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WETLAND IMPACT ASSESSMENT  
PROPOSED SALDANHA BAY NETWORK STRENGTHENING PROJECT  
WESTERN CAPE PROVINCE

OCTOBER 2016



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## Declaration

I Rowena Harrison, declare that -

- I act as the independent specialist in this matter;
- I do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act (Act 107 of 1998)(NEMA), regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the NEMA Act, regulations and all other applicable legislation;
- As a registered member of the South African Council for Natural Scientific Professions in terms of the Natural Scientific Professions Act, 2003 (Act No. 27 of 2003), I will undertake my profession duties in accordance with the Code of Conduct of the Council, as well as any other societies of which I am a member; and
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority; all the particulars furnished by me in this report are true and correct.

Signature of the specialist:



Date: 01/10/2016

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## EXECUTIVE SUMMARY

Afzelia Environmental Consultants (Pty) Ltd was appointed by Savannah Environmental (Pty) Ltd to undertake a wetland assessment for the proposed development of the Saldanha Bay Network Strengthening Project, Western Cape Province.

Three fundamental issues are addressed in this assessment:

- Groundtruthing of wetlands identified during the Scoping Phase of the assessment;
- The status quo of the identified wetlands, the impact on these wetlands of the existing land uses within the catchment, existing topography, existing surface soil conditions, and surface substrata forms.
- The projected impact of the Saldanha Bay Network Strengthening project on the current functional integrity of the wetland areas;
- Recommended mitigation measures to lessen the identified impacts of the project on the wetland systems.

The main findings of this report have been summarised below:

- i. A desktop and field investigation identified the presence of eight wetland systems within the study area. The wetlands were classified into separate hydrogeomorphic (HGM) units, comprising of six endorheic depression wetlands and two unchannelled valley bottom wetlands.
- ii. An initial desktop Level 1 health assessment (conducted during the Scoping Phase) of the wetlands categorised the depressions as moderately modified (PES Category C) and the unchannelled valley bottom wetlands as largely modified (PES Category D).
- iii. These scores were then evaluated during a field investigation in this EIA phase report. The unchannelled valley bottom wetlands were identified within the West Coast Fossil Park. As this is a National Heritage Site according to Section 27(5) of the National Heritage Resources Act (Act 25 of 1999) and a paleontologically active area the wetland systems could not be accessed and were therefore not assessed in this report. These wetlands will however not be impacted upon by the proposed project as they occur within a minimum distance of over 1km from the alternative power line corridors.
- iv. The Level 2 health assessment conducted for the depression wetlands (according to the WET-Health methods) categorised the wetlands as moderately modified (PES Category C) as per the Level 1 (Scoping Phase) investigation.
- v. Modifications to the wetlands are minor and stem from agricultural activities including grazing which has decreased the basal cover within the wetland systems. No erosion was noted at any of the wetland sites largely due to the flat topography of the area and the very sandy nature of the soils present.
- vi. The Ecological Sensitivity and Importance of the wetlands has been recorded as medium. Although no red-data floral species were identified in the depression systems, the generally high vegetation basal cover surrounding the wetland systems provides habitat for faunal and avifaunal species to utilise the larger ecosystems for protection, feeding and breeding.
- vii. A 21m buffer width is recommended to protect the identified wetland systems. This buffer must be enforced during the construction and operational phases of the proposed project.

- viii. The impact assessment identified that no direct impacts would occur on the delineated wetland systems. None of the alternative Distribution substation or Transmission substation sites will have a direct impact on the wetlands, with the closest wetland occurring approximately 520m away.
- ix. None of the alternative power lines corridors will have a direct impact on any of the wetlands delineated as they do not pass over these areas. All corridor alternatives will have no direct impact on any of the substation sites.
- x. Indirect impacts are highly unlikely due to the flat nature of the whole project area and the very sandy soils, which decreases the likelihood of any runoff from the construction sites entering into any of the wetland systems.
- xi. Best practice guidelines for general construction activities within the area must however be enforced in an Environmental Management Programme.

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## 1. INTRODUCTION

### 1.1 Background and Locality of the assessment

Afzelia Environmental Consultants (Pty) Ltd was appointed by Savannah Environmental (Pty) Ltd to undertake a wetland assessment for the proposed development of the Saldanha Bay Network Strengthening Project, Western Cape Province. The proposed project involves the following:

- Construction of a new 400/132kV Transmission Substation (Tx) with a planned capacity of 3 x 500 MVA transformers;
- Construction of a new 132/66kV Distribution Substation (Dx) near the current Blouwater Substation;
- The construction of two 400kV power lines (approximately 35 - 40 km long) from the Aurora Station to the new proposed Dx and Tx substations;
- Replacing two of the four existing 250 MVA transformers with 2 x 500 MVA transformers, as well as new 400 / 132 kV transformers;
- Establishing 2 x 132 kV feeder bays at Aurora Substation.

### 1.2 Scope of work

The scope of work entailed the following:

- Groundtruthing the presence and extent of wetlands identified during the Scoping Phase of the assessment according to the methods contained in the manual 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas' (DWAF, 2005);
- Assess and describe the health and functional integrity of any wetland units identified, through evaluation of indicators based on geomorphology, hydrology and vegetation as per the WET-Health and WET-EcoServices Level 2 methods;
- Assess and describe the Ecological Importance and Sensitivity of any wetlands identified on site, based on the presence of red data species; variety of habitats for faunal diversity; the health of the wetland and ecosystem benefits the wetland provides as per the Health Index of Habitat Integrity (DWAF, 2007);
- Identify potential impacts on the wetlands from the proposed project and assess the significance of these impacts;
- Provide recommended mitigation measures for the identified impacts in order to avert or lower the significance of negative impacts.

### 1.3 Assumptions and Limitations

It is difficult to apply pure scientific methods within a natural environment without limitations, and consequentially assumptions need to be made. The following constraints may have affected this assessment –

- The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information regarding the perceived impacts on the wetlands.
- A hand held Garmin etrex 20x GPS used to delineate the wetland and riparian channels had an accuracy of 3-5m;
- The results of the wetlands' functional, health and ecological sensitivity assessments are based on a five day site investigation from the 1<sup>st</sup> to the 5<sup>th</sup> of February 2016. Site visits should ideally be conducted over differing seasons in order to better understand the hydrological and geomorphologic processes

governing the wetlands' systems as well as the use of the wetlands by both the surrounding community and faunal species.

- Vegetation was not relied upon as a wetland indicator due to large scale disturbance to species composition within parts of the study area as well as the timing of the assessment, i.e. dry period. The delineations of wetland systems therefore relied heavily on soil indicators as well as topographic positions.
- The unchannelled valley bottom wetlands were identified through the NFEPA GIS database and are located within the West Coast Fossil Park. As this is a National Heritage Site according to Section 27(5) of the National Heritage Resources Act (Act 25 of 1999) and a paleontologically active area the wetland systems could not be accessed and were therefore not assessed in this report. These wetlands will however not be impacted upon by the proposed project as they occur within a minimum distance of 960m from the closest proposed alternative 1 power line corridor.

## 2. METHODOLOGY

For the purpose of this assessment, wetlands are considered as those ecosystems defined by the National Water Act as:

“land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.”

### 2.1 Desktop Assessment

The desktop study conducted during the initial Scoping Phase assessment involved the assessment of aerial photography, GIS databases including the NFEPA and South African National Wetland maps as well as literature reviews of the study site in order to determine the likelihood of wetland areas within the area. The study made use of the following data sources:

- Google Earth™ satellite imagery was used at the desktop level;
- Geographic Information System data from the Surveyor General was used to determine the presence of watercourses, NFEPA wetlands, and quaternary catchments associated with the study area;
- A classification of the vegetation types in the study area was obtained from Mucina & Rutherford (2006) and Scott-Shaw and Escott, (2011);
- In field data collection was taken over five days from the 1<sup>st</sup> to the 5<sup>th</sup> of February 2016.

### 2.2 Field Assessment

A field investigation of the identified wetlands was undertaken in February 2016. The wetland delineations were conducted as per the procedures described in 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas – Edition 1' (Department of Water Affairs, 2005). This document requires the delineator to give consideration to four indicators in order to find the outer edge of the wetland zone:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur.



- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation. Signs of wetness are characterised by a variety of aspects. These include marked variations in the colours of various soil components, known as mottling; a gleyed soil matrix or the presence of Fe/Mn concretions. It should be noted that the presence of signs of wetness within a soil profile is sufficient to classify an area as a wetland area despite the lack of other indicators.
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

In assessing whether an area is a wetland, the boundary of a wetland or a non- wetland area should be considered to be the point where the above indicators are no longer present. An understanding of the hydrological processes active within the area is also considered important when undertaking a wetland assessment. Indicators should be 'combined' to determine whether an area is a wetland, to delineate the boundary of that wetland and to assess its level of functionality and health.

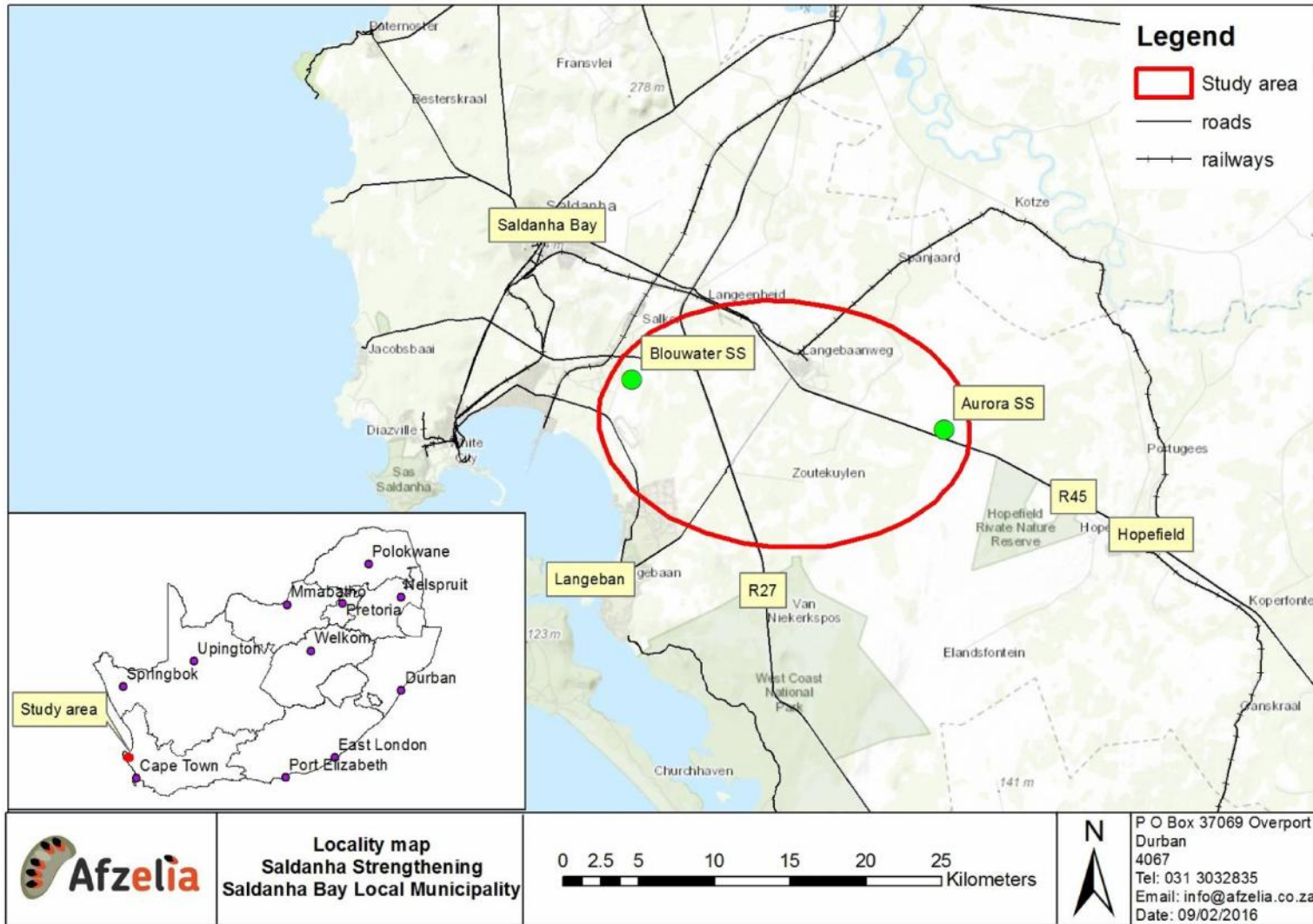


Figure 1: Locality of the project area associated with the Saldanha Bay Strengthening Project

### 3. RESULTS

#### 3.1 Background information of the study area

##### 3.1.1 Climate

The climate for the Langebaan-Saldanha area, is characterised by hot, dry summers and cool, wet winters. Mean annual rainfall that falls mainly in winter is about 265 mm – 330 mm per annum, and mean monthly temperatures range between 7.1°C -14.9°C (minimum) and 18.4°C- 27.5°C (maximum). Strong winds occur regularly, predominantly from the south (Mucina and Rutherford, 2006; CSIR, 2011).

##### 3.1.2 Vegetation

The study site falls into four different vegetation types, namely the Saldanha Flats Strandveld, which is the dominant vegetation type; the Saldanha Limestone Strandveld which is situated along the western edge of the site; the Saldanha Granite Strandveld located along the southern section of the site; and the Hopefield Sand Fynbos Vegetation along the northern boundary.

The Saldanha Flats Strandveld is situated in the Western Cape Province coastal flats from St Helena Bay to Saldanha and Langebaan. It consists of Sclerophyllous shrublands with a sparse emergent and moderately tall shrub layer with an open succulent shrub layer forming the undergrowth. The vegetation type is considered endangered with more than half transformed for cultivation, road building or by urban development (Mucina and Rutherford, 2006).

The different vegetation types are structurally very similar and all consist of low shrub land and fynbos with varying amounts of grass, succulents, forbs and geophytes depending on the aspect and landscape position. All vegetation types are considered endangered with land transformation as a result of cultivation, development of coastal settlements and roads (Mucina and Rutherford, 2006).

##### 3.1.3 Geology

The study area is situated on a coastal plain that consists of the tertiary fossiliferous calcretes of the Elandsfontein formation, with surface deposits of calcareous and quartzose sands. This sand is cohesionless, quartzitic and of aeolian origin. Quaternary deposits of the Langebaan formation which consist of calcrete capped dune sands are also located throughout the majority of the site and support the Saldanha Flats Strandveld vegetation type. The underlying sand is cohesionless, quartzitic and of aeolian origin (CSIR, 2011).

##### 3.1.4 Catchment characteristics

The study area is situated within the G10M quaternary catchment which is part of the Lower Berg Sub Water Management Area, and the Berg Water Management Area. The Berg water management area commands the south-western corner of South Africa. The Berg River is the only major river in the water management area, although there are several smaller rivers and streams draining to the ocean. Several large dams and

numerous farm dams regulate the surface runoff from the water management area (National Water Resource Strategy, 2004).

### 3.1.5 NFEPA

Examination of the National Freshwater Ecosystem Priority Areas (NFEPA)'s databases was undertaken for the proposed project. The NFEPA project aims to produce maps which provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. They are identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries (Macfarlane et al., 2009). Identification of FEPA Wetlands is based on a combination of special features and modelled wetland conditions that include expert knowledge on features of conservation importance as well as available spatial data on the occurrence of threatened frogs and wetland-dependant birds.

The examination of the FEPA GIS database showed that a number of Freshwater Ecosystem Priority Area wetlands are present in the study area (Figure 2). The wetlands within the study are classified as:

- Two unchannelled valley bottom wetlands
- Three depressions

These wetlands have been classified as FEPA wetlands as a result of the largely natural condition with a wetland health condition of C (moderately modified). The FEPA wetlands within the study site are further considered to be within a sub-quatarnary catchment that contains wetlands of exceptional biodiversity importance. The NFEPA wetland map was used in the initial Scoping Phase assessment for the desktop delineation of wetlands within the study site. The EIA phase involved ground-truthing the existence and condition of these wetlands in order to better understand the local conditions which are having an impact on the wetland systems, their functional integrity and health. The functional and health assessments are detailed in Section 4 of this report.

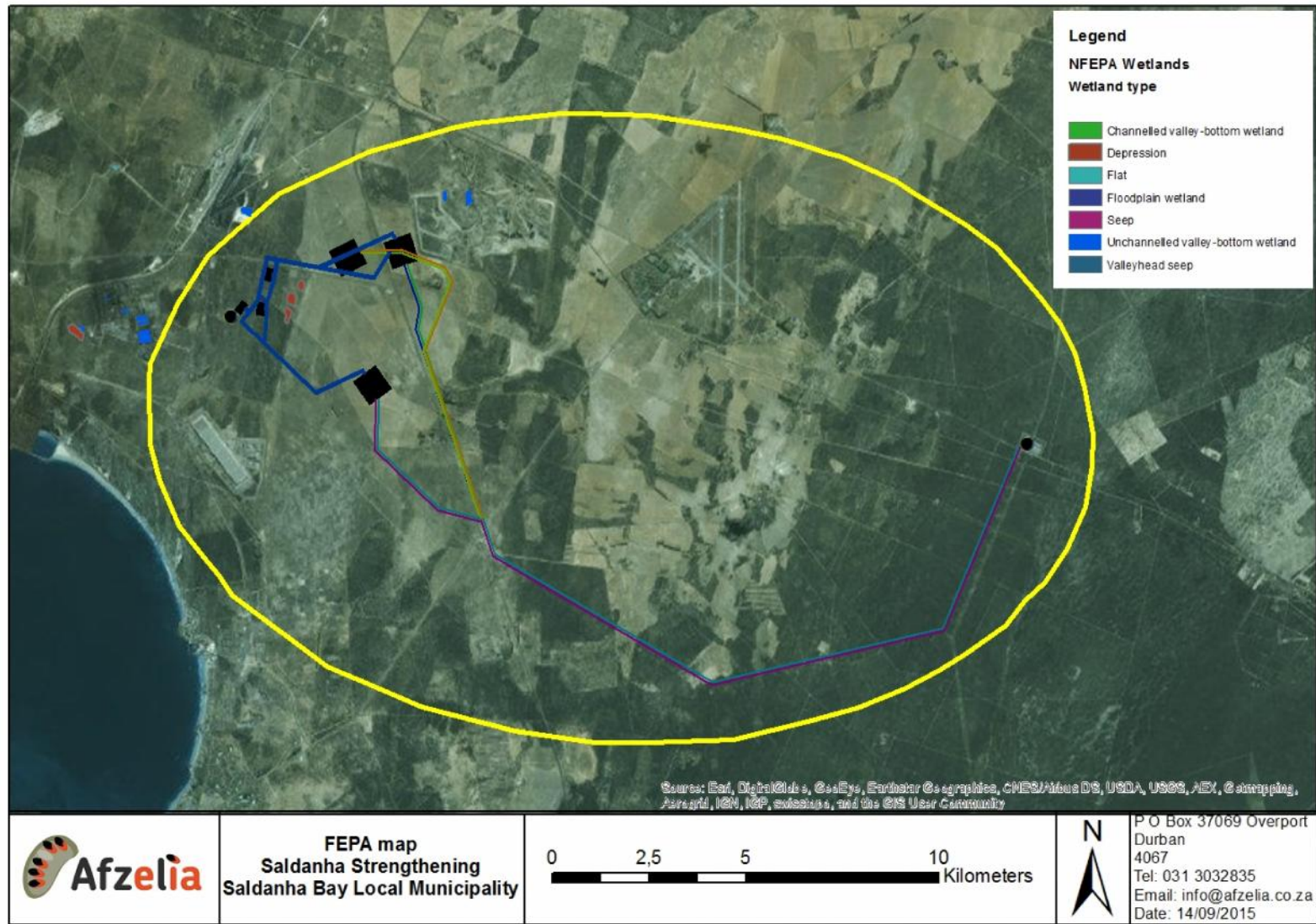


Figure 2: FEPA wetlands

### 3.2 Wetland indicators

Four wetland indicators were used during the field investigation to determine the presence or absence of wetlands within the study site and particularly along the alternative power line corridors and substation sites. The indicators are:

- Soil wetness and soil form;
- Vegetation;
- Topography.

#### 3.2.1 Soil wetness and soil form indicator

The majority of soils identified in the project area were cohesionless, quartzitic and of aeolian origin. The topsoil was devoid of any organic matter due to the highly aerated conditions found in these sandy soils which tends to oxidise organic matter and hence carbon in the soil (Brady, 1974).

Soils identified in the pan systems were characterised by a soft carbonate horizon and were calcic in nature. These soils are often found in depression systems and are moderately deep to deep overlying soft or hard calcrete. Hydric properties were not observed in the soil profile however at a depth of approximately 800mm the soil profile became saturated. Soil properties recorded on site are summarised in Table 1.

Table 1: Information used to inform the wetland assessment

Soil Form and Horizons		Defining Soil colour	Soil Texture	Zone of wetness	Observations
Brandvlei	Orthic A	10YR 8/2	Sand	Seasonal and temporary zone	No mottling observed within the soil profile, however soil saturation increased with profile depth. At approximately 800mm water was noted within the core sample taken.
	Soft Carbonate Horizon				
Cohesionless sand	Regic sand with a limited A horizon or no A horizon at all	10YR 5/3	sand	None	Unstructured sand identified throughout the majority of the study site, no hydric properties identified in any of the soil samples taken.



Photograph 1: Soft Carbonate Horizon



Photograph 2: Saturated soft carbonate horizon



Photograph 3: Cohesionless quartzite sands which dominate the project site

### 3.2.2 Vegetation indicator

According to DWAF (2005), vegetation is regarded as a key component to be used in the delineation procedure for wetlands. Vegetation also forms a central part of the wetland definition in the National Water Act, Act 36 of 1998. Using vegetation as a primary wetland indicator requires undisturbed conditions (DWAF, 2005) however agricultural activities have had an impact on vegetation cover within the study area making it difficult to rely on vegetation as a wetland indicator (Photograph 4 and 5).

No hydrophytic species were identified along any of the corridor alternatives or substation site alternatives investigated. General species composition was dominated by Euphorbia species such as Euphorbia mauritanica, Euphorbia tuberosa and Euphorbia caput-medusae as well as Asparagus capensis (Katdoring) and Eriocephalus africanus (Wild rosemary) (Photograph 6). One vulnerable species Leucospermum



hypophyllocarpodendron and one endangered species *Cephalophyllum rostellum* were identified in the study site. *Acacia cyclops* (red-eyed wattle) was the only alien species identified.



Photograph 4: Dry and disturbed conditions in parts of the study area



Photograph 5: Lack of hydrophytic vegetation within the depression systems



Photograph 6: General vegetation of parts of the study area

### 3.2.3 Terrain Unit Indicator

The topography of an area is generally a good practical indicator for identifying those parts in the landscape where wetlands are likely to occur. Generally, wetlands occur as a valley bottom unit however wetlands can also occur on steep to mid slopes where groundwater discharge is taking place through seeps (DWAF, 2005). In order to classify a wetland, the localised landscape setting must be taken into consideration through ground-truthing of the study site after initial desktop investigations (Ollis et al., 2014)

The study site can be characterised as a coastal plain with a relatively flat topography with altitude ranges of 16m to 80m. An investigation of the aerial photography of the site revealed a number of depressions characterised by their closed contour shape (Figure 3). These areas identified during the desktop assessment were then assessed in more detail during the field investigation and confirmed to be endorheic depression systems.



Figure 3: Aerial photograph of part of the study area showing the depression wetlands

### 3.3 Wetland delineation

The wetlands identified during the Scoping Phase and ground-truthed in the field investigation were categorised according to the National Wetland Classification System for South Africa (SANBI, 2009) into different hydrogeomorphic (HGM) units. An HGM unit is a recognisable physiographic wetland-unit based on the geomorphic setting, water source of the wetland and the water flow patterns (Macfarlane et al., 2008). Six depression wetland systems and two unchannelled valley bottom wetlands were identified throughout the study site (Figure 4 and Figure 5).



Depressions are wetland systems with closed (or-near closed) elevation contours which increases in depth from the perimeter to a central area of greatest depth and within which water typically accumulates. Depressions may have any combination of inlets and outlets or lack them completely (Ollis et al., 2013). The depressions identified in the project area do not have any inflow or outflow and can be described as 'isolated depressions' or endorheic<sup>1</sup> in nature.

Unchannelled valley bottom wetlands are characterised by their location on valley floors and the absence of distinct channel banks and the prevalence of diffuse flows. These wetlands are generally formed when a river or stream channel loses confinement and spreads out over a wider area causing the concentrated flow associated with a river

<sup>1</sup> Endorheic depressions are inward draining with no transport of water into downstream systems via subsurface or surface flow. Water leaves via evapotranspiration and infiltration only (Ollis et al., 2013).

channel to change to diffuse flow (Ollis et al., 2013). A description of all wetland types is given in Table 2.

Table 2: Wetland hydrogeomorphic (HGM) types (Kotze et al., 2008; Ollis et al., 2013)

HGM Unit	Description	Source of water maintaining the wetland <sup>2</sup>	
		Surface	Subsurface
Unchannelled Valley bottom 	Valley bottom areas with no clearly defined stream channel usually gently sloped and characterized by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	* / ***
Depression 	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	* / ***	* / ***

<sup>2</sup> Precipitation is an important water source and evapotranspiration an important output in all of the above settings

Water source:

\* Contribution usually small

\*\*\* Contribution usually large

\* / \*\*\* Contribution may be small or important depending on the local circumstances

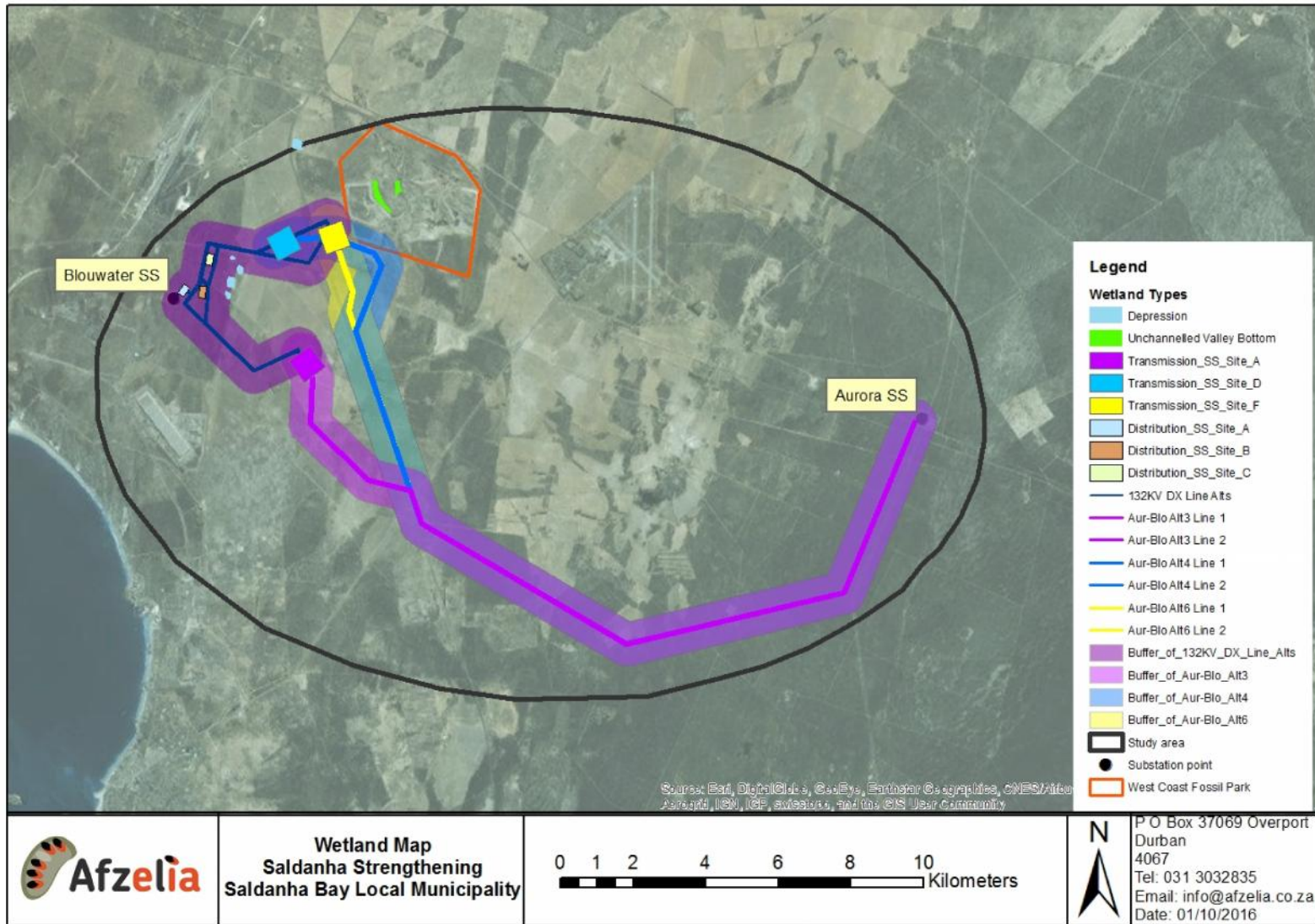


Figure 4: HGM units delineated

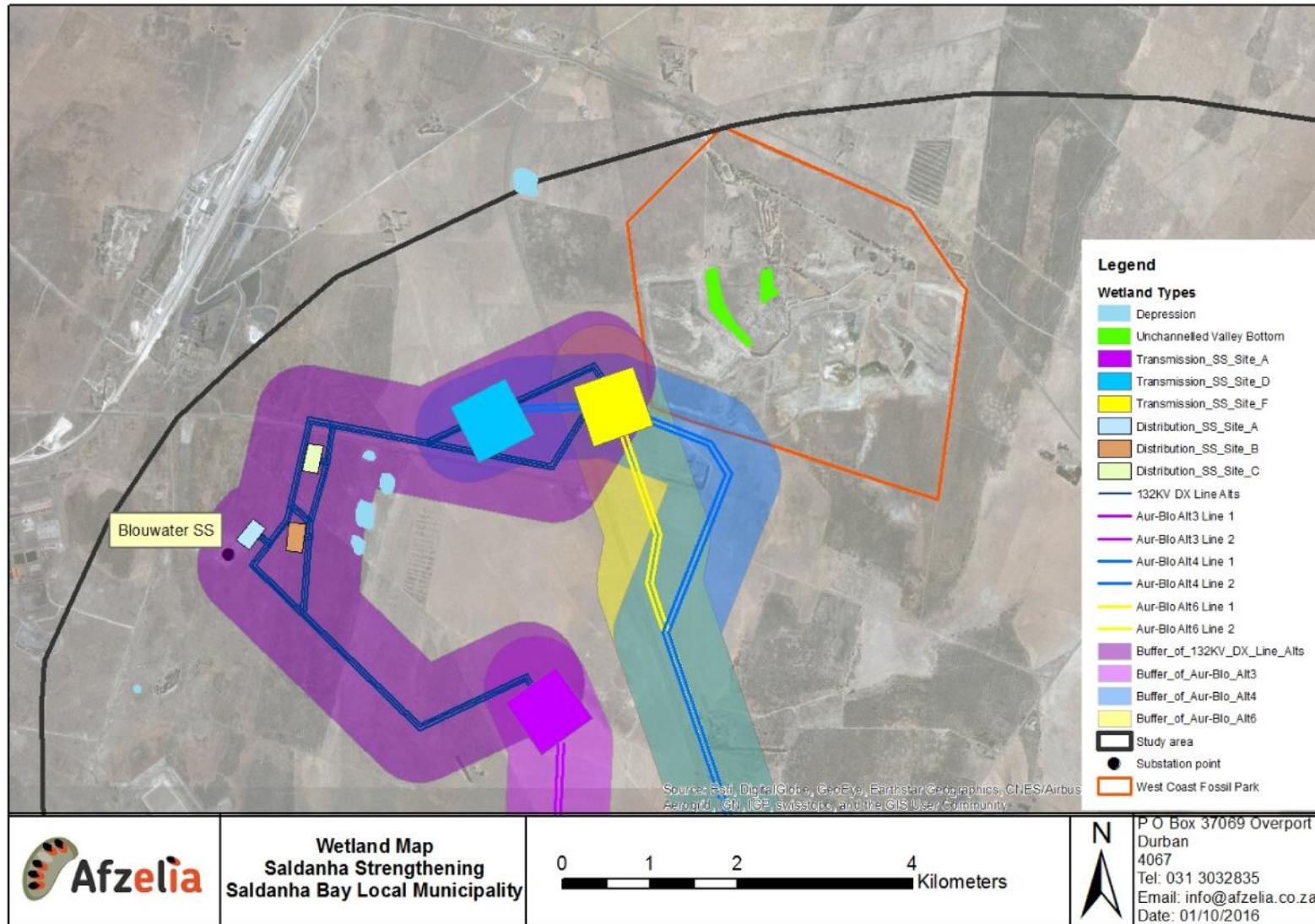


Figure 5: Map at finer scale showing the delineated Depression and Unchannelled Valley Bottom Wetlands

#### 4. WETLAND FUNCTIONAL AND HEALTH ASSESSMENT

Wetlands within the study area serve to improve habitat within and potentially downstream of the study area through the provision of various ecosystem services.

These ecosystem services relate to:

- Flood attenuation;
- Streamflow regulation;
- Water purification (including sediment trapping and the assimilation of phosphates, nitrates and toxicants);
- Carbon storage;
- Maintenance of biodiversity;
- Provision of water for human and agricultural use;
- Cultural benefits (including tourism, recreation and cultural heritage).

Wetlands therefore affect the quantity and quality of water within a catchment (Mitsch and Gosselink, 1993). The importance of wetland conservation and sustainable management is directly related to the value of the functions provided by a wetland (Smathkin and Batchelor, 2005); (Table 3) and these functions need to be assessed in order to make more informed decisions regarding management and rehabilitation of wetlands within a study site.

An indication of the functions and ecosystem services provided by wetlands is assessed through the WET-EcoServices manual (Kotze et al., 2008) and is based on a number of characteristics that are relevant to the particular benefit provided by the wetland. A Level 2 WET-EcoServices assessment was undertaken for the endorheic depression wetlands occurring in the project area. A Level 2 assessment is the highest WET-EcoServices assessment that can be undertaken and involves an on-site assessment as well as desktop work.

Each wetland's ability to contribute to ecosystem services within the study area is further dependant on the particular wetland's Present Ecological State (PES) in relation to a benchmark or reference condition. A Level 2 Wetland Health assessment was conducted on the wetlands delineated as per the procedures described in 'Wet-Health: A technique for rapidly assessing wetland health' (MacFarlane et al., 2008). This document assesses the health status of a wetland through evaluation of three main factors -

- ❖ Hydrology: defined as the distribution and movement of water through a wetland and its soils.
- ❖ Geomorphology: defined as the distribution and retention patterns of sediment within the wetland.
- ❖ Vegetation: defined as the vegetation structural and compositional state.

The WET-Health tool evaluates the extent to which anthropogenic changes have impacted upon wetland functioning or condition through assessment of the above-mentioned three factors. Scores range from 0 indicating no impact to a maximum of 10 which would imply that impacts had completely destroyed the functioning of a particular component of the wetland. Impact scores obtained for each of the modules reflect the degree of change from natural reference conditions (Table 3).

Table 3: Guideline for interpreting the magnitude of impacts on wetland integrity

IMPACT CATEGORY	DESCRIPTION	RANGE
None	No discernible modification or the modification is such that it has no impact on wetland integrity.	0 – 0.9
Small	Although identifiable, the impact of this modification on wetland integrity is small.	1 – 1.9
Moderate	The impact of this modification on wetland integrity is clearly identifiable, but limited.	2 – 3.9
Large	The modification has a clearly detrimental impact on wetland integrity. Approximately 50% of wetland integrity has been lost.	4 – 5.9
Serious	The modification has a clearly adverse effect on this component of habitat integrity. Well in excess of 50% of the wetland integrity has been lost.	6 – 7.9
Critical	The modification is present in such a way that the ecosystem processes of this component of wetland health are totally / almost totally destroyed.	8 – 10

The tool evaluates the health of the wetland, which is determined by a score known as the Present Ecological Score. The health assessments for the hydrology, geomorphology and vegetation components are then represented by the Present Ecological State (PES) categories. The PES categories are divided into six units (A-F) based on a gradient from “unmodified/natural” (Category A) to “severe/complete deviation from natural” (Category F) as depicted in Table 4.

Table 4: Health categories used by WET-Health for describing the integrity of wetlands

DESCRIPTION	IMPACT SCORE	HEALTH CATEGORY
Unmodified, natural.	0 – 1.0	A
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.1 - 2.0	B
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2.1 - 4.0	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4.1 - 6.0	D
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6.1 - 8.0	E
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.1 - 10.0	F



Since hydrology, geomorphology and vegetation are interlinked their scores are aggregated to obtain an overall PES health score using the following formula (MacFarlane et al., 2008):

$$\text{Health} = ((\text{Hydrology score}) \times 3 + (\text{Geomorphology score}) \times 2 + (\text{Vegetation score}) \times 2) \div 7$$

This gives a score ranging from 0 (pristine) to 10 (critically impacted in all respects). Hydrology is weighted by a factor of 3 since it is considered to have the greatest contribution to wetland health.

Due to differences in the pattern of water flow through different hydro-geomorphic (HGM) type, the tool requires that the wetland is divided into distinct HGM units at the outset. Ecosystem services for each HGM unit are then assessed separately.

#### 4.1 Scoping phase assessment summary

A level one functional and health assessment was undertaken as part of the Scoping Phase report through the WET-Health tools (Macfarlane et al., 2009). The purpose of this EIA report is to update the findings of this assessment according to the Level 2 (field assessment) methods of the WET-Ecoservices and WET-Health tools.

The scoping phase assessment categorised the endorheic depressions as moderately modified (PES Category C) as a result of impacts stemming from agricultural activities including grazing, and cultivation which has led to the removal of vegetation as well as soil mixing which causing a desiccation of the soil changing the hydrology of the pan systems.

The findings of the Level 1 (desktop) health assessment for the unchannelled valley bottom wetlands categorise the wetlands as largely modified (PES Category D). Modifications to the unchannelled valley bottom wetlands are predominantly as a result of a phosphorus mine which was operational in the area up until 1993.

The unchannelled valley bottom wetlands were identified through the NFEPA GIS database and are located within the West Coast Fossil Park. Access was gained to the Park (Photograph 7) however as this is a National Heritage Site according to Section 27(5) of the National Heritage Resources Act (Act 25 of 1999) and a paleontologically active area the wetland systems could not be accessed and were therefore not assessed as part of this report. The probability of any impact on these wetland systems as a result of the proposed project is highly unlikely as the minimum distance between the wetlands and the closest Alternative Corridor (Alternative 1) is 960m.



Photograph 7: West Coast Fossil Park.

#### 4.2 EIA Phase assessment

Due to the similarities in the functional integrity of the wetlands as well as the similarity in the impacts these wetlands are subject to, the endorheic depressions were assessed as one unit so as not to duplicate scores.

##### 4.2.1 Depression wetlands

The endorheic depressions (Photograph 8) were all delineated in the north-western area of the larger project site, in the vicinity of substation site Alternative B and C as well as the Dx substation sites. As shown in Figure 6 these depressions contribute to sediment trapping; phosphate, nitrate and toxicant removal, the maintenance of biodiversity and erosion control within the catchment area.

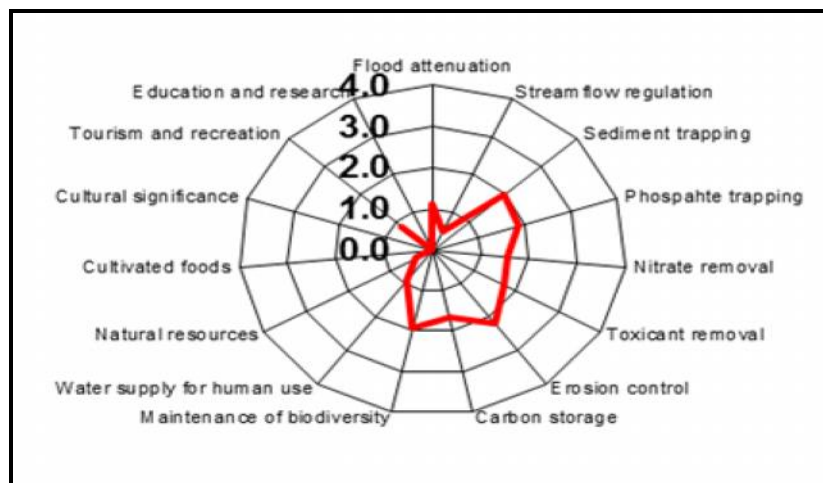


Figure 6: General WET-Eco Services results

The depression systems were assessed in terms of wetland health and can be categorised as moderately modified (PES Category C; Table 5). Hydrology and

geomorphology scores are largely natural. Modifications to these systems are therefore predominantly related to a decrease in basal cover as a result of grazing.

Table 5: Summary of PES score for all endorheic depression systems

Hydrology	Geomorphology	Vegetation	Present Ecological Score (Category)
1.5	1.1	4.0	C (2.55)

The Ecological Importance and Sensitivity<sup>3</sup> of the wetlands have generally been recorded as being medium (Table 6). Although no red-data floral species were identified in the depression systems, the generally high vegetation basal cover surrounding the wetland systems provides habitat for faunal and avifaunal species to utilise the larger ecosystems for protection, feeding and breeding.

The Hydrological Functional Importance of the seep has been recorded as low-medium. As already discussed this wetland provides a number of ecosystem functions particularly with regard to sediment trapping and filtering processes. Human uses are related to agriculture and the use of the areas for grazing.

Table 6: Summary of the Ecological Importance and Sensitivity

	Score	Confidence	Category <sup>4</sup>
Ecological Importance and Sensitivity	2.33	3.50	Medium
Hydrological Functional Importance	1.57	3.50	Low-medium
Direct Human Benefits	0.83	3.00	Low

<sup>3</sup> See Appendix A for methodology in determining the EIS of the wetland systems

<sup>4</sup> A medium score indicates features that are considered to be ecologically important and sensitive at a local scale. The functioning and/or biodiversity of these features is not usually sensitive to anthropogenic disturbances. They typically play a small role in providing ecological services at the local scale.



Photograph 8: Endorheic depressions identified in the study area

## 5. BUFFERS

All wetlands were assessed using the Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries, 2014. Buffer zones associated with water resources have been shown to perform a wide range of functions, and on this basis, have been proposed as a standard measure to protect water resources and associated biodiversity (Macfarlane et al., 2014). These functions include:

- Maintaining basic aquatic processes;
- Reducing impacts on water resources from upstream activities and adjoining land uses;
- Providing habitat for aquatic and semi-aquatic species;

- Providing habitat for terrestrial species; and
- A range of ancillary societal benefits.

The buffer tool aims to provide a method for determining appropriate buffer widths for projects associated with wetlands, rivers or estuaries. It takes into account a number of different factors in determining the buffer width including the risk of the proposed activity on the water resource, climatic factors and the sensitivity of the water resource.

The results calculated show that a 21m buffer is appropriate for the protection of the ecosystem services provided by these endorheic depressions (Figure 7). This buffer is based on the current vegetation basal cover, the slope of the buffer area, the vulnerability to erosion as well as sedimentation, and the natural saturation of the depression systems.

The above buffer widths must be enforced (i.e. not developed) during both the construction and operational phase of the proposed project.

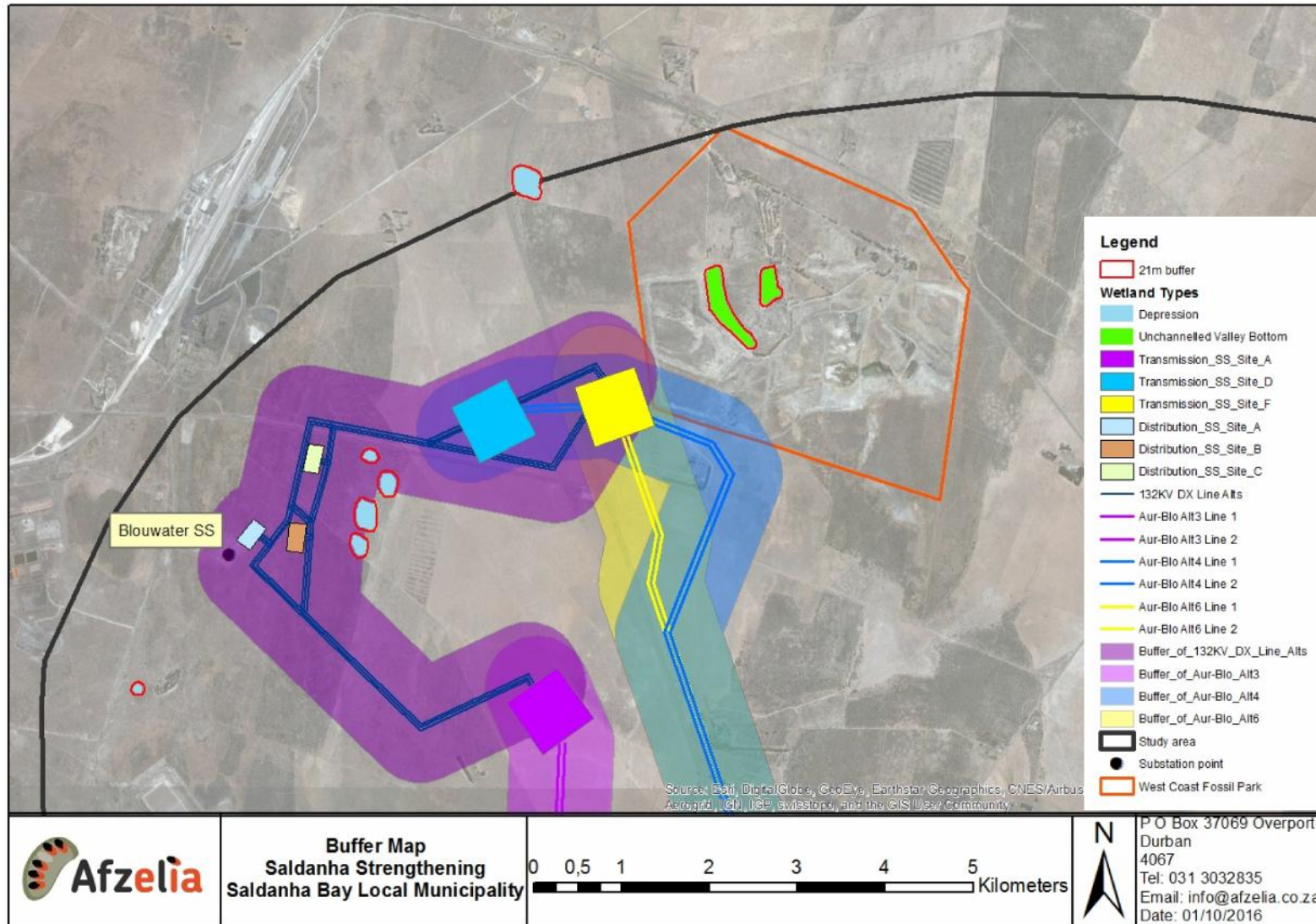


Figure 7: Buffer map showing the 21m buffer around the depression systems

## 6. CONSIDERATION OF ALTERNATIVES

### 6.1 Distribution Substation Alternatives

The three Distribution Substation alternatives (Site A, B and C) are located within a 1km radius of each other. The endorheic depression wetlands are located to the east of Distribution Alternative B (approximately 600m) and Distribution Alternative C (approximately 520m). Distribution site Alternative A is located at the furthest distance to any of the depressions (approximately 1km). The construction of any of the Distribution substation sites will not have a direct impact on the wetland systems due to the flat topography of the site and the limited runoff potential of the sandy soils associated with the area. Distribution substation alternative A is the preferred option as it is located at the furthest distance from a depression in a disturbed area adjacent to the existing Blouwater substation.

### 6.2 Transmission Substation Alternatives

Three Transmission substation alternatives (Site A, D and F) were also investigated. No wetland or watercourse areas were identified in any of the substation sites. Site alternative A is located approximately 2.5km south of the depression systems, Site D is located approximately 940m north-east of a depression and Site F is located approximately 2.1km south from a depression. Any of the substation sites are acceptable from a wetland or watercourse perspective; however, Transmission substation site A is the preferred alternative as it is located at the furthest distance from any wetland system.

### 6.3 Power Line Corridor Alternatives

Three power line corridors were assessed in this investigation. None of the alternatives will directly cross any of the endorheic depression systems. All corridor alternatives are suitable from a wetland and watercourse perspective.

## 7. IMPACT ASSESSMENT

Any development activity in a natural system will have an impact on the surrounding environment, usually in a negative way. The purpose of this phase of the study was to identify and assess the significance of the potential impacts caused by the proposed Saldanha Bay Strengthening Project and to provide a description of the mitigation required so as to limit the identified impacts on the natural environment.

As shown in the comparison of the alternative substation sites and power line corridors there will be no direct impact on any of the identified endorheic depression systems in the project site. No substation site alternative is proposed to be built within a wetland system, with the closest wetland occurring approximately 430m away. With the exception of power line corridor alternative 1, none of the corridor alternatives directly passes over any of the identified wetland systems. If alternative corridor 1 is moved slightly outside of the 21m buffer for one of the wetland systems this route would also have no direct impact on these depressions.

The proposed development will also have limited possibilities to have indirect impacts on these wetlands due to the flat nature of the whole study area, the very sandy nature of

the soils and therefore the limited opportunity for any surface or subsurface water runoff from the construction sites. There is thus no need to conduct significant scoring within an impact assessment.

Best practice guidelines for general construction activities within the area must however be enforced in an Environmental Management Programme. These include:

- Do not locate the construction camp or any depot for any substance which causes or is likely to cause pollution within a distance of 100m of the delineated wetlands
- Make use of existing access roads as much as possible and plan additional access routes to avoid significant vegetation specimens and communities;
- Minimise the extent of the work footprint;
- All waste generated during construction and operation (maintenance) is to be disposed of as per the Environmental Management Programme;
- No release of any substance i.e. cement, oil, that could be toxic to flora, fauna or natural communities within the project site;
- Portable toilets must be placed 100m away from the boundary of the wetlands;
- Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using correct solid/hazardous waste facilities (not to be disposed of within the natural environment). Any contaminated soil must be removed and the affected area rehabilitated immediately.

## 8. CONCLUSION

A desktop and field investigation identified the presence of eight wetland systems within the study area. The wetlands were classified into separate hydrogeomorphic (HGM) units, comprising of six endorheic depression wetlands and two unchannelled valley bottom wetlands.

An initial desktop Level 1 health assessment (conducted during the Scoping Phase) of the wetlands categorised the depressions as moderately modified (PES Category C) and the unchannelled valley bottom wetlands as largely modified (PES Category D). These scores were then evaluated during a field investigation in this EIA phase report. The unchannelled valley bottom wetlands were identified within the West Coast Fossil Park. As this is a National Heritage Site according to Section 27(5) of the National Heritage Resources Act (Act 25 of 1999) and a paleontologically active area the wetland systems could not be accessed and were therefore not assessed in this report. These wetlands will however not be impacted upon by the proposed project as they occur within a minimum distance of 960m from the Alternative 1 power line corridor.

The Level 2 health assessment conducted for the depression wetlands (according to the WET-Health methods) categorised the wetlands as moderately modified (PES Category C) as per the Level 1 (Scoping Phase) investigation. Modifications to the wetlands are minor and stem from agricultural activities including grazing which has decreased the basal cover within the wetland systems. No erosion was noted at any of the wetland sites largely due to the flat topography of the area and the very sandy nature of the soils present.



The Ecological Sensitivity and Importance of the wetlands has been recorded as medium. Although no red-data floral species were identified in the depression systems, the generally high vegetation basal cover surrounding the wetland systems provides habitat for faunal and avifaunal species to utilise the larger ecosystems for protection, feeding and breeding.

A 21m buffer width is recommended to protect the identified wetland systems. This buffer must be enforced during the construction and operational phases of the proposed project.

The impact assessment identified that no direct or indirect impacts would occur on the delineated wetland systems. None of the alternative Distribution substation or Transmission substation sites will have a direct impact on the wetlands, with the closest wetland occurring approximately 520m away. None of the alternative power lines corridors will have a direct impact on any of the wetlands delineated as they do not pass over these systems. All corridor alternatives will have no direct impact on any of the substation sites.

Indirect impacts are highly unlikely due to the flat nature of the whole project area and the very sandy soils, which decreases the likelihood of any runoff from the construction sites entering into any of the wetland systems.

Best practice guidelines for general construction activities within the area must however be enforced in an Environmental Management Programme.

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## 10.GLOSSARY

**Buffer zone:** The strip of vegetation between the natural edge of a sensitive environmental system and the surrounding land use . ie wetland systems, forest systems

**Catchment:** The area where water from atmospheric precipitation becomes concentrated and drains downslope into a river, lake or wetland. The term includes all land surface, streams, rivers and lakes between the source and where the water enters the ocean.

**Delineation:** Refers to the technique of establishing the boundary of a resource such as a wetland or riparian area.

**Invasive alien species:** Invasive alien species means any non-indigenous plant or animal species whose establishment and spread outside of its natural range threatens natural ecosystems, habitats or other species or has the potential to threaten ecosystems, habitats or other species.

**Mitigate/Mitigation:** Mitigating impacts refers to reactive practical actions that minimise or reduce in situ wetland impacts. Examples of mitigation include “changes to the scale, design, location, siting, process, sequencing, phasing, and management and/or monitoring of the proposed activity, as well as restoration or rehabilitation of sites”. Mitigation actions can take place anywhere, as long as their effect is to reduce the effect on the site where change in ecological character is likely, or the values of the site are affected by those changes (Ramsar Convention, 2012).

**Water course:** Means a river or spring; a natural channel in which water flows regularly or intermittently; a wetland, lake or dam into which, or from which, water flows: and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks (National Water Act, 1998).