TRANSNET NATIONAL PORTS AUTHORITY

Richards Bay Port Ecological Assessment: Cassaurina

Wetland Delineation Report

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Project No.: 13642

SPECIALIST REPORT DETAILS

This report has been prepared as per the requirements of Section 32 of Government Notice No. R. 543 dated 18 June 2010 (Environmental Impact Assessment Regulations) under sections 24(5), 24M and 44 of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signed: Date: March 2016

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Document Title:	**Richards Bay Port Ecological Assessment: Cassaurina Wetland Delineation Report**
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Declaration

I, **Stephen Leslie Burton**, declare that I –

- act as an independent specialist consultant in the field of Ecology and have undertaken the **Wetland Delineation Assessment** for the site identified for assessment and known as **Cassaurina in Richards Bay Port,** in **KwaZulu-Natal**;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2010;
- have and will not have any vested interest in the proposed activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2010; and
- will provide the competent authority with access to all information at our disposal regarding the application, whether such information is favourable to the applicant or not.

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1 INTRODUCTION

SiVEST SA (Pty) Ltd (SiVEST) Environmental Division has been appointed by **Transnet National Ports Authority (TNPA)** to undertake a specialist wetland delineation for Cassaurina within the Richards Bay Port, KwaZulu-Natal.

2 TERMS OF REFERENCE

The terms of reference of this assessment are to:

- Delineate the outer temporary boundary of the wetland units within the project site;
- Provide a general description of the state of the wetland units delineated as above;

Further to the Terms of Reference supplied by TNPA, the following protocol was extracted from the National Environmental Management Act, Act 108 of 1998. The relevant Section is **Section 32** and is included below for your ease of reference.

Specialist reports and reports on specialised processes

32.

(1) An applicant or the EAP managing an application may appoint a person who is independent to carry out a specialist study or specialised process.

(2) /the Person referred to in sub-regulation (1) must comply with the requirements of Regulation 17.

(3) A specialist report or a report on a specialised process prepared in terms of these Regulations must contain –

(a) details of –

(i) the person who prepared the report; and

(ii) the expertise of that person to carry out the specialist study or specialised process;

(b) a declaration that the person is independent in a form as may be specified by the competent authority;

(c) an indication of the scope of, and the purpose for which, the report was prepared;

(d) a description of the methodology adopted in preparing the report or carrying out the specialised process;

(e) a description of any assumptions made and any uncertainties or gaps in knowledge;

(f) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;

(g) recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;

(h) a description of any consultation process that was undertaken during the course of carrying out the study;

(i) a summary and copies of any comments that were received during any consultation process; and

(j) any other information requested by the competent authority.

3 PROJECT OVERVIEW AND LOCAL SETTING

TNPA require the undertaking of a Baseline Ecological Survey (BES), to determine the current ecological status of the areas earmarked for development in the area. Some areas have been highly transformed however still host important vegetation and faunal communities and species, as well as sensitive wetland environments. Assessment is required to ascertain the ecological status of the earmarked areas prior to commissioning of any development, as envisaged in the Port Development Framework.

The study site is 247 ha in extent and is located within Richards Bay Port, Kwazulu-Natal and is currently dominated by alien vegetation and a large mangrove system (see **Figure 1** below). The site appears to have been used for timber production in the past, and has a number of roads and railway lines. Additionally, the site is dominated by alien plant species, with some indigenous vegetation present (for further information regarding the vegetation and fauna of the site please see the vegetation and faunal reports for this area).

Figure 1: Overview Map

4 CONCEPTUAL FRAMEWORK

4.1 Wetland Delineation

Wetlands are defined as those areas that have water on the surface or within the root zone for long enough periods throughout the year to allow for the development of anaerobic soil conditions that favour the growth and regeneration of hydrophytic vegetation (plants adapted to saturated and anaerobic soil conditions).

In terms of **Section 1** of the National Water Act (Act No. 36 of 1998), wetlands are legally defined as:

(1)…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.

Soils characterised by prolonged anaerobic soil conditions are referred to as hydric or hydromorphic soils. Hydric soils develop and occur under anaerobic conditions and are characterised by the chemical reduction of common soil minerals (e.g. iron and manganese) under saturated conditions that results in the gleying (loss of mineral colours) of the soil matrix and under temporarily and seasonally saturated conditions, the formation of mottles, which are mineral oxide precipitates of formerly reduced minerals that precipitate out of solution during the drying of the soil in the dry season. These soil wetness features are referred to as redoximorphic features. Wetland delineations are based primarily on the presence of soil wetness indicators/redoximorphic features. These features must occur within 50 cm of the surface soil profile for an area to be considered a wetland (**Collins, 2005**).

Typical redoximorphic features are (**Collins, 2005**):

- A reduced matrix - occurs when the iron and manganese in soils are reduced and the soils appears grey/pale (colour appears washed out).
- Redox depletions - the “grey” (low chroma) bodies within the soil where Fe-Mn oxides have been stripped out, or where both Fe-Mn oxides and clay have been stripped. Iron depletions and clay depletions can occur. These can occur as:
    - Iron depletions - low chroma bodies with clay contents similar to that of the adjacent matrix. Iron depletions are often referred to as grey mottles.
    - Clay depletions - low chroma bodies containing less iron, manganese and clay than the adjacent soil matrix.
- Redox concentrations - Accumulation of iron and manganese oxides. These can occur as:
    - Nodules - firm, irregular shaped bodies that are uniform when broken.
    - Concretions - harder, regular shaped bodies;
    - Mottles - soft bodies of varying size, mostly within the matrix, with variable shape appearing as blotches or spots of high chroma colours;
    - Pore linings - zones of accumulation that may be either coatings on a pore surface, or impregnations of the matrix adjacent to the pore. They are recognized as high chroma

colours that follow the route of plant roots, and are also referred to as oxidised rhizospheres.

It is important to note that there are normally three wetness or saturation zones to every wetland; namely, the permanent zone, the seasonal zone and the temporary zone. Each zone is based on the degree and duration of inundation and saturation of the soils.
The permanent zone usually reflects soils that indicate inundation and/or saturation cycles that last more or less throughout the year, whilst the seasonal zone may only reflect soils that indicate inundation and/or saturation cycles for a significant period during the rainy season.

The temporary zone reflects soils that indicate the shortest period(s) of inundation/saturation that are long enough, under normal circumstances, for the formation of hydromorphic soils and the growth of wetland vegetation (**DWAF, 2005**). The diagnostic criteria for the identification of the three wetness zones are summarised in **Table 1** below.

Table 1: Relationship between degree of wetness (wetland zone), soil-physio-chemistry and vegetation (***after*** **Kotze *et al*, 1994**)

	Degree of wetness		
	Temporary	**Seasonal**	**Permanent / Semi-permanent**
Soil Depth (0cm – 10cm)	Matrix chroma: 1-3 Few / no mottles Low / intermediate OM Non-sulphuric	Matrix chroma: 0-2 Many mottles Intermediate OM Seldom sulphuric	Matrix chroma: 0-1 Few / no mottles High OM Often sulphuric
Soil Depth (40cm – 50cm)	Few / many mottles Matrix chroma: 0-2	Many mottles Matrix chroma: 0-2	No / few mottles Matrix chroma: 0-1
Vegetation	Predominantly grass species	Predominantly sedges and grasses	Predominantly reeds and sedges

Vegetation distribution within wetlands is very closely linked to the flooding regime. Terrestrial plants are not tolerant of flooding and saturation within the root zone for periods long enough to cause anaerobic conditions, and are thus found on higher ground. The distribution of wetland plants is related to their tolerance of different flooding conditions, and their distribution within a system can be used as an indication of the wetness of an area.

Wetland plants are divided into 5 categories based on their expected frequency of occurrence in wetlands. These groups are:

- **Obligate Wetland Plants** - occur almost always in wetlands under natural conditions (>99% of occurrences);
- **Facultative Wetland Plants** - usually occur in wetlands but can occasionally be found on dry land (67-99% of occurrences);
- **Facultative Plants** - equally likely to grow in wetlands and non-wetlands (34-66% of occurrences);
- **Facultative Upland/Dry-land Plants** - usually occur outside of wetlands but occasionally found in wetlands (1-34% of occurrences); and

- **Obligate Upland/Dry-land Plants** - occur almost always outside of wetlands under natural conditions (<1% of occurrences).

Typically, indicators of soil wetness based on soil morphology correspond closely with vegetation distribution, since hydrology affects soils and vegetation in systematic and predictable ways. However, in systems where the hydrological regime has been modified due to human activities, vegetation distribution will not vary systematically with soil morphology. The response of vegetation to alteration of hydrological conditions is rapid (months/years), whereas the response of soil morphology to such alteration is slow (centuries). Therefore, the lowering of the water table or reduction of surface flows, may lead to rapid establishment of terrestrial vegetation, whereas the soil morphology will retain indicators of wetness for a lengthy period.

For this reason, soil morphology forms the basis of wetland delineation nationally, following international protocols, mainly because it provides a long-term indication of the "natural" hydrological regime. However, it is important to note that where soil wetness indicators cannot be used to identify the current hydrological conditions either through extensive disturbance or through certain soil types that do not retain clear redoximorphic features, the terrain and vegetation indicators will have to be used.

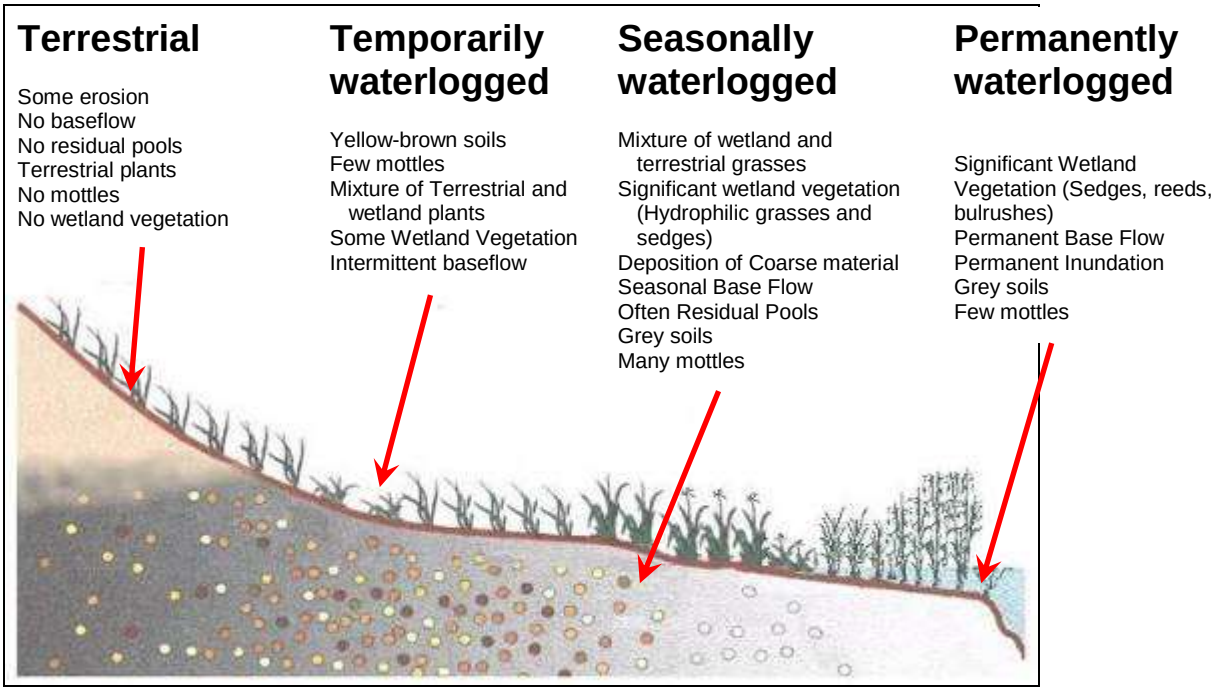

Figure 2: Cross section through a wetland, indicating how the soil wetness and vegetation indicators change along a gradient of decreasing wetness, from the middle to the edge of the wetland. (**Reproduced from Kotze (1996), DWAF Guidelines**)

4.2 Wetland Classification

Any features meeting the criteria above within the study area will be delineated and classified using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa.

User Manual: Inland systems hereafter referred to as the “Classification System” (Ollis et. al., 2013). A summary of Levels 1 to 4 of the classification system are discussed further below.

Inland wetland systems (non-coastal) are ecosystems that have no existing connection to the ocean which are inundated or saturated with water, either permanently or periodically (Ollis et. al., 2013). Inland wetland systems were divided into four levels by the Freshwater Consulting Group in 2009 and revised in 2013. Level 1 describes the connectivity of the system to the ocean, level 2 the regional setting (eco-region), level 3 the landscape setting, level 4A the hydro-geomorphic (HGM) type and level 4B the longitudinal zonation.

The level 3 classification has been divided into four landscape units. These are:

a) **Slope** – located on the side of a mountain, hill or valley that is steeper than lowland or upland floodplain zones.
b) **Valley Floor** – gently sloping lowest surface of a valley, excluding mountain headwater zones.
c) Plain – extensive area of low relief. Different from valley floors in that they do not lie between two side slopes, characteristic of lowland or upland floodplains**.**
d) **Bench** (hilltop/saddle/shelf) - an area of mostly level or nearly level high ground, including hilltops/crests, saddles and shelves/terraces/ledges.

Level 4 HGM types (which is commonly used to describe a specific wetland type) have been divided into 8 units. These are described as follows:

- **Channel** (river, including the banks) - an open conduit with clearly defined margins that (i) continuously or periodically contains flowing water. Dominant water sources include concentrated surface flow from upstream channels and tributaries, diffuse surface flow or interflow, and/or groundwater flow.
- **Channelled valley-bottom wetland** - a mostly flat valley-bottom wetland dissected by and typically elevated above a channel (see channel). Dominant water inputs to these areas are typically from the channel, either as surface flow resulting from overtopping of the channel bank/s or as interflow, or from adjacent valley-side slopes (as overland flow or interflow).
- **Unchannelled valley-bottom wetland** - a mostly flat valley-bottom wetland area without a major channel running through it, characterised by an absence of distinct channel banks and the prevalence of diffuse flows, even during and after high rainfall events.
- **Floodplain wetland** - the mostly flat or gently sloping wetland area adjacent to and formed by a Lowland or Upland Floodplain river, and subject to periodic inundation by overtopping of the channel bank.
- **Depression** - a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates. Dominant water sources are precipitation, ground water discharge, interflow and (diffuse or concentrated) overland flow.
- **Flat** - a near-level wetland area (i.e. with little or no relief) with little or no gradient, situated on a plain or a bench in terms of landscape setting. The primary source of water is precipitation.

- **Hillslope seep** - a wetland area located on (gentle to steep) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope.
- **Valley head seep** - a gently-sloping, typically concave wetland area located on a valley floor at the head of a drainage line, with water inputs mainly from subsurface flow.

Any of the above mentioned wetland forms may occur within the study area. The types of wetlands identified by the study are addressed later in the report.

5 METHODS

5.1 Wetland Delineation

The outer temporary boundaries of the wetlands onsite were delineated using the method contained within the DWAF guideline 'A practical field procedure for the identification and delineation of wetlands and riparian areas' (**DWAF, 2005**). This guideline document stipulates that consideration be given to four specific wetland indicators required to determine the outer edge of the temporary boundary of a wetland.

These indicators are:

- **Terrain Unit** - identify those parts of the landscape where wetlands are most likely to occur e.g. valley bottoms and low lying areas.
- **Soil Form** - identify the soil forms associated with prolonged and frequent saturation.
- **Soil Wetness** - identify the soil morphological "signatures" that develop in soils characterised by prolonged and frequent saturation.
- **Vegetation** - indentify the presence of 'hydrophylic and hydrophytic vegetation associated with frequently saturated soils.

In practice, the soil wetness indicator is the most important indicator for determining the outer boundary of wetlands and the other three indicators are better used in a confirmatory role. This is mainly due to the fact that soil wetness indicators remain in wetland soils, even if they are degraded or desiccated, thereby providing an indication of the natural extent of wetlands.

In this study the presence of soil wetness indicators within the top 50 cm of the soil profile were utilised to delineate the outer temporary wetland boundary. The vegetation indicator was used to supplement the findings.

Soil sampling was carried out along transects across the valley bottom and low-lying areas onsite. At each sample point, soil was sampled at 0-10 cm and 40-50 cm. The value and chroma were recorded for each sample according to the 7.5YR Munsell Soil Colour Chart, as well as the degree and colour of mottling. Vegetation sampling was carried out in a 5m radius surrounding each of the soil sample sites.

A conventional handheld Global Positioning System (GPS) was used to record the location of the soil sampling points along each transect. The GPS points were then imported into ArcGIS 10 and the outer temporary wetland boundary along each transect determined. The boundary points were then combined to form a single continuous boundary using contour information, aerial photography and knowledge on the hydraulic conductivity of the soils. The GPS is expected to be accurate up to 3 metres.

5.2 Wetland Classification

Any features meeting this criteria within the study area were delineated and classified using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems hereafter referred to as the "Classification System" (Ollis et. al., 2013). This was achieved by observing the topographical and geomorphic setting, and the general hydrology of the wetland units.

6 WETLAND DELINEATION RESULTS AND DISCUSSION

6.1 Assumptions and Important Notes

This study has focused on the delineation of wetlands and wetland boundaries for the Cassaurina area of Richards Bay Port. A full delineation and mapping of all wetlands in the wider area has thus not been undertaken.

Large portions of the site have been transformed by anthropogenic activities (road creation, disturbance etc.), as such secondary wetland indicators, at times, guided the delineation of the current wetland boundaries.

6.2 Wetland Units

A wetland delineation assessment was undertaken for the Cassaurina area of Richards Bay Port and an initial desktop identification of potentially wet areas indicated a potential large wetland system along the northern boundary of the site. A map of the final wetland delineation is provided in **Figure 5**.

One (1) wetland unit is located within the study site and is classified as an Unchannelled Valley Bottom wetland.

6.3 Wetland Delineation Descriptions

Only one HGM unit was identified and this system is an Unchannelled Valley Bottom that appears to have been extensively impacted upon by previous activities on the site. The wetland is currently quite dry, but still shows distinct wetland characteristics, with mottles indicating that it is a seasonal wetland, and is not permanently saturated (see **Figure 3** below).

Figure 3: Soil from a depth of 40-50 cm showing wetland indicators.

The wetland is generally dominated by a large reed bed, and is surrounded by numerous Cassaurina trees (see **Figure 4** below).

Figure 4: wetland dominated by large reed beds, with a boundary of Cassaurina trees.

Historical imagery for the site indicates that portions of the wetland have been developed in the past, and additionally, the system can sometimes hold a standing body of water near its centre. There is also evidence of some illegal dumping taking place in close proximity to this wetland, which may lead to pollution of the system. The system is generally healthy at present, but currently dry due to the severe drought that affecting most of KwaZulu-Natal.

In addition to the wetland unit identified, the site also contains a large mangrove system along the southern portion of the site (mapped in the vegetation report for the site). This system is tidal in nature, and being saline, is not colonised by any freshwater plant species, but dominated by exclusively by mangrove tree species.

Figure 5: Wetland delineation aerial map.

7 CONCLUSION AND RECOMMENDATIONS

SiVEST were appointed by Transnet National Ports Authority to undertake a specialist wetland delineation for the Cassaurina Site within Richards Bay Port, KwaZulu-Natal.

The wetland delineation forms part of the ecological assessment of the study area, and should be read in conjunction with the faunal and vegetation assessments for the Cassaurina site.

An examination of the study area from a desktop perspective indicated the potential presence of some wetland habitat along the northern boundary of the site. On-site investigation of this area found a seasonal unchannelled valley bottom wetland that has been historically impacted upon by infilling, but is still reasonably healthy.

Additional development within the wetland area may require Environmental Authorisation from the relevant Competent Authority. An application for a **water use licence** will also need to be sought from the Department of Water Affairs.

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