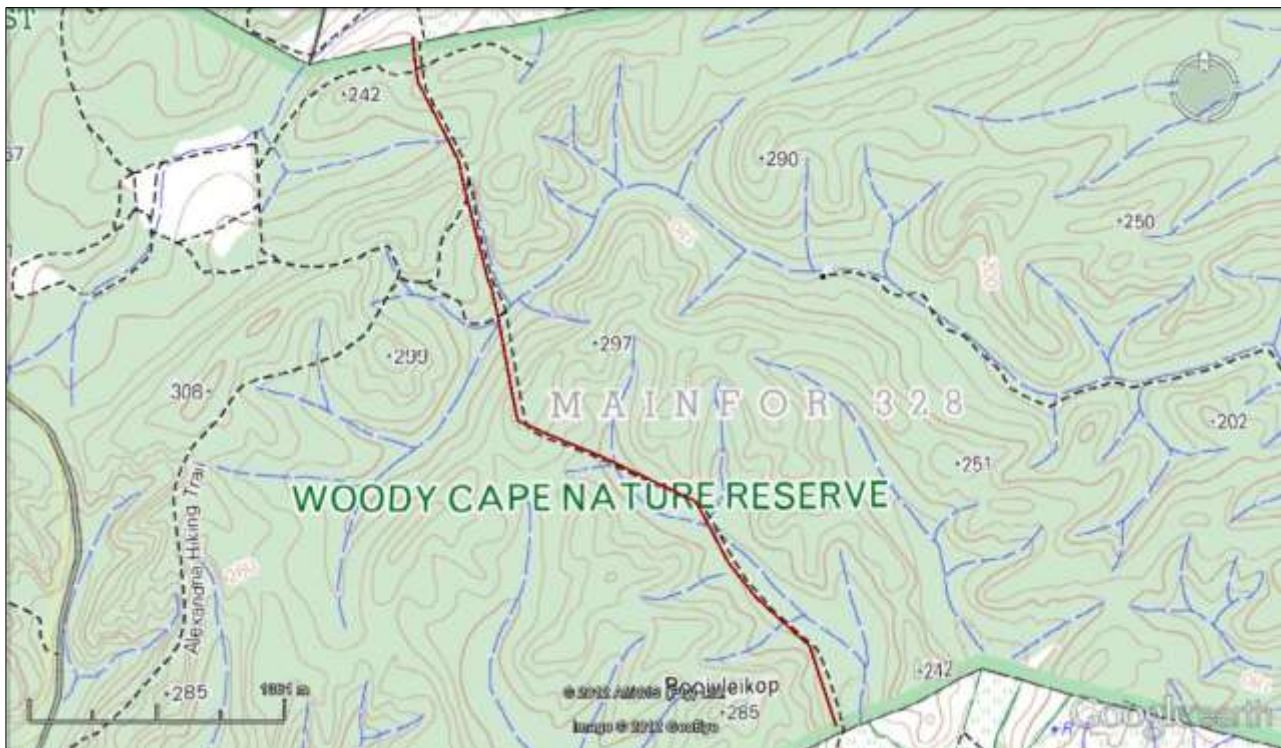


Figure 3.7. Layout of the proposed pipeline upgrade within Section B

As the entire section of pipeline is situated within the Alexandria forest, individual site sampling was not undertaken. A desktop approach together with a “walk-through” observation of the entire section was conducted and an attempt was made to identify areas of sensitivity (see Chapter 4) within the entire Section B.

Slope

The elevation profile of the proposed pipeline layout in Section B shows a total increase in elevation of 44m from the start point (southern border of the Alexandria forest) to the endpoint (northern border of the Alexandria forest). The average elevation is 211m.a.s.l. (meters above sea level) spiking at 25 km (283 m.a.s.l.). An average slope of between 1:5 and 1:25 in the area was calculated.



Figure 3.8. Elevation profile of the proposed pipeline upgrade within Section B from Cannon Rocks (left) to the Alexandria Woody Cape forest (right).





Plate 3.5. Showing the various slopes and vegetation along the Alexandria forest existing cleared pipeline route in Section B.

Geology and soils

The area consists of Cenozoic tertiary deposits consisting of limestones (Alexandria Fm) and overlain by Aeolian deposits consisting of dune rock and semi-consolidated and loose sand (Nanaga Fm).

Water bodies

Four drainage systems will be traversed by the proposed pipeline (see Figure 3.4 below). They are shown in Figure 3.9 and Plate 3.6 below.



Figure 3.9. Showing the location of affected water bodies within 32 meters of the proposed pipeline path.

Mitigation is required to minimise any impacts on these drainage systems during the construction and operation phases. Due to the nature of the soil, standing or flowing water within these systems rapidly drain away. It is not envisaged that the pipeline will cause significant impacts, but DWA comment and General Authorisations may be required.



Plate 3.6. Photos of some of the affected drainage systems.

Vegetation

SANBI (Mucina and Rutherford; 2006) identifies the Alexandria forest as a Southern Coastal Forest type. These forests are considered intrazonal forests found at low altitudes (20 – 340 m) in patches on coastal plains between Alexandria and Van Stadens River and on coastal dunes in the Eastern Cape. It is dominated by *Celtis africana* (white stinkwood), *Sideroxylon inerme* (white milkwood), *Mimusops caffra* (red milkwood) and *Dovyalis rotundifolia* (coastal silver oak). Southern Coastal forests have well developed low-tree, shrub and herb layers.

Southern Coastal Forests in the Eastern Cape is well protected under statutory conservation since most of the frontal dune cordons along the Province fall largely on state-owned land. The Alexandria Woody Cape forest forms part of the Greater Addo Elephant National Park and as such is a protected forest.

This Forest Biome vegetation type is considered “**LEAST THREATENED**” by SANBI, but do contain protected plant species like *Encephalartos altensteinii* and *Sideroxylon inerme*. *Podocarpus latifolius* spp. and *Minusops caffra*. The Alexandria forest is protected by the National Forests Act (No.84 of 1998).

The following plant species were identified in Section B. The conservation status is also indicated. Any protected species that is to be destroyed, trimmed or removed will require permits from DEDEAT and DWAF (Forestry). As it is a National Park, approval will be required from SANParks.

Table 3.1. List of plant species found onsite and its conservation status.

Plant name	Conservation status
Species identified	
<i>Celtis africana</i> (white stinkwood)	
<i>Sideroxylon inerme</i> subsp. <i>inerme</i> (white milkwood)	Protected tree
<i>Dovyalis rotundifolia</i> (coastal silver oak)	
<i>Ficus burkei</i>	
<i>Scotia latifolia</i>	
<i>Diospyros natalensis</i>	
<i>Afrocarpus falcatus</i>	Least Concerned
<i>Brachylaena discolor</i> subsp. <i>discolor</i>	
<i>Brachylaena ilicifolia</i>	
<i>Euclea natalensis</i>	Least Concerned
<i>Gymnosporia buxifolia</i>	
<i>Mystroxydon aethiopicum</i>	
<i>Rhoicissus tomentosa</i>	
<i>Cissampelos torulosa</i>	
<i>Carissa bispinosa</i> subsp. <i>bispinosa</i>	
<i>Olea exasperata</i>	
<i>Rhus glauca</i>	
<i>Oxalis pes-caprae</i>	
<i>Sansevieria hyacinthenoides</i>	
<i>Cyperus albostrigatus</i>	
<i>Ehrharta erecta</i>	
<i>Erythrina caffra</i>	
<i>Hypoxis</i> sp.	
<i>Aneilema dregeanum</i>	
<i>Tephrosia</i> sp.	
<i>Berkheya decurrens</i>	
<i>Silene bellidioides</i>	
Possible species (not identified but may be present)	
<i>Euphorbia kraussiana</i>	
<i>Encephalartos altensteinii</i>	Vulnerable
<i>Euclea racemosa</i>	
<i>Euphorbia grandidentata</i>	
<i>Aloe ciliaris</i>	Not threatened
<i>Hypoestes aristata</i>	Least Concerned
<i>Isoglossa woodii</i>	
<i>Dracaena alectrifolia</i>	
<i>Laportea grossa</i>	
<i>Oplismenus hirtellus</i>	
<i>Deinbollia oblongifolia</i>	
<i>Sterculia alexandri</i>	Vulnerable
<i>Mimusops caffra</i> (Coastal red milkwood)	Protected
<i>Podocarpus latifolius</i> (Yellowwood)	Protected
Alien vegetation	

<i>Agrimonia procera</i>	Invasive
<i>Casuarina equisetifolia</i>	Alien
<i>Acacia cyclops</i>	Alien
<i>Acacia saligna</i>	Alien

Discussion

The entire length (4.48 km) is considered sensitive as it forms part of a protected National Park. Various protected plant species and sections of forest edges may be affected in the pipeline construction phase as it has been indicated by the developer that the existing 4 m cleared pipeline route may not be sufficient for the construction of the pipeline. A minimum clearance width of 6 meters will be required within the forest to accommodate construction, and therefore widening the existing 4 meters wide cleared pipeline route will be necessary. This may affect trimming, removal and destruction of protected tree species.

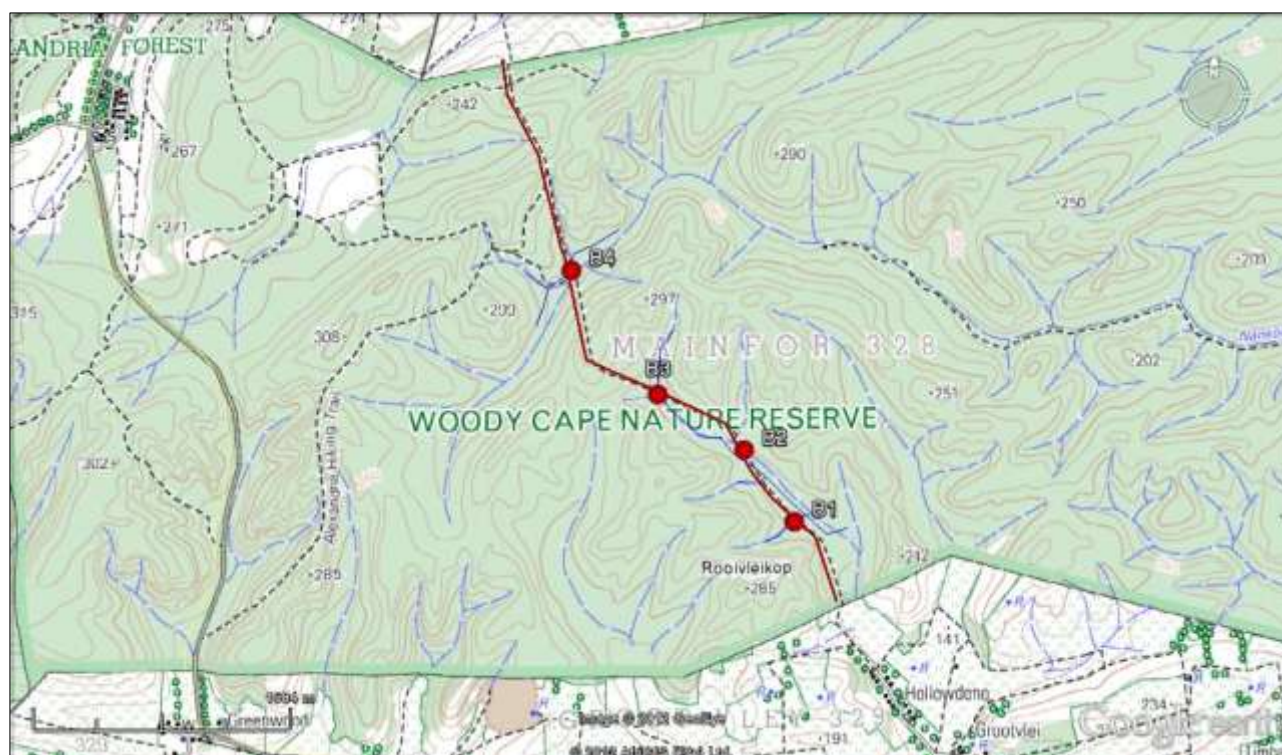


Figure 3.10. Location of identified sensitive areas within Section B (Discussed in detail in Chapter 4)

Recommendation

Widening the current 4 m cleared pipeline route to 6 m in the 4.48 km Alexandria forest route will require a high level of mitigation.

- It is recommended that where feasible, alternative methods (eg. manual labour) during the construction phase within Section B takes place. This will have the least impact on the forest vegetation.
- It is recommended that where feasible, above ground installation of the proposed pipeline takes place within Section B. This will have the least impact on the forest vegetation.
- If a mechanical option is used during the construction phase within Section B, high level mitigation is required to minimise impacts.
- No construction camps will be allowed anywhere in the Alexandria forest.
- In sections where the existing cleared pipeline route width is less than 4 m due to forest encroachment, every effort should be made to avoid forest removal.
- In the event that it is necessary to remove forest vegetation, consultation with DWAF (Forestry) and SANParks will be required to determine if permit applications are required in terms of the National Forests Act (NFA).

3.1.4. Section D

An additional 1.12 km of pipeline is included that will link the existing Springs Reservoir situated in the Woody Cape Coastal forest to the proposed new pipeline (Figure 3.5).

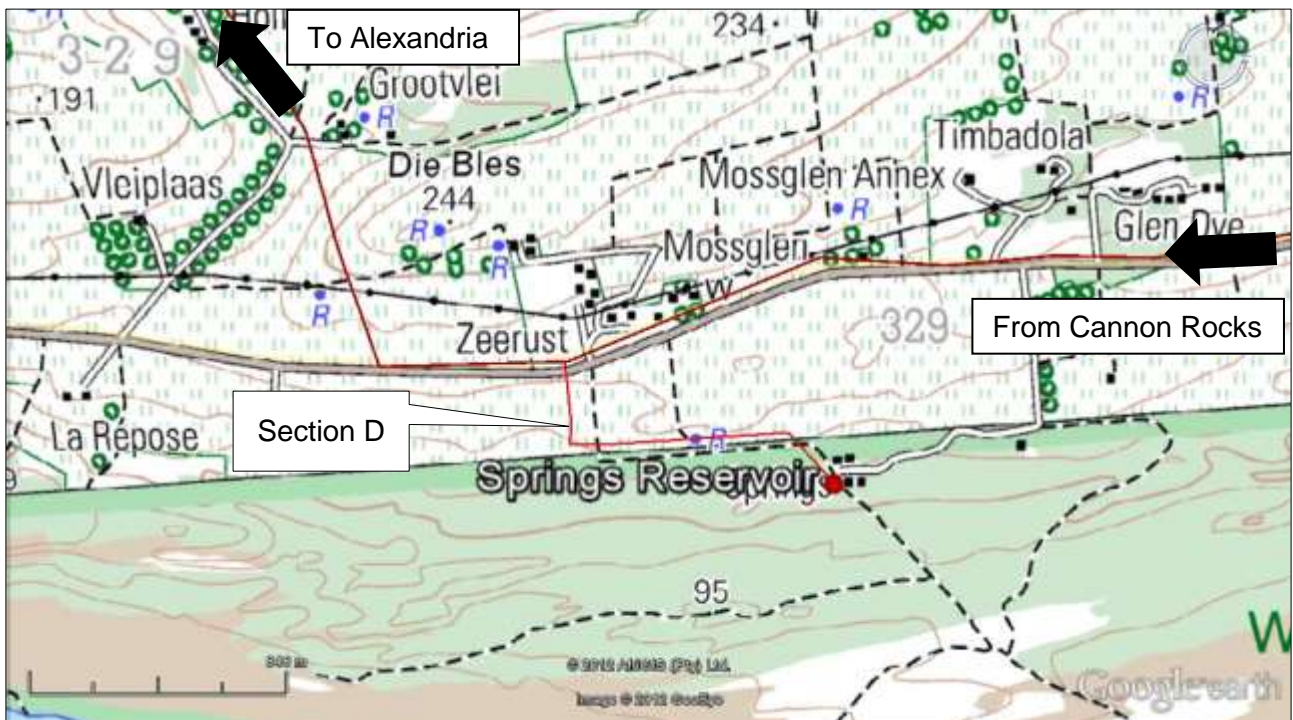


Figure 3.5. Showing the pipeline link between the proposed bulk pipeline & the existing Springs Reservoir.

The Springs reservoir is situated in the Coastal forest section that forms part of the ADDO Elephant National Park. The reservoir will be upgraded but will not exceed the existing footprint and as such is not assessed. The pipeline will follow an existing cleared pipeline route for 800m out of the indigenous forest. Trimming and possible widening of the natural vegetation in the existing pipeline route fringes may be required.





Plate 3.4. Photos of the existing Springs reservoir and associated cleared pipeline route through the Coastal forest. The red line represents the proposed pipeline layout.

4. SENSITIVITY

4.1. Sensitivity rating

Identified sensitive sites were assessed and ranked accordingly to three sensitivity classifications, depending on the biophysical conditions.

These levels of sensitivity are described as follows:

Sensitivity Level	Colour allocated	Description
High sensitivity	Red	These areas are considered as highly sensitive and should be avoided if possible.
Moderate sensitivity	Orange	These sites require a high level of mitigation.
Low sensitivity	Yellow	These sites require a low level of mitigation.
Not sensitive	Blank	No mitigation required.

4.2. Sensitivity maps

The four different Sections (namely Sections A, B, C & D) were individually assessed in terms of sensitivity. Sections A & D will be discussed en masse in this chapter as the pipeline in Section D links to the pipeline in Section A.

4.2.1. Section A & D



Figure 4.1. Sensitivity map of Section A of the proposed pipeline upgrade.

Both the northern Alexandria forest and the southern Coastal forest are considered highly sensitive (red coloured). Construction should be avoided or minimised to existing footprints in these areas if possible.

Four areas in the proposed pipeline upgrade path are considered as medium sensitive (S2-S5). All four of these areas are considered near natural coastal forest patches while site S4 is considered an inactive river (called the Apies River by the local community) and mainly acts as a drainage system. Construction footprints in these areas should be minimised. No work camps or any other permanent or temporary construction infrastructure, other than the pipeline itself, may take place in these areas.

A single area was considered as low sensitive (as opposed to not sensitive) due to a steeper slope gradient. Care must be taken to avoid erosion in this area as steep slopes and may be prone to erosion during and/or after construction.

4.2.2. Section B



Figure 4.2. Sensitivity map of Section B of the proposed pipeline upgrade.

The entire area is protected as it is located within the Greater Addo Elephant National Park and, as such, is considered as highly sensitive. Various protected species were identified in this section that may be affected by the proposed pipeline upgrade. Some drainage systems were also identified within the forest.

Widening the existing 4 m cleared pipeline route to 6 m and other construction activities in the Alexandria forest will require high level mitigation.

4.2.3. Section C



Figure 4.3. Sensitivity map of Section C of the proposed pipeline upgrade.

Two farm dams were identified within 32 meters of the proposed pipeline upgrade. They are considered sensitive and comment from DWA may be required as a guideline to move forward.

Two small patches of dense vegetation were identified as moderately sensitive. Construction footprints in these areas should be minimised by limiting construction to the existing cleared pipeline route. No work camps or any other permanent or temporary construction infrastructure other than the pipeline itself may take place in these areas.

Historically SANBI showed the origin of the Boknes River in the Alexandria forest. Currently no surface water or any recognisable riparian vegetation was identified in the section just north of the Alexandria forest. This area is identified as low sensitive.

5. ASSESSMENT METHODOLOGY

The methods employed to assess the identified impacts are prescribed by EIA regulations (2010). Impact assessments should include consideration of the spatial scale, temporal scale, the likelihood of the impact occurring and the severity of the impact, should it happen. The assessment of these scales can be translated into an overall significance of the impact. Assessment should include mitigation steps in order to reduce the significance levels.

The impact assessment should also predict whether the mitigation measures provided will reduce the project impact to acceptable levels, if implemented.

The following methodology has been developed by CES and has been applied successfully to numerous EIAs.

Table 5.1a Significance Rating Table

Significance Rating Table	
Temporal Scale (The duration of the impact)	
<u>Short term</u>	Less than 5 years (Many construction phase impacts are of a short duration).
<u>Medium term</u>	Between 5 and 20 years.
<u>Long term</u>	Between 20 and 40 years (From a human perspective almost permanent).
<u>Permanent</u>	Over 40 years or resulting in a permanent and lasting change that will always be there.
Spatial Scale (The area in which any impact will have an affect)	
Individual	Impacts affect an individual.
Localised	Impacts affect a small area of a few hectares in extent. Often only a portion of the project area.
Project Level	Impacts affect the entire project area.
Surrounding Areas/ Downstream	Impacts that affect the area surrounding the development
Municipal	Impacts affect either the Local Municipality, or any towns within them.
Regional	Impacts affect the wider district municipality or the province as a whole.
National	Impacts affect the entire country.
International/Global	Impacts affect other countries or have a global influence.
Will definitely occur	Impacts will definitely occur.
Degree of Confidence or Certainty (The confidence with which one has predicted the significance of an impact)	
<i>Definite</i>	More than 90% sure that the impact will occur.
<i>Probable</i>	Over 70% sure that an impact will occur.
<i>Possible</i>	Only over 40% sure of a particular fact or of the likelihood of an impact occurring.
<i>Unsure</i>	Less than 40% sure of a particular fact or of the likelihood of an impact occurring.

Table 5.1b Impact Severity Rating

Impact severity (The severity of negative impacts, or how beneficial positive impacts would be on a particular affected system or affected party)	
Very severe	Very beneficial
An irreversible and permanent change to the affected system(s) or party(ies) which cannot be mitigated. For example the permanent loss of land.	A permanent and very substantial benefit to the affected system(s) or party(ies), with no real alternative to achieving this benefit. For example the vast improvement of sewage effluent quality.
Severe	Beneficial
Long term impacts on the affected system(s) or party(ies) that could be mitigated. However, this mitigation would be difficult, expensive or time consuming, or some combination of these. For example, the clearing of forest vegetation.	A long term impact and substantial benefit to the affected system(s) or party(ies). Alternative ways of achieving this benefit would be difficult, expensive or time consuming, or some combination of these. For example an increase in the local economy.
Moderately severe	Moderately beneficial
Medium to long term impacts on the affected system(s) or party (ies), which could be mitigated. For example constructing the sewage treatment facility where there was vegetation with a low conservation value.	A medium to long term impact of real benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are equally difficult, expensive and time consuming (or some combination of these), as achieving them in this way. For example a 'slight' improvement in sewage effluent quality.
Slight	Slightly beneficial
Medium or short term impacts on the affected system(s) or party(ies). Mitigation is very easy, cheap, less time consuming or not necessary. For example a temporary fluctuation in the water table due to water abstraction.	A short to medium term impact and negligible benefit to the affected system(s) or party(ies). Other ways of optimising the beneficial effects are easier, cheaper and quicker, or some combination of these.
No effect	Don't know/Can't know
The system(s) or party(ies) is not affected by the proposed development.	In certain cases it may not be possible to determine the severity of an impact.

Table 5.1c Overall Significance Rating

Overall Significance (The combination of all the above criteria as an overall significance)	
VERY HIGH NEGATIVE	VERY BENEFICIAL
<p>These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects.</p> <p>Example: The loss of a species would be viewed by informed society as being of VERY HIGH significance.</p> <p>Example: The establishment of a large amount of infrastructure in a rural area, which previously had very few services, would be regarded by the affected parties as resulting in benefits with VERY HIGH significance.</p>	
HIGH NEGATIVE	BENEFICIAL
<p>These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light.</p> <p>Example: The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated.</p> <p>Example: The change to soil conditions will impact the natural system, and the impact on</p>	

affected parties (such as people growing crops in the soil) would be HIGH.	
MODERATE NEGATIVE	SOME BENEFITS
<p>These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment. These impacts are real but not substantial.</p> <p>Example: The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.</p>	
LOW NEGATIVE	FEW BENEFITS
<p>These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect.</p> <p>Example: The temporary change in the water table of a wetland habitat, as these systems is adapted to fluctuating water levels.</p> <p>Example: The increased earning potential of people employed as a result of a development would only result in benefits of LOW significance to people who live some distance away.</p>	
NO SIGNIFICANCE	
<p>There are no primary or secondary effects at all that are important to scientists or the public.</p> <p>Example: A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context.</p>	
DON'T KNOW	
<p>In certain cases it may not be possible to determine the significance of an impact. For example, the primary or secondary impacts on the social or natural environment given the available information.</p> <p>Example: The effect of a particular development on people's psychological perspective of the environment.</p>	

6. IMPACT ASSESSMENT

The majority of the impacts identified are associated with the construction phase of work for the pipeline upgrade. As there are no alternatives considered, and the development consists of upgrading an existing pipeline, the impacts of the upgrade for the proposed pipeline and the “no-go” for the proposed route were assessed. The identified impacts and assessment thereof did not reveal any fatal flaws.

6.1. No-go alternative

Impact assessment for the No-go alternative has been assessed as:

“No associated ecological impacts will be incurred in terms of vegetation loss or disturbance to sensitive environments.”

6.2. Impacts and mitigations tables

The following mitigations are proposed for the identified environmental impacts caused by the proposed pipeline development:

Table 6.1 Impact assessment for the proposed Ndlambe Bulk water pipeline upgrade – Cannon Rocks to Alexandria.

Impacts	Spatial Scale (Duration)	Temporal Scale	Certainty Scale (Likelihood)	Severity	Significance Pre-mitigation	Mitigation	Significance Post mitigation
Direct impacts							
Lack of environmental consideration in the route planning may result in inappropriate placement of pipeline within sensitive systems along the length of route.	Project area	Permanent	Possible	Moderate	MODERATE	<ul style="list-style-type: none"> Incorporation of the mitigation measures provided below will ensure proper route planning. Appoint an independent Environmental Control Officer (ECO) for the duration of the construction to monitor construction activities. Micro-siting of the final pipeline layout must be approved by the ECO. 	LOW
Permanent loss of forest vegetation due to the widening of the existing cleared pipeline route through the forest sections.	Localised	Permanent	Definite	Severe	HIGH	<ul style="list-style-type: none"> Ensure that construction activities are limited to the pipeline route. Alternative methods such as above ground installation or manual labour for trenching for below ground pipeline may be used within the natural forest sections to avoid the need to widen the existing cleared pipeline route. If widening of the existing cleared pipeline route is required, consult with SANParks and DWAF (Mr Tabo Nokoya) to determine if and what permit applications are required. All relevant permits must 	MODERATE

Impacts	Spatial Scale (Duration)	Temporal Scale	Certainty Scale (Likelihood)	Severity	Significance Pre-mitigation	Mitigation	Significance Post mitigation
						<p>be obtained before removal/trimming/destruction of any protected species takes place.</p> <ul style="list-style-type: none"> When widening the route, every effort must be made to avoid protected species and species of special concern. This includes reducing clearance to 4 m, using manual labour and clearance route realignment in affected sections (See scenario illustrations and mitigations in Section 7.2). If possible, transplant any impacted trees. Sapling and seedlings especially must not be destroyed but rather removed and transplanted. The maximum total width that the existing cleared pipeline route may be widened to is 6 m. 	
Impeded hydrological flow in tributaries and rivers where the pipeline intersects.	Project Level	Medium-Long term	Possible	Severe	MODERATE	<ul style="list-style-type: none"> Water bodies within 32 meters of the route must be demarcated and must not be accessible during construction. All trenches dug within 32 meters of any water body must be rehabilitated in full. 	LOW

Impacts	Spatial Scale (Duration)	Temporal Scale	Certainty Scale (Likelihood)	Severity	Significance Pre-mitigation	Mitigation	Significance Post mitigation
						<ul style="list-style-type: none"> No work camp or any other temporary construction infrastructure must be erected within 32 meters of any water body. 	
Excessive damage to surrounding biodiversity due to unrestricted construction activities and vehicular movement within the forest sections.	Localized	Short-term	Definite	Moderately severe	MODERATE	<ul style="list-style-type: none"> Construction activities must be restricted within the existing cleared pipeline route within the forest sections. An ECO must be on site twice a week or more during construction in the Alexandria & Coastal forests to monitor construction activities. No work camp or any other temporary construction infrastructure must be erected in or within 100 m of any forest section. 	LOW
Site, site camps, storage facilities and ablution facilities may impact on vulnerable Alexandria forest through inappropriate waste management (litter, sewage and hydrocarbon pollution) and potential break-away fires.	Project level	Short-term	Possible	Severe	HIGH	<ul style="list-style-type: none"> Camps and ablution facilities are to be placed in currently impacted areas, at least 100 meters away from any forest area. An appropriate waste management programme must be implemented throughout the construction phase. Fires for cooking must be located within an enclosed, demarcated area. 	LOW

Impacts	Spatial Scale (Duration)	Temporal Scale	Certainty Scale (Likelihood)	Severity	Significance Pre-mitigation	Mitigation	Significance Post mitigation
						<ul style="list-style-type: none"> No fires will be allowed in the Alexandria forest. Fire-fighting equipment must be kept onsite in order to contain an accidental fire. 	
Indirect Impacts							
Building unnecessary access roads may result in high level surface erosion of these tracks.	Project level	Long term	Probable	Severe	MODERATE	<ul style="list-style-type: none"> Ensure that current road infrastructure is used to access remote areas of the pipeline layout. 	LOW
Soil erosion on steep slopes due to disturbance of highly erosive soils and poor rehabilitation.	Project area	Medium-Long term	Possible	Severe	HIGH	<ul style="list-style-type: none"> Ensure that construction sites are stabilised and soil is prevented from unnecessary exposure. Implement vegetation re-establishment as part of a detailed Rehabilitation Plan. 	MODERATE
Cut and fill of soil on steep slopes within the Alexandria forest section may affect protected trees.	Localised	Long term	Possible	Severe	HIGH	<ul style="list-style-type: none"> Avoid cut and fill of soil on steep slopes within the Alexandria forest where protected trees will be affected. 	LOW

7. CONCLUSIONS

7.1. Project background

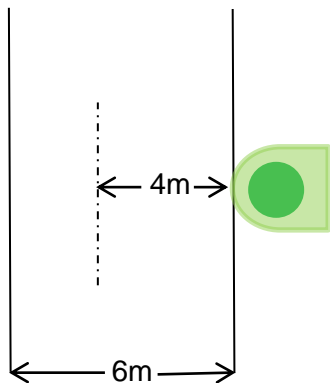
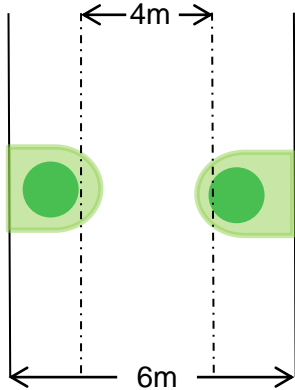
Amatola Water has been appointed by the Department of Water Affairs (DWA), on behalf of Ndlambe Municipality, to upgrade the existing bulk water reticulation from Cannon Rocks to Alexandria within the Ndlambe Municipality in the Eastern Cape Province of South Africa.

This project entails replacing the existing 23 km water supply pipeline with a new pipe. The pipeline will supply the town of Alexandria of bulk water.

7.2. Summary of findings

The following general issues are relevant:

- The main impacts identified will occur during the planning and construction phases which can be described as direct, short to medium term impacts.
- The risk of impacts within the Alexandria and Coastal forests were considered the most significant and is associated with potential vegetation removal.
- The risk associated with accessing the pipeline route with construction and maintenance equipment (large and heavy earth moving equipment like TLB's) are considered significant in terms of promoting surface erosion.
- The "No-go" alternative would naturally result in lower impacts.
- No alternative bulk water pipeline route was assessed since the proposed development constitutes the upgrade of an existing pipeline for most of the 23.2 km route. Only a small 8.39 km section close to Cannon Rocks constitutes a new pipeline.
- The following scenarios and mitigation measures must be implemented during the widening of the existing 4 m cleared pipeline route in the forest areas:

Scenario 1	
	<ul style="list-style-type: none"> Sections containing protected trees on one side of the existing 4 m cleared pipeline route must be expanded in the opposite direction to avoid impacting the tree/s. No trenches or stored topsoil must be placed within 2 m of any protected tree/s. These 2 m buffers must be clearly marked with tape and completely removed afterwards. Trimming of any protected trees will only be allowed if a legal trimming permit was obtained. Manual labour can also be used.
Scenario 2	
	<ul style="list-style-type: none"> Sections containing protected trees on both sides of the existing cleared pipeline route must be kept at the existing width of 4 m to avoid damaging protected trees. Manual labour must be used in these sections. No trenches or stored topsoil must be placed within 2 m of any protected tree. These 2 m buffers must be clearly marked with candy tape and completely removed afterwards. Trimming of these trees will only be allowed if a legal trimming permit was obtained.

7.3. Opinion of the Ecological Specialist

After due consideration of all the identified impacts associated with the vegetation and sensitive environments, it is the opinion of the author that the impacts identified can be mitigated to an acceptable level and that, given that the recommendations and measures are implemented, the project would not pose a serious threat to the surrounding natural vegetation or water-related environments.

Although alternative routes were considered they were deemed to be more sensitive due to being a new pipeline route compared to the existing pipeline route and as such was not assessed. It is the opinion of the author that the proposed layout will have the least impact on the surrounding environment as it is merely replacing an existing pipeline traversing the same cleared route. A new/alternative pipeline route would require further clearing of natural vegetation.

Traversing the Alexandria and Coastal forests will require specific mitigations to avoid unnecessary and permanent impacts on the surrounding natural forest vegetation.

An alternative to burying the new pipeline below ground is to install the pipeline above ground on a pedestal structure. This may reduce impacts on the surrounding environment, especially in the forest sections. Various advantages and disadvantages between the two alternatives are compared below.

Table 7.1. Comparison between above ground and below ground installation of the pipeline within the Alexandria forest section.

Issue	Above ground installation of pipeline		Below ground installation of pipeline	
	Advantages	Disadvantages	Advantages	Disadvantages
Possibility of vandalism	-	High	Low	-
Accessibility for maintenance	Easy access to the pipe	-	-	Difficult access for maintenance.
Additional support	-	Unnecessary stresses and possible sagging of the pipeline.	No additional support required	-
Leakage	Minimum leakage as pipe can be easily fixed.	-	-	Pipe needs to be excavated before leak is fixed. Digging may incur damage to the surrounding environment if done incorrectly.
Cleared route through the Alexandria forest	Requires minimum clearance through the forest during construction (max. 4m)	-	-	A minimum clearance of 6m is required during the construction phase.

7.4. Mitigation measures

- All mitigation measures outlined in this report need to be taken into account and implemented as part of the Environmental Management Programme (EMPr).
- Incorporation of the mitigation measures provided below will ensure proper route planning.
- Appoint an independent Environmental Control Officer (ECO) for the duration of the construction to monitor construction activities.
- Micro-siting of the final pipeline layout must be approved by the ECO.
- Ensure that construction activities are limited to the pipeline route.
- Alternative methods such as above ground installation or manual labour for trenching for below ground pipeline may be used within the natural forest sections to avoid the need to widen the existing cleared pipeline route.
- If widening of the existing cleared pipeline route is required, consult with SANParks and DWAF (Mr Tabo Nokoya) to determine if and what permit applications are required.
- All relevant permits must be obtained before removal/trimming/destruction of any protected species takes place.
- When widening the route, every effort must be made to avoid protected species and species of special concern. This includes reducing clearance to 4 m, using manual labour and clearance route re-alignment in affected sections (See scenario illustrations and mitigations in Section 7.2).
- If possible, transplant any impacted trees. Sapling and seedlings especially must not be destroyed but rather removed and transplanted.

- The maximum total width that the cleared pipeline route may be widened to is 6 m.
- Water bodies within 32 meters of the route must be demarcated and must not be accessible during construction.
- All trenches dug within 32 meters of any water body must be rehabilitated in full.
- No work camp or any other temporary construction infrastructure must be erected within 32 meters of any water body.
- Construction activities must be restricted within the existing cleared pipeline route within the forest sections.
- An ECO must be on site twice a week or more during construction in the Alexandria & Coastal forests to monitor construction activities.
- No work camp or any other temporary construction infrastructure must be erected in or within 100 m of any forest section.
- Camps and ablution facilities are to be placed in currently impacted areas, at least 100 meters away from any forest area.
- An appropriate waste management programme must be implemented throughout the construction phase.
- Fires for cooking must be located within an enclosed, demarcated area.
- No fires will be allowed any natural forest.
- Fire-fighting equipment must be kept onsite in order to contain an accidental fire.
- Ensure that current road infrastructure is used to access remote areas of the pipeline layout.
- Ensure that construction sites are stabilised and soil is prevented from unnecessary exposure.
- Implement vegetation re-establishment as part of a detailed Rehabilitation Plan.
- Avoid cut and fill of soil on steep slopes within the Alexandria forest where protected trees will be affected.

END