

ENVIRONMENTAL IMPACT ASSESSMENT
Final Environmental Impact Assessment Report for
the Proposed Construction, Operation and
Decommissioning of a Seawater Reverse Osmosis
Plant and Associated Infrastructure in
Tongaat, Kwazulu-Natal

**FINAL
EIA
REPORT**



**CHAPTER 3:
DESCRIPTION OF THE
AFFECTED ENVIRONMENT**

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CHAPTER 3: DESCRIPTION OF THE AFFECTED ENVIRONMENT

3.1. INTRODUCTION

This chapter provides an overview of the environment of the North Coast of the eThekweni Municipality, within which the Umgeni Water Desalination Project will take place (should an Environmental Authorisation be granted by the DEA). The receiving environment is understood to include biophysical, socio-economic and heritage aspects which could be affected by the proposed development or which in turn might impact on the proposed development. The majority of information used in this chapter has been sourced from studies and recent EIAs conducted in the eThekweni Municipality, as well as from the specialist studies undertaken for this EIA.

3.2. SITE LOCATION

The site for the proposed Tongaat SWRO plant is located at Desainagar between the coastal resort settlements of La Mercy and Tongaat Beach, approximately 200 m away from the ocean and 2.8 km from the Mdloti Estuary. The King Shaka international airport is located approximately 2.6 km northwest of the proposed site. The Shaka Estate, an upmarket residential complex, lines the hill north of the site and the large Sivananda International Cultural Centre is located approximately 400 m to the north-west of the proposed site. Urban residential areas are located all along the coast and the M4, with the area surrounding the proposed site (Desainagar) being the least developed. Large urban areas such as at Verulam and Tongaat cover the rest of the landscape.

The desalination plant is proposed to be built on land currently under cultivation for market gardening crops (e.g. vegetables). Directly adjacent to the west of the proposed site are some patches of natural vegetation and beyond that, the hills are covered in sugar cane plantations up to the N2.

The M4 is a major coastal road which passes very close to the development site (although the SDP suggests that this road may be realigned in future between the Umdloti and Tongaat Rivers (FutureWorks 2012)). Other roads that will potentially be affected by the desalination plant are South Beach Road, South Dune Road (the eastern boundary of the site). The N2 is the national route which passes within 2 km of the proposed site. This road has a very high traffic density and provides access to Durban and the South Coast to the south, and tourist destinations of the northern KwaZulu-Natal Province.

3.3. BIOPHYSICAL ENVIRONMENT

3.3.1. Climate

The climate of this area is warm and is strongly influenced by the Warm Agulhas Current that moves down the east coast of southern Africa. The region is characterized by a typical warm sub-tropical climate with an average winter temperature of 16°C between the months of May to July and an average summer temperature of 27°C between the much warmer months of January to March, coupled with an average annual rainfall of 1054 mm mainly during the summer months. Approximately 80% of the annual rainfall occurs in the warmer summer months. The average rainfall ranges from 28 mm in June to 134 mm in January (Royal HaskoningDHV, 2014).

In terms of temperature, average monthly minimum and maximum temperatures measured at the old Durban International Airport site from 1990 to 1999 is respectively shown in Figure 3.1 and Figure 3.2 below. The average monthly minimum temperatures (over the period of 1990 to 1999) range from 8.97°C to 22.59°C. The average monthly maximum temperatures (over the period of 1990 to 1999) range from 20.63°C to 29.60°C. As shown in Figure 3.1, the lowest average monthly minimum temperatures are generally achieved in the winter months.

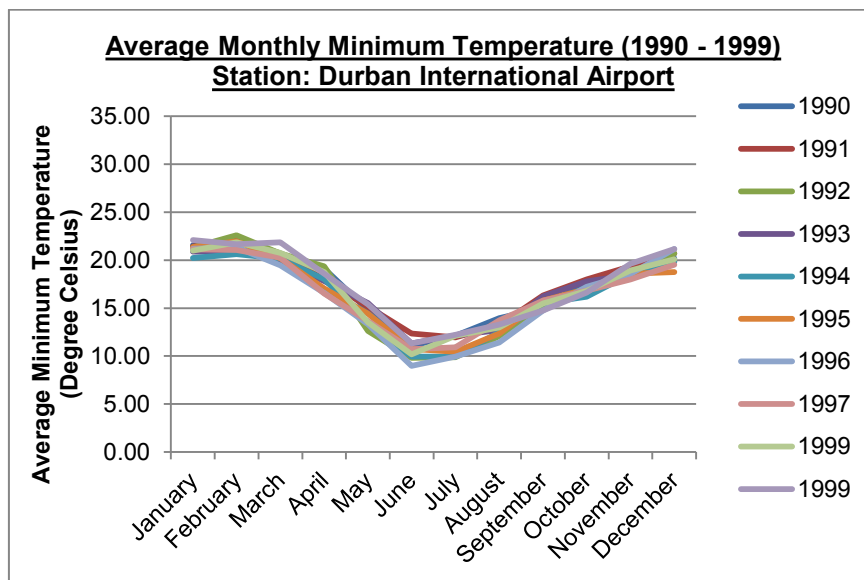


Figure 3.1: Average Monthly Minimum Temperatures in Durban (measured at the old Durban International Airport site in from 1990 to 1999). (Data Source: Climate System Analysis Group (CSAG), University of Cape Town), Accessed 8 September 2015).

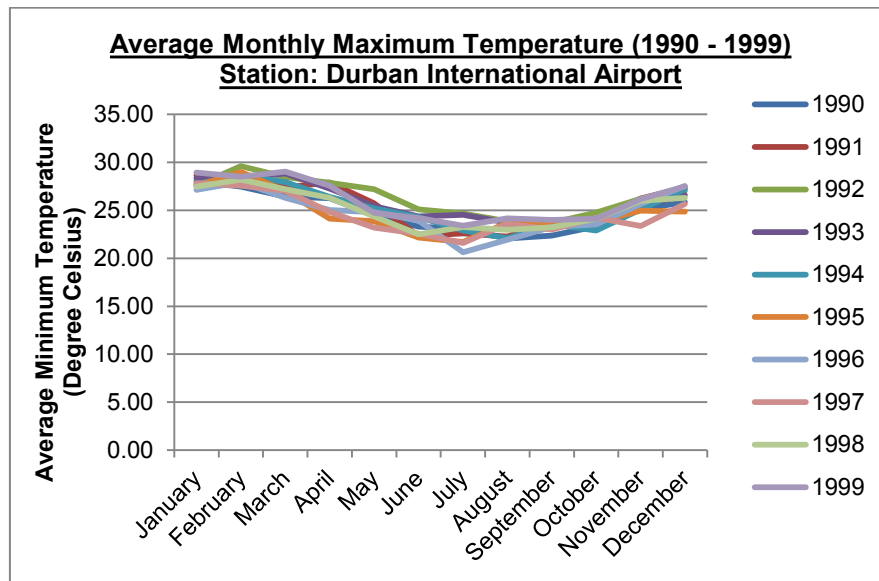


Figure 3.2: Average Monthly Maximum Temperatures in Durban (measured at the old Durban International Airport site in from 1990 to 1999). (Data Source: CSAG, University of Cape Town), Accessed 8 September 2015).

The total observed monthly rainfall measured at the old airport site from 1990 to 1999 was sourced from the CSAG. From this data, the average rainfall received each month over this 10 month period was calculated, as shown in Figure 3.3 below. Derived from Figure 3.3, it is clear that the majority of the rainfall is generally received in summer, whilst minimal rainfall is received in winter.

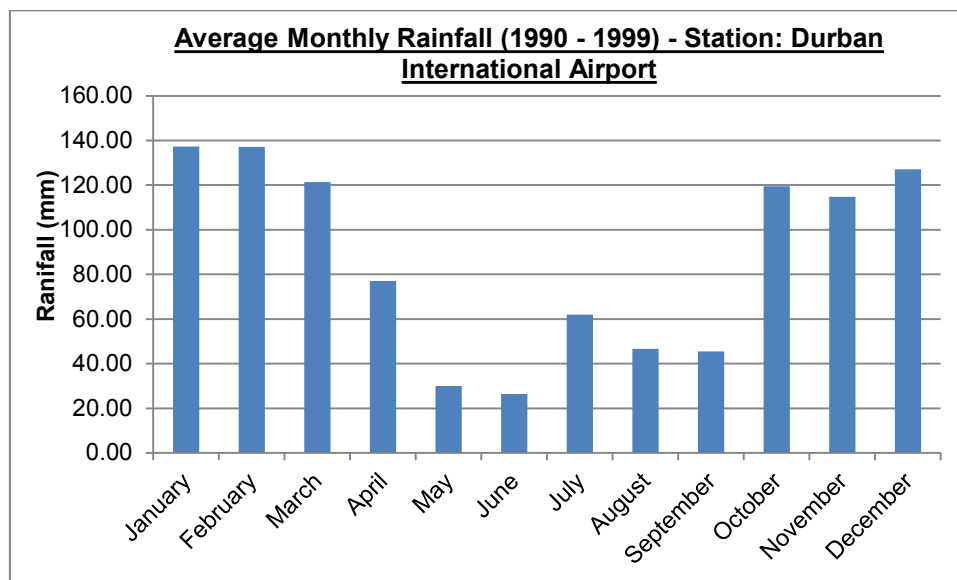


Figure 3.3: Average Monthly Maximum Temperatures in Durban (measured at the old Durban International Airport site in from 1990 to 1999). (Data Source: CSAG, University of Cape Town), Accessed 8 September 2015).

Meteorologically, the KZN coastline is affected by the position and seasonal movements of both the South Atlantic and Indian Ocean anti-cyclone cells, and mid-latitude cyclones that originate from the westerly wind belt. South-westerly winds result from the eastward moving mid-latitude cyclones (and their associated coastal low pressure systems) and prevail during both summer and winter, although the occurrence of north-east winds increases during summer. The basic weather cycle is related to the eastward movement of the coastal low-pressure systems generated along the southern African West Coast during pre-frontal conditions.

3.3.2. Coastline, Visual Landscape and Topography

The orientation of the coastline along the East Coast is relatively uniform, and north-northeast. The only significant topographical feature is the Natal Bight, a coastal indentation between Cape Vidal and Durban. The majority of the East Coast region has a narrow continental shelf and a steep continental slope. The KZN continental shelf is characterised by Cretaceous and Cenozoic marine sediments, with the uppermost Cretaceous sediments being predominantly a soft and muddy layer, rich in marine fossils. Stratified Quaternary marine deposits have also resulted in a series of prominent north-south oriented sandy dune ridges (Sink & Atwood 2008).

Beaches are relatively narrow and the land rises quickly, forming prominent bluffs in places. Beyond the bluffs are steep, rolling hills carved in by the three major river networks in the region. The Ohlangua, Mdloti and Tongati River networks produced a rugged terrain with steep narrow valleys and high hills. The rivers have relatively wide, flat floodplains and broad estuaries. The proposed site for the desalination plant is located just beyond the bluff in a relatively flat area between the beach and the hills.

The topography is that of undulating hills that are relatively open perpendicular to the coast, but more steep parallel to the coast (Figures 3.3 and 3.4). Rivers run approximately west to east in the region and these have incised deeply into the bedrock creating the steeply undulating topography.

The proposed development site is located in the Northern Coastal Corridor of the eThekweni Municipality. The coastline *“provides a distinctly different coastal experience which is quieter, nature based, visually attractive”* according to the North Spatial Development Plan (SDP) (FutureWorks 2012). The desalination plant will be built on agricultural land which is currently used as commercial gardens. The North Coastal Corridor is earmarked for development as a *“mixed density residential, recreation, entertainment and tourist oriented corridor.”* The SDP aims to develop this corridor as a high quality natural coastal environment for tourism and residents (FutureWorks, 2012). East of the site, along the coastal strip between the M4 and South Beach Road, there are several beach holiday residences in close proximity to the site (less than 100 m) (Figure 3.4). There are existing residential areas either side of the development site (within 1 km). The King Shaka Estate is approximately 500 m from the proposed site (Figure 3.5).

Refer to Chapter 6 Marine specialist study for further details of the physical characteristics of the coastline and Chapter 10 Visual impact assessment for additional information regarding the visual baseline.



Figure 3-4: View showing large residential buildings in close proximity to the proposed desalination plant site (Source: Google Earth StreetView).



Figure 3-5: King Shaka Estate with views onto proposed development site.

3.3.3. Soils and Geology

Most of the region surrounding the desalination plant site is underlain by a palaeo-dune system known as the Berea Formation. Its soils are red and well vegetated, although most of this formation is now under sugar-cane cultivation or used as prime building sites. The small pockets of indigenous vegetation that remain in the region are disturbed and invasive species are common.

The geology of the region is complex and includes fairly recent red palaeo-dune sands of the Berea Formation which extends all along the Natal coastline, Ecca shales and Dwyka tillites of the Karoo Supergroup, quartzitic sandstone of the Natal Group which correlates with the Table Mountain Group in the Western Cape, and metamorphic rocks of the Mapumulo Metamorphic Suite. The last 20 million years saw two major periods of continental uplift in Southern Africa with the eastern portion rising more than the rest (approximately a 900 m rise during the second period 5 million years ago). These rapid uplift events caused the rivers along the east coast to incise deeply into the landscape creating the fragmented topography evident in the hinterland beyond the proposed site.

3.3.4. Terrestrial Ecology

The proposed Tongaat Desalination Plant and its related infrastructure are confined primarily to approximately 7ha around the tertiary dune slack at Tongaat Beach. The bulk of the infrastructure is located proximal to the coastline; although the bulk potable water pipelines associated with the plant traverse approximately 24 kilometres. Affected environments within the project area can be summarised as:

- Coastal dune and beach environment;
- Mesic or dry lands; and
- Occasional wetlands and a portion of the uMdloti estuary.

The marine intake pipes will be tunnelled under primary and secondary dune forms and under a portion of coastline that is predisposed to high levels of coastal erosion on account of its rocky substrate and thin veneer of sands. Notably, these dunes have, since 2012, been undergoing quite rapid accretion and growth.

The desalination plant is positioned within a wet dune slack at the foot of a paleo dune of Berea Red Sands, from which some of the evident surface water is derived. Notably, agriculture which dominates this area has augmented such water from sub terranean sources. Habitat diversity in this region is low, with the greatest diversity being located in close proximity to, and within the frontal dunes.

Almost all of the mesic or dry land environments can be considered to be under cultivation or habitat that is secondary in nature. Secondary vegetated areas show some successional return to a forest structure, although exotic invasion and the presence of fruit trees and other horticultural specimens are common within these areas.

The freshwater bulk pipeline will cross the uMdloti River estuary in the vicinity of the existing N2 bridge. As such this crossing will arise in a highly transformed portion of the estuary and options for mitigation of most impacts can be implemented. Affected wetland systems are primarily associated with perennial stream systems lying within agricultural lands.

There are no protected areas within 5 km of the proposed development site and associated infrastructure (including potable water pipelines).

Additional information regarding terrestrial ecology is provided in Chapter 7 of this Final EIA Report (i.e. Terrestrial Ecology Assessment).

3.3.5. Freshwater Resources

NFEPA data shows that the proposed project would be located in the Department of Water Affairs (DWA) Mvoti to Umzimkulu Water Management Area (WMA 14), in the Mvoti Sub WMA. While the proposed desalination plant itself would be located in a local coastal catchment close to the uThongati River catchment, much of the proposed outgoing potable water pipeline infrastructure would be located in the adjacent Mdloti River catchment, the mouth of the estuary of which is located some 3 km south west of the plant site.

Of the above two river systems, NFEPA River data (Nel *et al* 2011) show that the uThongati River has been classified as in a Present Ecological State (PES) Category C, indicative of rivers that have been Moderately modified from their natural condition, while the Mdloti River is considered more intensively modified, and representative of rivers with a PES Category D (Highly modified).

Ecoregions are groups of rivers that share similar physiography, climate, geology, soils and (under natural conditions) natural vegetation. The National Ecoregional Classification of Kleynhans (2005) classifies both of the above catchments as falling within Ecoregion 17 (North Eastern Coastal Belt). Rivers within this ecoregion are characteristically:

- Associated with a diversity of terrains, but usually occurring in closed hill and mountain terrain, at altitudes from sea level to 700 mamsl;
- Typically associated with Valley Thicket and a variety of Grassland and Bushveld types; and
- Usually in areas where mean annual precipitation and temperatures are both high (MAP = 700-1000 mm and mean annual temperature =16-22°C).

Chapter 8 of this Final EIA Report provides a detailed description of the freshwater aquatic ecosystems that have been identified close enough to the proposed desalination plant and are likely to be impacted on.

3.3.6. Estuarine Ecology

The Tongaat Reverse osmosis desalination plant proposed at the North Coast lies between the Mdloti and uThongati river mouths. Potentially impacted estuaries are therefore the Mdloti and uThongati estuaries; however, negligible impacts can be expected at these estuaries given that the proposed site lies approximately 3.5 km to the north of the Mdloti estuary and approximately 6.5 km to the south of the uThongati estuary. For this reason, it is the opinion of the specialist that an estuarine specialist study for the assessment of the potential impacts of the proposed Tongaat desalination plant is not necessary.

3.3.7. Marine Biological Environment

Biogeographically the coastline of the study area falls into the subtropical Natal bioregion, which extends from the Mbashi Mouth to Cape Vidal (Lombard *et al* 2004). The coastline comprises primarily sandy beaches, punctuated by numerous rocky shores. Consequently, marine ecosystems along the coast comprise a limited range of habitats that include:

- Sandy intertidal and subtidal substrates;
- Intertidal rocky shores and subtidal reefs; and
- The water body.

The benthic communities within these habitats are generally ubiquitous throughout the southern African East Coast region, being particular only to substratum type, wave exposure and/or depth zone. They consist of many hundreds of species, often displaying considerable temporal and spatial variability. The following biological communities ‘typical’ of each of these habitats are described in detail in Chapter 6 of this Final EIA Report (i.e. Marine Ecology Assessment), focusing both on dominant, commercially important and conspicuous species, as well as potentially threatened or sensitive species, which may be affected by the proposed project:

- Plankton
- Soft-sediment Benthic Macro and Meiofauna
 - Intertidal beaches
 - Subtidal Macrobenthos
- Reef Communities
 - Intertidal rocky shores
 - Subtidal reefs
- Pelagic and Demersal Fish
- Turtles
- Seabirds
- Marine mammals
- Fisheries

3.3.7.1. Conservation Planning

KwaZulu-Natal boasts three Marine Protected Areas (MPAs). The Aliwal Shoal MPA is situated on the south coast between Umkomaas and Ocean View (more than 50 km from the proposed development) and is 125 km² in size, approximately 18 km long and stretches ~4 nautical miles offshore. The Aliwal Shoal is especially known for its abundance of Grey nurse sharks that congregate there to mate between August and November. Further south lies the small Trafalgar Marine Reserve, which stretches for only 6 km along the KwaZulu-Natal south coast adjacent to the Mpenjati Nature Reserve, and extends 500 m offshore. This reserve, which primarily protects a petrified forest that is exposed in the intertidal zone at low tide, may be incorporated into the proposed Pondoland Marine Protected Area which (although still in the concept phase) would extend from southern KwaZulu-Natal into the northern part of the Eastern Cape.

The Maputaland and St Lucia Marine Reserves form a continuous protected area stretching 150 km from the Mozambique border southwards to Cape Vidal, and 3 nautical miles out to sea. They are components of the iSimangaliso Wetland Park. The MPA protects a large number of turtle nesting sites; the migration of whales, dolphins and whale-sharks offshore; and a considerable number of waterfowl associated with the iSimangaliso Wetland Park, including large breeding colonies of pelicans, storks, herons and terns. The southern boundary of the Marine Reserve is located ~250 km to the north-west of the Tongaat site.

3.3.7.2. Recreation

Marine waters in KZN are used for a variety of full contact recreational activities which underpin a significant social benefits and tourism value. These include swimming, snorkelling and SCUBA diving, board sports (e.g. surfing, kite boarding), paddling and sailing. These activities all inherently rely on good marine water quality. In this respect the Tongaat site is on a densely populated part of the KZN

coast and lies in reasonably close proximity to beaches that attract significant usage for full contact recreational activities. The beaches nearby are also well used for swimming and board sports. The mouth of the Mdloti River (approximately 2.7 km from the proposed desalination plant) is especially favoured as a kite boarding spot.

3.4. ARCHAEOLOGICAL HERITAGE

The proposed Tongaat Desalination site will have to be surveyed for evidence of past Iron Age habitation. The entire east coast littoral zone within one kilometre of the highwater mark is flagged as being of high heritage significance, largely because of the presence of shell middens and homestead sites located just beyond the frontal dune cordon. Numerous shell middens are known to be present between the Umdloti and uThongathi river mouths. Proposed tunnelling between the high water mark and the proposed plant site will cross sensitive areas. This can however certainly be mitigated through re-routing or archaeological excavation.

Chapter 13 of this Final EIA Report include additional information regarding heritage resources.

3.5. SOCIAL AND ECONOMIC ENVIRONMENT

The significance of impacts is often highly dependent on the social and economic environment or context within which they occur. For example, job creation in a small local community with a stagnating economy and high unemployment will be far more significant than it would be in a larger community with a healthy economy.

Given the location and nature of the project, the social and economic context includes information primarily on eThekweni and Tongaat along with the smaller local areas near the plant site including La Mercy, Desainager, Tongaat Beach, Genazanno and Westbrook. The main information sources used were Census 2011 data, Community Survey 2007 data, Integrated Development Plans, Spatial Development Frameworks and Demarcation Board data.

Refer to Chapters 11 and 12 for further details on the social and economic baseline description.