SEAVIEW LOW INCOME HOUSING DEVELOPMENT, PORT ELIZABETH

AQUATIC IMPACT ASSESSMENT

Report Number 516124/1

Report Prepared by

srk consulting

April 2017

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AQUATIC IMPACT ASSESSMENT

Nelson Mandela Bay Municipality (NMBM)

Govan Mbeki Avenue
PO Box 116
Port Elizabeth
6000

SRK Consulting (South Africa) (Pty) Ltd.

Ground Floor Bay Suites
1a Humewood Rd.
Humerail
Port Elizabeth 6001
South Africa

e-mail: portelizabeth@srk.co.za
website: www.srk.co.za

Tel: +27 (0) 41 509 4800
Fax:+27 (0) 41 509 4850

SRK Project Number 516124

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Compiled by:

Karissa Nel
Senior Environmental Scientist

Luc Strydom
Environmental Consultant

Email: knel@srk.co.za

Peer Reviewed by:

Rob Gardiner
Principal Environmental Scientist

Authors:

Luc Strydom & Karissa Nel

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Disclaimer

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List of Abbreviations

amsl	above mean sea level
C.A.P.E.	Cape Action for People and the Environment
CDSM	Chief Directorate: Surveys and Mapping
CESA	Critical Ecological Support Areas
CoCT	City of Cape Town
DAEA	Department of Agriculture and Environmental Affairs
DLA	Department of Land Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EAPSA	Environmental Assessment Practitioners of South Africa
ECBCP	Eastern Cape Biodiversity Conservation Plan
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
FEPA	Freshwater Ecosystem Priority Area
GDACE	Gauteng Department of Agriculture, Conservation and Environment
GIS	Geographical Information Systems
GPS	Global Positioning System
HDPE	High Density Polyethylene
HGM	Hydrogeomorphic
MAP	Mean Annual Precipitation
NMBM	Nelson Mandela Bay Municipality
NFEPA	National Freshwater Ecosystem Priority Area
OESA	Other Ecological Support Areas
PE	Potential Evaporation
PES	Present Ecological State
REC	Recommended Ecological Category
SANBI	South African National Biodiversity Institute
TMG	Table Mountain Group
WMA	Water Management Area

Definitions

Artificial Wetland	Produced by human beings, not naturally occurring.
Catchment	The land area from which water runs off into a specified wetland or aquatic ecosystem; a drainage basin.
Concentrated Flow	A flow of water contained within a distinct channel. Rivers are characterised by concentrated flow, either permanently or periodically.
Delineation (of a wetland)	The determination of the boundary of a wetland based on soil, vegetation, and/or hydrological factors.
Depression	An inland aquatic ecosystem 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.
Diffuse Flow	When water flow is not concentrated within a distinct channel, but is rather spread as sheet-flow on the ground surface, or as seepage below the ground surface.
Ecoregions	Geographic regions delineated on the basis of physical/abiotic factors.
Endorheic	As relates to a depression, inward-draining with no transport of water into downstream systems via subsurface or surface flow. Water leaves via evapotranspiration and infiltration only.
Evapotranspiration	The movement of water from the Earth's surface into the atmosphere through the combined process of evaporation and transpiration.
Exorheic	As relates to a depression, outward-draining with water transported to downstream systems via concentrated or diffuse surface flow, or as subsurface flow.
Facultative (FAC)	As relates to wetland indicator status, equally likely to occur in wetlands (estimated probability 34% - 66%) or non-wetlands.
Facultative Upland (FACU)	As relates to wetland indicator status, usually occur in non-wetlands (estimated probability 67% - 99%) but occasionally found in wetlands (estimated probability 1% - 33%).
Facultative Wetland (FACW)	As relates to wetland indicator status, usually occurs in wetlands (estimated probability 67% - 99%) but occasionally found in non-wetlands.
Groundwater	Subsurface water in the saturated zone below the water table.
Infiltration	Downward permeation of water below the ground surface, either into the soil or into the groundwater.
Inundated	Covered by water (water is observably present at the surface).
Mottles	As relates to wetland soils, spots of colour in the soil that contrast with the background (matrix) soil colour. Mottles occur where minerals in the soil that have been reduced under anaerobic conditions are re-oxidised.
Natural Wetland	Existing in, or produced by, nature; not manmade or caused by

	humankind.
Non-perennial	Does not flow continuously throughout the year, although pools may persist.
Obligate (OBL)	As relates to wetland indicator status, almost always occurs in wetlands (estimated probability > 99%) under natural conditions.
Perennial	Flows continuously throughout the year, in most years.
DWS Regulated Area	a) The outer edge of the 1:100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; b) In the absence of a determined 1:100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act); or c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.
Seepage	Percolation of water through a soil layer, as subsurface flow.
Terrestrial	Of or on dry land; outside the boundaries of a wetland or other aquatic ecosystem.
Water Table	The upper surface of groundwater or that level below which the soil is completely saturated with water.
Wetland	As defined in the National Water Act (Act No. 36 0f 1998), “a wetland is land that 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.
Wetland Indicator Status	Denotes the probability of individual species of vascular plants occurring in freshwater, brackish and saltwater wetlands.

1 Project Introduction

The Nelson Mandela Bay Municipality (NMBM) proposes to construct a low cost housing development and associated facilities in Seaview (see locality in Figure 1-1). The development will primarily cater for the communities currently living in Zweledinga and New Rest informal settlements in Seaview.

SRK Consulting (SRK) has been appointed by the NMBM, as the independent consultants, to conduct the Environmental Impact Assessment (EIA) in terms of the National Environmental Management Act 107 of 1998 (NEMA), as amended, and the Environmental Impact Assessment (EIA) Regulations, 2010, for the proposed housing development. As part of the EIA process an Aquatic Impact Assessment is required to identify watercourses and wetlands near the proposed site. This Aquatic Assessment Report will provide input into the EIA regarding identification and delineation of all wetlands, watercourses and aquatic resources, as well as the assessing the sensitivity thereof and potential impact thereon by the proposed development.

1.1.1 Applicant Details

Nelson Mandela Bay Municipality	Contact person: Mr Schalk Potgieter
P.O. Box 116	Tel: (041) 506 2168
Port Elizabeth	Fax: (041) 506 3469
6000	Email: spotgiet@mandelametro.gov.za

1.1.2 Assessor Details

SRK Consulting	Contact person: Ms Karissa Nel
PO Box 21842	Tel: (041) 405 4800
Port Elizabeth	Fax: (041) 405 4850
6000	Email: knel@srk.co.za

1.2 SRK Profile and Expertise of Project Team

Karissa Nel, from the SRK Port Elizabeth office, has been appointed by the environmental assessment practitioner, CEN, as the independent specialist to undertake the Aquatic Impact Assessment in terms of applicable legislation and guidelines.

Aquatic Impact assessor, Project coordinator: Karissa Nel, MEM (Environmental Management), CEAPSA
Karissa Nel is an Environmental Scientist, with 10 years' experience in Environmental Impact Assessments (EIA), Environmental Management Programmes (EMPr) and Environmental Auditing, Environmental Licensing, as well as report writing. Her training is in aquatic research, zoology, microbiology and environmental management. She has shown competence in wetland impact assessment when completing a course at the Rhodes University.
Environmental Assessment Practitioner, Internal Reviewer: Rob Gardiner, MSc, MBA, Pr Sci Nat
Rob Gardiner is the Principal Environmental Scientist and head of SRK's Environmental Department in Port Elizabeth. He has more than 19 years environmental consulting experience covering a broad range of projects, including Environmental Impact Assessments (EIA), Environmental Management Systems (EMS), Environmental Management Programmes (EMPr), and environmental auditing. His experience in the development, manufacturing, mining and public sectors has been gained in projects within South Africa, Lesotho, Botswana, Angola, Zimbabwe, Suriname and Argentina.

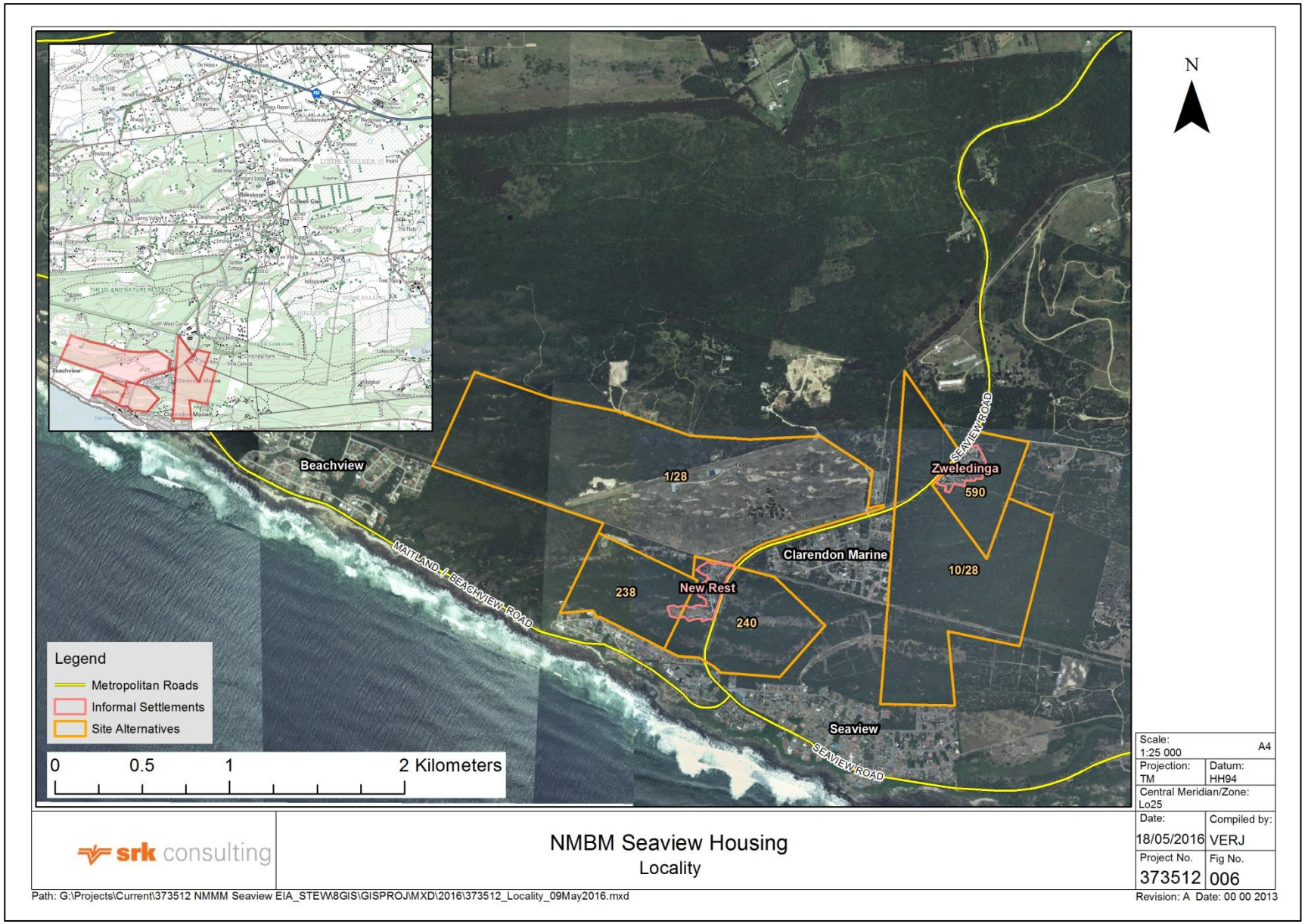

Figure 1-1: Locality Plan for the proposed Seaview Low Income Housing Development

1.3 Statement of SRK Independence

Neither SRK nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK's fee for completing this Report is based on its normal professional daily rates plus reimbursement of incidental expenses. The payment of that professional fee is not contingent upon the outcome of the Report.

2 Study Scope and Methodology

2.1 Terms of Reference

The scope of works to conduct this aquatic impact assessment included the following activities:

- Conduct a desktop research study regarding the wetlands within 500 m of the proposed construction activities as well as other watercourses that could potentially be affected;
- Site visit to ground truth the information obtained in the desktop study. This will include delineation of wetlands within 500 m of the proposed structures;
- Classify all identified wetlands;
- Compile the relevant maps indicating wetlands, watercourses and buffers (if required);
- Determine the Present Ecological State (PES) and the Ecological Importance and Sensitivity (EIS) and comment on the conservation status and ecosystem function and/ or importance of wetlands and watercourses; and
- Compile a report that will include a description and condition of identified wetlands and watercourses. The report will also include the identification of potential impacts of the proposed activity on the aquatic environment and suggest mitigation measures to prevent such impacts. Actions to enhance the functioning of identified aquatic features will also be considered and recommended, if any.

2.2 Methodology

The aquatic assessment commenced in March 2017 with a desktop study during which data was collected and studied using existing literature, maps and aerial photography of the study area and Geographical Information Systems (GIS). In a desktop exercise, all potentially affected watercourses, associated riparian zones and wetlands were identified and delineated at a scale of 1:1,250 before field verification.

Site visits were conducted on 14 and 23 March 2017 to verify the desktop data and collect the required field data for watercourse delineation and classification. Special attention was given to observations with regard to characteristics of the environment, existing land uses and impacts in and around the site, potential sources of pollution, as well as potential wetland uses/ functions.

The assessment of potential aquatic systems was conducted according to the *Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas* produced by the Department of Water Affairs and Forestry (DWAF) dated 2008. Since no natural aquatic systems were found during the ground truthing exercise, no additional classification and assessments were conducted as part of the study. Some key plant species have been noted and are tabled below to explain the findings.

2.3 Study Limitations

The assessment is based on information collected during two site visits undertaken over a one month period during a dry period in terms of rainfall. These factors can influence the quality and accuracy of the data collected. However, every attempt was made to collect the types of information necessary to assist in the assessment of the status and potential impacts of the aquatic resources on site.

Notwithstanding these limitations, it is our view that this report provides a good description of the environment in the vicinity of the proposed site.

2.4 Relevant Legislation

2.4.1 National Legislation

National Water Act (Act 36 of 1998)

The National Water Act (NWA) recognises that the protection of water resources, including not only the water itself but the entire aquatic ecosystem, is necessary to achieve sustainable use of water for the benefit of all water users. In section 1 of the NWA a *water resource* is defined as being all water found in the various phases of the hydrological cycle, including that portion of water that is found underground. This definition ensures that the entire water resource is treated in an integrated fashion and as a resource that is common to all. The DWS has regulated that no activity may take place within a watercourse without authorisation from DWS. Therefore no development activities may occur within any wetland or riparian zone unless authorisation is granted by DWS in terms of section 21 of the NWA.

A General Authorisation (GA) in terms of Section 39 of the NWA, which is an authorisation for water uses as defined in Section 21(c) and section 21(i) without a license provided that the water use is within certain limits and complies with conditions as set out in the GA, was issued by DWS for prescribed water uses as contained in General Notice 509 of 2016 as published in the Government Gazette No. 40229 of 26 August 2016. However, according to section 3 of the Notice, it must be noted that the GA does not apply:

- to the use of water in terms of section 21(c) or (i) of the Act for the rehabilitation of a wetland as contemplated in General Authorisation 1198 published in Government Gazette 32805 dated 18 December 2009;
- to the use of water in terms of section 21(c) or (i) of the Act within the regulated area of a watercourse where the Risk Class is Medium or High as determined by the Risk Matrix;
- in instances where an application must be made for a water use license for the authorisation of any other water use as defined in section 21 of the Act that may be associated with a new activity;
- where storage of water results from the impeding or diverting of flow or altering the bed, banks, course or characteristics of a watercourse; and
- to any water use in terms of section 21(c) or (i) of the Act associated with construction, installation or maintenance of any sewerage pipelines, pipelines carrying hazardous materials and to raw water and wastewater treatment works.

National Environmental Management Act (Act 107 of 1998)

The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations (No R. 983 and No R. 984) as amended, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the type and location of the proposed activity.

2.4.2 Provincial Legislation and Policy Regarding Buffers

A buffer zone is defined as a strip of land surrounding a wetland or riparian area in which activities are controlled or restricted in order to reduce the impact of adjacent land uses on the wetland or riparian area (DWAF, 2005). Buffer zones have been shown to have a variety of functions and have been proposed as a standard mitigation measure to protect or limit potential impacts on wetlands and other watercourses. Some generic functions of buffer zones are the following:

- Sediment trapping;
- Erosion control;

- Nutrient retention;
- Maintaining basic hydrological processes;
- Reducing impacts on water resources from upstream activities and adjoining land uses; and
- Providing habitat for various aspects of biodiversity.

Available local government policies require that wetland buffer zones be determined from the outer edge of the temporary zone of a wetland and river buffer zones be calculated from the outer edge of the riparian zone (DAEA, 2002; CoCT, 2009; GDACE, 2008). However, no formal guidelines for riverine and wetland buffer zones have been established applicable to this study area in the Eastern Cape Province. Recommendations in the available policies and guidelines are listed in Table 2-1.

Table 2-1: Recommended buffer zones for wetlands and other aquatic systems in available local government policies and guidelines

Policy/ Guideline	Recommended Buffer
Kwa-Zulu Natal Department of Agriculture and Environmental Affairs (DAEA) Interim Guidelines for Development Activities That May Affect Wetlands (2002)	*15 m* – hardened surfaces should be located at least 15 m outside of the outer boundary of the seasonal/ permanent wetland zone; and *20 m* – a predominantly vegetated buffer area at least 20 m wide should be included between the stormwater outflow and the outer boundary of the wetland, with mechanisms for dissipating water energy and spreading and slowing water flow and preventing erosion.
Gauteng Department of Agriculture, Conservation and Environment (GDACE) Requirements for Biodiversity Assessments: Version 2 (2008)	*30 m* – from the outer edge of the wetland temporary zone, for wetlands occurring inside the urban edge; *50 m* – from the outer edge of the wetland temporary zone, for wetlands occurring outside the urban edge; Larger buffer zones may be required for wetlands supporting sensitive species (Red list of plant species – *200 m* buffer and Giant Bullfrog – *60 m* buffer)
	32 m – from the edge of the riparian zone, for rivers and streams within the urban edge; and *100 m* – from the edge of the riparian zone for rivers and streams outside the urban edge.
City of Cape Town (CoCT) Prioritisation of City Wetlands Report (2009).	Minimum of *32 m* buffer for wetlands ranging up to *75 m*; *32 m* – artificial wetlands given the status of Critical Ecological Support Area (CESA) should be protected by a buffer of at least 32 m, but which can be wider, if deemed necessary by a wetland ecologist; and *10 m* – artificial wetlands given the status of an Other Ecological Support Area (OESA) should be protected by a buffer of at least 10 m, but these wetlands must still be assessed and ground-truthed by a wetland ecologist.
Eastern Cape Biodiversity Conservation Plan (ECBCP) (Berliner, *et al*., 2007)	*50 m* – for all wetlands until a provincial priority ranking system for wetlands is developed.
	50 m – mountain streams and upper foothills of all 1:500,000 rivers; *100 m* – lower foothills and lowland rivers of all 1:500,000 rivers; and *32 m* – all remaining 1:500,000 rivers.
Department of Water Affairs and Forestry (DWAF) Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas (2008).	*20 m* – watercourses in afforested areas Specific (defensible) objectives should be identified for buffers

3 Proposed Activities

3.1 Background Information & Activity Description

The Nelson Mandela Bay Municipality (NMBM) proposes to develop low income residential units and associated infrastructure in Seaview, Port Elizabeth. Two development options are provided, Option 1 entailing development of approximately 400 units on non-forested patches on erf 590, erf 238 and erf 240 as well as Portion 10 of Farm 28, Seaview, and Option 2 involving development of up to approximately 1,000 units on Portion 1 of Farm 28. The development will provide formal housing for the residents of Zweledinga and New Rest informal settlements located on erven 590 238 and 240. The NMBM proposes to undertake the development on municipal and state-owned land (Farms 590,238,240 and 10/28 – Development Option 1) and in the instance that this is not feasible to consider development on alternative land parcels (i.e. development Option 2) (refer to Figure 3-1 for details of the affected properties).

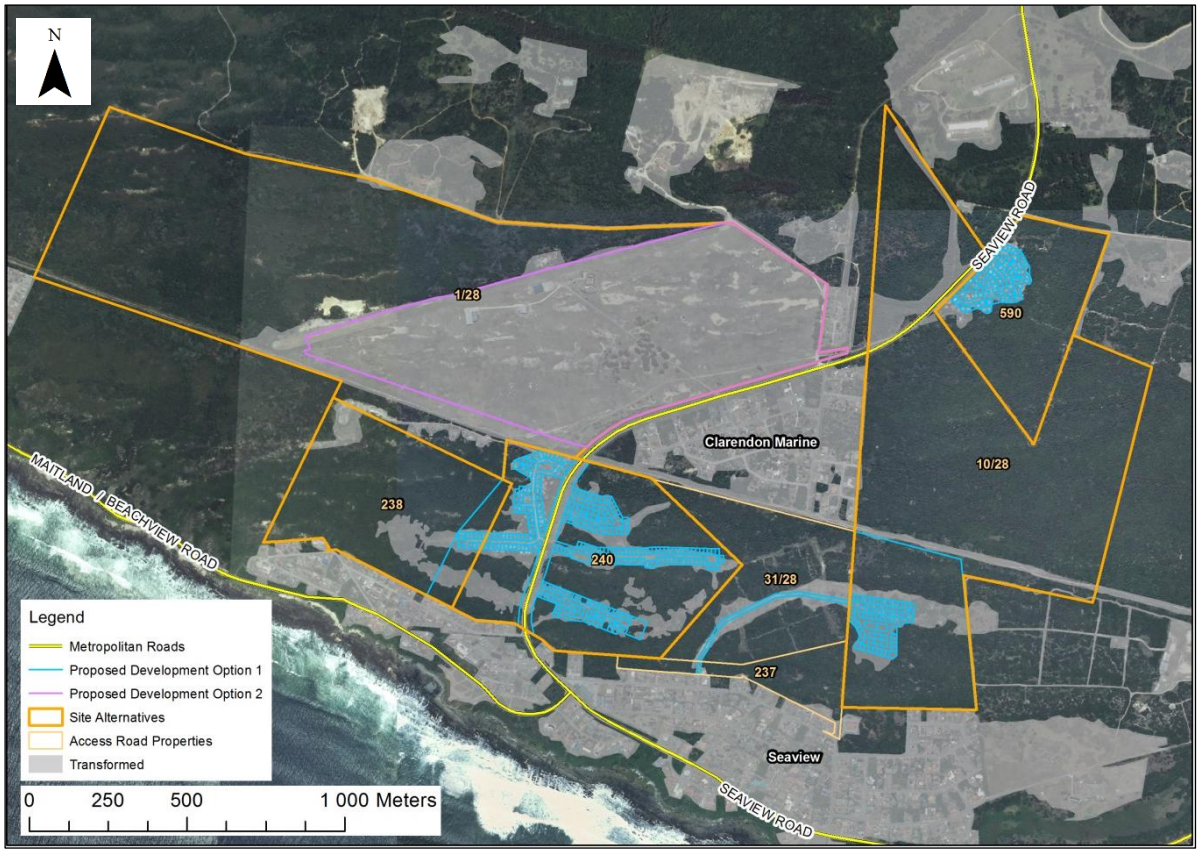

Figure 3-1: Development Alternatives

3.1.1 Housing and associated land uses

Houses will be typical RDP structures on a minimum erf size of 250 m² to accommodate the sanitation services on each erf. The houses will consist of one shower and sink per dwelling (no bath). Various internal layouts are possible for the RDP houses. General specifications of standard RDP houses as proposed for the development are:

- Fully State Subsidised Housing – for beneficiaries earning up to R3,500 per month;
- Each unit >40 m², and costing approximately R160,000 each to build;

- Beneficiaries will depend entirely on being housed by the state without any expectation of making financial contributions towards the house/services/ transfer/ registration costs for the property to be received; and
- Units will be free standing.

The proposed development will include areas zoned as public open space (both parks and natural/ indigenous vegetation), as well as community zoning to make provision for uses such as a crèche or church. Special Purpose zoning would be a zoning for an integrated use such as a community facility or a waste transfer station etc.

3.1.2 Bulk services

Water

The development will connect onto the proposed Seaview bulk water supply scheme, which is intended to augment water supply for the broader area.

Sanitation

No wastewater treatment works currently exists in the Seaview area, and existing communities make use of on-site sanitation. For the formal developments this largely consists of septic tanks, and for Zweledinga this mostly comprises home-built pit latrines, the majority of which are unhealthy and physically unsafe. The community have dug these toilets due to a lack of any other alternative services. Water is supplied to a few standpipes located throughout the informal settlement. In New Rest communal chemical toilets are provided and are serviced by a Municipal appointed service provider. The community have expressed dissatisfaction with this service. Connection onto existing bulk sanitation services therefore is not possible and due to space and topographic limitations, sanitation options to service the proposed development are limited. While numerous options in this regard were investigated, the conclusion was reached that on-site sanitation was the only viable option. Makhetha Development Consultants (MDC) was appointed by the NMBM to assess options in this regard, and the resultant recommendation was for on-site Low Volume Flush Toilets with leach pits.

Waste

Solid waste generated by individual households in operational phase will be collected as per the NMBM's waste collection schedule.

3.1.3 Access

Access to all the sites except Portion 10 of Farm 28 will be off Seaview road. It is proposed that Portion 10 be accessed via Aliwal Road in Seaview. A 12 m road reserve will need to be constructed to connect the development with Aliwal Road. This new access route will follow the footprint of the transformed area. The preliminary layouts proposed allow for 12 m wide road reserves within the residential areas, to allow for access by municipal service vehicles such as waste removal.

4 Desktop Assessment: General Importance of the Study Area with regards to Aquatic Ecosystems

4.1 Ecoregions

Ecoregional classification or typing allows for the grouping of rivers according to similarities based on a top-down nested hierarchical approach. It is based on physical/ abiotic attributes such as physiography, climate, rainfall, geology and potential natural vegetation (Kleynhans, *et al*., 2005). The ecoregional classification approach is specifically useful for the purposes of the determination of the Ecological Reserve, but also for managing inland aquatic ecosystems more generally. In Kleynhans, *et al*., 2005, 31 Level I Ecoregions were identified throughout South Africa, Lesotho and Swaziland.

The study area falls within the *South Eastern Coastal Belt ecoregion (ID – 20)*. This information is useful for the purposes of the wetland classification system as the Level I Ecoregions for South Africa, Lesotho and Swaziland are applied at Level 2 of the classification system.

4.2 Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) project aimed to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation. The goal is to conserve a sample of the full diversity of species and the inland water ecosystems in which they occur, as well as the processes which generate and maintain diversity (SANBI, 2011b). The NFEPA database was used to obtain information with regards to areas of ecological importance on or in close proximity to the study area.

The study area falls within the *Fish to Tsitsikamma Water Management Area (WMA ID – 16)* and the *Algoa Sub-water Management Area (sub-WMA ID – 84)*. The quaternary catchment applicable to the area is M20A (within the Van Stadens River catchment). Of the total area of these management/ catchment areas, 20% of the WMA and 19% of the sub-WMA has been identified as a Freshwater Ecosystem Priority Area (FEPA). This includes the area of sub-quaternary catchment identified as river FEPAs, wetland FEPAs and wetland clusters. The planning unit identifiers for the sub-quaternary catchments relevant to the study area are 9114.

Fish sanctuaries are sub-quaternary catchments that are essential for protecting threatened and near-threatened freshwater fish populations that are indigenous to South Africa. The combined GIS layer for fish sanctuary maps was used with river condition to divide fish sanctuaries, and fish rehabilitation and translocation areas into FEPAs and Fish Support Areas, where fish sanctuaries in a good condition (A or B ecological category) were selected as FEPAs, and the remaining ones became Fish Support Areas.

According to SANBI's BGIS web-based information, the relevant sub-quaternary catchment (ID 9114) is not identified as a FEPA or Fish Support Area (FSA) (see Figure 4-1) and has not been indicated as important in terms of relocation, translocation or migration corridors of threatened fish.

4.3 Wetland Ecosystem Type

The approach to identify wetland ecosystem types uses wetlands that are classified on the basis of a hydrogeomorphic approach to Level 4a of the 2010 version of the National Wetland Classification System (SANBI, 2009) and using a GIS protocol for automation. These were then combined with groupings (called wetland vegetation groups) of the vegetation map of South Africa (Mucina and Rutherford, 2006) to derive wetland ecosystem types that were used to depict the diversity of wetland ecosystems across the country (792 wetland ecosystem types). Wetlands in the same

wetland ecosystem types are expected to share similar broad functionality and ecological characteristics. A goal of NFEPA is to ensure that at least 20% of each wetland ecosystem type is managed in a natural or near-natural state. This serves to conserve many common species and communities, and the habitats in which they evolve (Nel, *et al*., 2011).

The Wetland Ecosystem Type relevant to the study area is the *Albany Thicket*. This information was used to derive the FEPAs mentioned above.

4.4 National Wetland Map 4

The most recent national wetlands locality map augments the waterbodies and wetlands from the National Land Cover 2000 with inland water features from the Department of Land Affairs' Chief Directorate: Surveys and Mapping (DLA-CDSM). All of these have been classified as either 'natural' or 'artificial' wetlands to derive the National Wetland Map 3. Finally, wetland data layers from sub-national wetland locality maps (e.g. KwaZulu-Natal province and the Cape Action for People and the Environment (C.A.P.E.) fine-scale biodiversity planning domains) have also been added to derive the final NFEPA Wetland Map/ National Wetland Map 4.

Wetlands within one kilometre of each other were placed into initial clusters. Clusters allow for important ecological processes such as migration of frogs and insects between wetlands. NFEPA wetland clusters were identified where a cluster contained at least three wetlands of which at least 50% of the wetlands are natural, and where the majority of the wetland cluster area is under natural land cover. A goal of NFEPA is to ensure that at least 20% of the wetland cluster area identified for each wetland vegetation group is managed in a way that supports dispersal between wetlands within the cluster, ideally a natural or near-natural condition (CSIR, 2011).

According to the NFEPA database, there are no wetland features occurring within 500 m from the proposed construction activities as indicated on Figure 4-1.

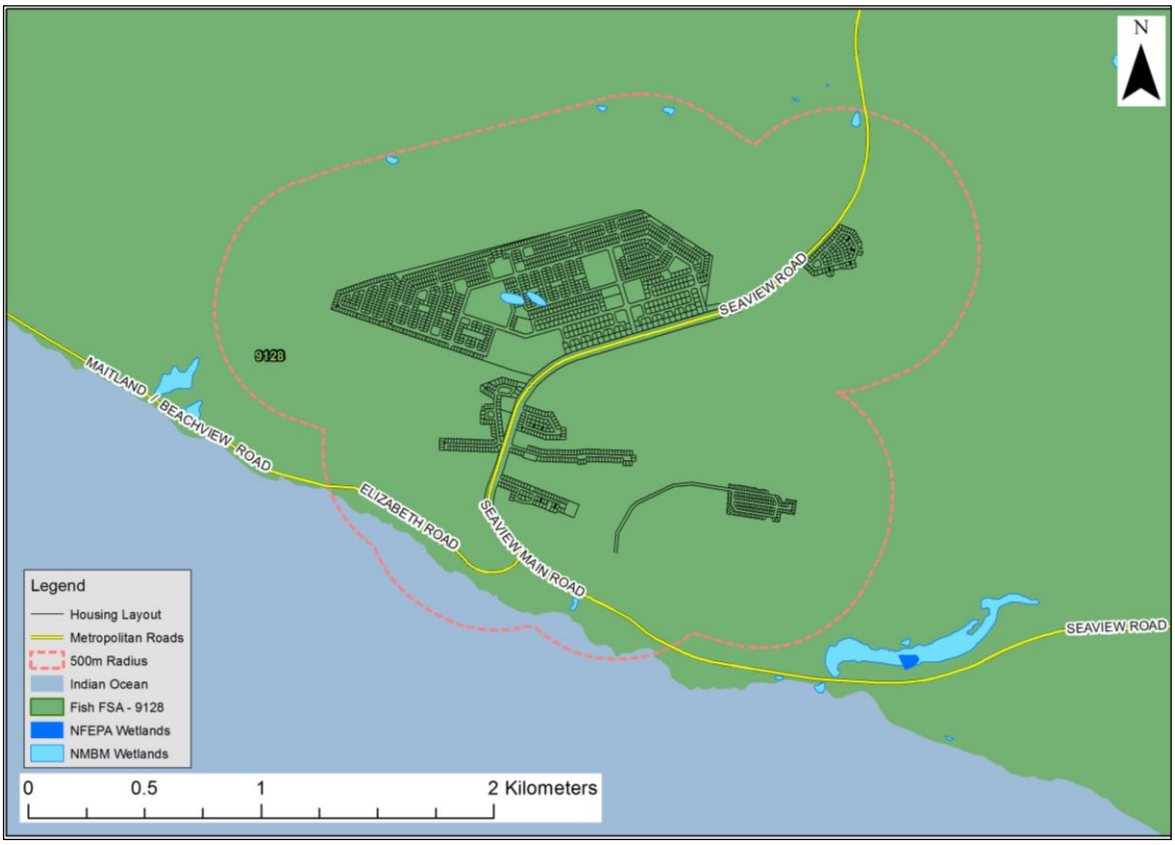

Figure 4-1: NFEPA and NMBM wetlands database data in relation to the study site location

4.5 NMBM Wetlands Map

Ephemeral wetlands of the Nelson Mandela Bay Metropolitan area have been mapped as part of an ongoing project by the Nelson Mandela Metropolitan University (NMMU) (Schael, *et al*., in preparation).

According to the NMBM wetlands database, seven wetland features occur within 500 m from the proposed construction activities. More information regarding the identified features is provided in section 5 below.

4.6 NMBM Contour Data

NMBM contour data (1 m intervals) and historical aerial photography was used to identify potential unmapped wetlands and/or drainage lines within 500 m from the proposed construction activities. Three potential wetlands and three potential drainage lines were identified. These are indicated on Figure 5-1.

4.7 Rivers

Rivers data on the SANBI database is derived from the 2007 1:500,000 rivers data layer available from the DWS website, which were updated and amended at various instances. Additional information includes river condition, river ecosystem types and free-flowing river information that were used in deriving FEPAs for river ecosystems. River condition on this database was determined by using DWAF's 1999 Present Ecological State (Kleynhans, 2000) data for quaternary catchment mainstem rivers and modelled data for tributaries. Only river ecosystems in good condition (A or B

ecological category) were chosen as FEPAs because these rivers provide the best representative examples of South Africa's freshwater ecosystems and associated biodiversity.

The most recent study by Birkhead, *et al*. (2013) reported the Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) for Water Management Areas (WMAs) 12 and 15 in a study for the DWS.

No NFEPA rivers fall within 500 m from the proposed construction activities. A non-perennial drainage line is included in the 1:50 000 topographical map of the study area. Additional information regarding the non-perennial drainage line is included in Section 5 below.

4.8 Eastern Cape Biodiversity Conservation Plan

The Eastern Cape Biodiversity Conservation Plan (ECBCP) is a broad-scale biodiversity plan. It integrates other existing broad-scale biodiversity plans in the Province, and fills in the gaps using mainly national data. It has been designed to serve as the basic biodiversity layer in Strategic Environmental Assessments, State of Environment Reports, SDFs, EMFs and Bioregional Plans and contains maps of terrestrial and aquatic CBAs, as well as suggested land use guidelines.

A land management objectives-based approach has been adopted in the ECBCP. This approach rests on the concept of Biodiversity Land Management Classes (BLMCs). Each BLMC sets out the desired ecological state that an area should be kept in to ensure biodiversity persistence.

No aquatic CBAs are present within 500 m from the proposed construction activities.

4.9 Strategic Water Source Areas (SWSA)

Strategic water source areas are those areas that supply a disproportionate amount of mean annual runoff to a geographical region of interest. Any area estimated to have ≥135 mm/year in its 1 x 1 minute grid cell was considered to be a SWSA at the national level. These areas span South Africa, Lesotho and Swaziland and occupy 8% of the land surface area in the region. Together, these areas supply 50% of the region's mean annual runoff.

Strategic water source areas are important because they have the potential to contribute significantly to overall water quality and supply. Deterioration of water quality and quantity in these areas can have a disproportionately large negative effect on the functioning of downstream ecosystems and the overall sustainability of growth and development in the regions they support. Appropriate management of these areas can greatly support downstream sustainability of water quality and quantity. Maintaining healthy functioning riparian zones and wetlands are some of the key management measures for these areas (Nel, *et al*. 2013).

The mean annual runoff (MAR)[1] for the proposed site is given as between 20.34 and 61.03 mm/year. The area within 500 m of the proposed development is therefore not considered a SWSA.

4.10 Groundwater Recharge

Groundwater is essential for sustaining river flows during dry seasons. Groundwater recharge is a process whereby rainwater seeps into groundwater systems and is calculated as an average over many years. Rainfall and geological permeability are the two main factors on which recharge is

[1] Mean annual runoff for South Africa (mm/year for each 1 x 1 minute grid cell), based on disaggregating the Water Resources Assessment 2005 data (Middleton and Bailey, 2009), which represents the most commonly-used national mean annual runoff data used by the Department of Water and Sanitation for water resources planning and management.

dependent and will vary among areas. An area where recharge is high is considered to be a recharge hotspot and it is essential that vegetation in these areas is kept intact to maintain the healthy functioning of groundwater dependent ecosystems, which are in the immediate vicinity or several kilometres removed from the recharge area (Nel, *et al*. 2011).

The percentage recharge for each sub-quaternary catchment is expressed as the percentage recharge of the relevant primary catchment to identify areas where groundwater recharge is at least three times more than that of the primary catchment.

The groundwater recharge for the relevant sub-quaternary catchments is given as 144% for the sub-quaternary catchment (SANBI, 2011a), which is not regarded as significant. The area is therefore not considered important or sensitive from a groundwater recharge perspective.

5 Study Results

As mentioned above, the NMBM wetlands database identified seven wetland features occurring within 500 m from the proposed construction activities. One non-perennial drainage line has also been identified (using the 1:50 000 topographical map of the area) within 100 m of the proposed pipeline alignment and therefore within the DWS regulated area for watercourses. Additional desktop research revealed three potential unmapped wetlands and three potential drainage lines. Two site visits were conducted to verify the identified features.

Ground truthing of these areas revealed that no wetlands occur at the identified locations (refer to numbering in Figure 5-1), and that the watercourse indicated on the 1:50 000 topographical map is not currently present. Each area is individually discussed below including the identified potential drainage lines and are also depicted in Figure 5-1.

Area 1 was originally identified as a natural valley floor wetland (channelled valley bottom) according to the NMBM wetlands database. During the site visit it was revealed that it is an informal drainage channel resulting from a stormwater discharge point located adjacent to the M9 road to Seaview. The channel is surrounded by a mix of *Phragmites australis* (common reed)*, Typha capensis* (bulrush)*,*and *Chrysanthemoides monilifera* (bitou bush) and other terrestrial vegetation (see Table 5-1). The channel discharges into rock-pools on the tidal edge of the supratidal zone where inflow from stormwater discharge and residential septic tanks combine vertically with marine inflow. Water flows down the informal drainage channel which lies on a fairly sloped gradient from the road level to the rocky coastline. Evidence of erosion is present directly adjacent to the stormwater discharge pipe, where large pieces of the concrete pipe have broken off as the ground beneath has eroded. Large stands of *Phragmites australis* and *Typha capensis* are present along the edge of the coastline in this area, most likely due to residential septic tank discharge points. No wetland could be identified in the area.

Area 2 was originally identified as a possible wetland during the desktop study due to its position in the landscape (valley floor) and aerial photography. During the site visit it was revealed that it is a flat-bottom dune slack. Historical aerial photography shows that a road ran through the length of the area. The bottom of the slack is densely covered in terrestrial vegetation, namely, *Carpobrotus sp, Pennisetum clandestinum* (kikuyu grass) and other grasses (see Table 5-1). The edges of the dune slack are bordered with *Acacia cyclops* (rooikrans), *Vachellia karroo* (sweet-thorn), *Zanthoxylum capense* (small knobwood) and *Sideroxylon inerme* (white milkwood). No water was present in the area and soil samples taken showed no signs of wetness. Therefore, no wetland could be identified in the area.

Area 3 was originally identified as two possible wetlands during the desktop study due to the topographical data and aerial photography. During the site visit it was revealed that it is two patches of low-lying fynbos vegetation (namely *Disparago sp* and *Metalasia sp*) surrounded by dense stands of *Acacia cyclops* (rooikrans) and *Acacia saligna* (port Jackson willow) in a previously disturbed area. The area is fairly sloped with sandy soil. No wetlands could be identified in the area.

Area 4 was originally identified as two modified bench wetlands (wetland flats) according to the NMBM wetlands database. Historical aerial photography shows that Area A4(b) was previously a horse training track. Currently the area is part of a large patch of planted pasture grass. Evidence of recent grass cutting activities was present. Historical aerial photography shows that Area A4(a) was used for agricultural land. Currently the area was revealed to be a horse training track. The area is gently undulating, consisting of sandy soils. No wetlands could be identified in the area.

Area 5 was originally identified as a natural slope wetland (seep) according to the NMBM wetlands database. The site visit revealed that the area was previously cleared and is surrounded by natural bush with intermittent stands of *Acacia cyclops* (rookrans). The area is fairly sloping and the

vegetation within the cleared area consists of a mix of *Pennisetum clandestinum* (kikuyu grass), *Carpobrotus sp.* and *Metalasia sp*. No wetland could be identified in the area.

Area 6 (A6) and **Area 7 (A7)** were originally identified as degraded wetland seeps on a natural slope according to the NMBM wetlands database. The site visit revealed that these areas exist within a sand quarry currently being mined to the south of the identified areas. Historical aerial photography shows that both areas have been previously modified through mining activities and have since been rehabilitated. Area 6 is a fairly sloped area in the north-west corner of the quarry and consists of a mix of indigenous fynbos vegetation and *Pennisetum clandestinum* (kikuyu grass). Area 7 is a flat area in the north-east corner of the quarry. It currently has a road running through the length of the area. The road is flanked by a mix of grasses, namely *Pennisetum clandestinum* (kikuyu grass) and *Cynodon dactylon* (kweek). No wetlands could be identified in either area.

Area 8 (A8) was originally classified as an artificial wetland flat according to the NMBM wetlands database. The NMBM database notes that the wetland had been damaged by the construction of adjacent roads and farm structures. Historical aerial photography shows no signs of a wetland feature in the area. The site visit revealed that the area is grassed parking area surrounded by a grassed road (*Pennisetum clandestinum*). No wetland could be identified in the area.

A **non-perennial drainage** was identified on the 1:50,000 topographical map. Historical aerial photography indicates that the identified drainage line appears to have been a wind-row consisting of *Eucalyptus grandis* (bluegum). The site visit revealed that the area is low-lying area adjacent to the M9 road lined with a mix of *Eucalyptus grandis* (bluegum), *Searsia undulata* (namaqua kunibush), *Pterocelastrus tricuspidatus* (candelwood), *Gymnosporia buxifolia (*common spikethorn) and *Zanthoxylum capense* (small knobwood). Several small dune slacks exist either side of the ridge, however they all consisted of sandy soils, and terrestrial vegetation (such as *Vachellia karroo, Carpobrotus sp* as well as the above mentioned tree species). No sign of water (wetness) or aquatic vegetation was present and no drainage line could be identified.

Three **potential drainage lines** were identified using contour data and aerial photography. During the site visit these areas were revealed to be previously cleared dune slacks consisting of sandy soil, terrestrial vegetation and no indication of flowing water. No drainage lines could be identified in these areas.

A map of the investigated areas is included in Figure 5-1 and Table 5-1 below lists the main plant species observed.

Due to the lack of wetlands or other watercourses in close proximity to the proposed construction activities, it is not anticipated that any impacts will occur on aquatic resources as a result of the proposed development. Therefore, no mitigation measures are recommended.

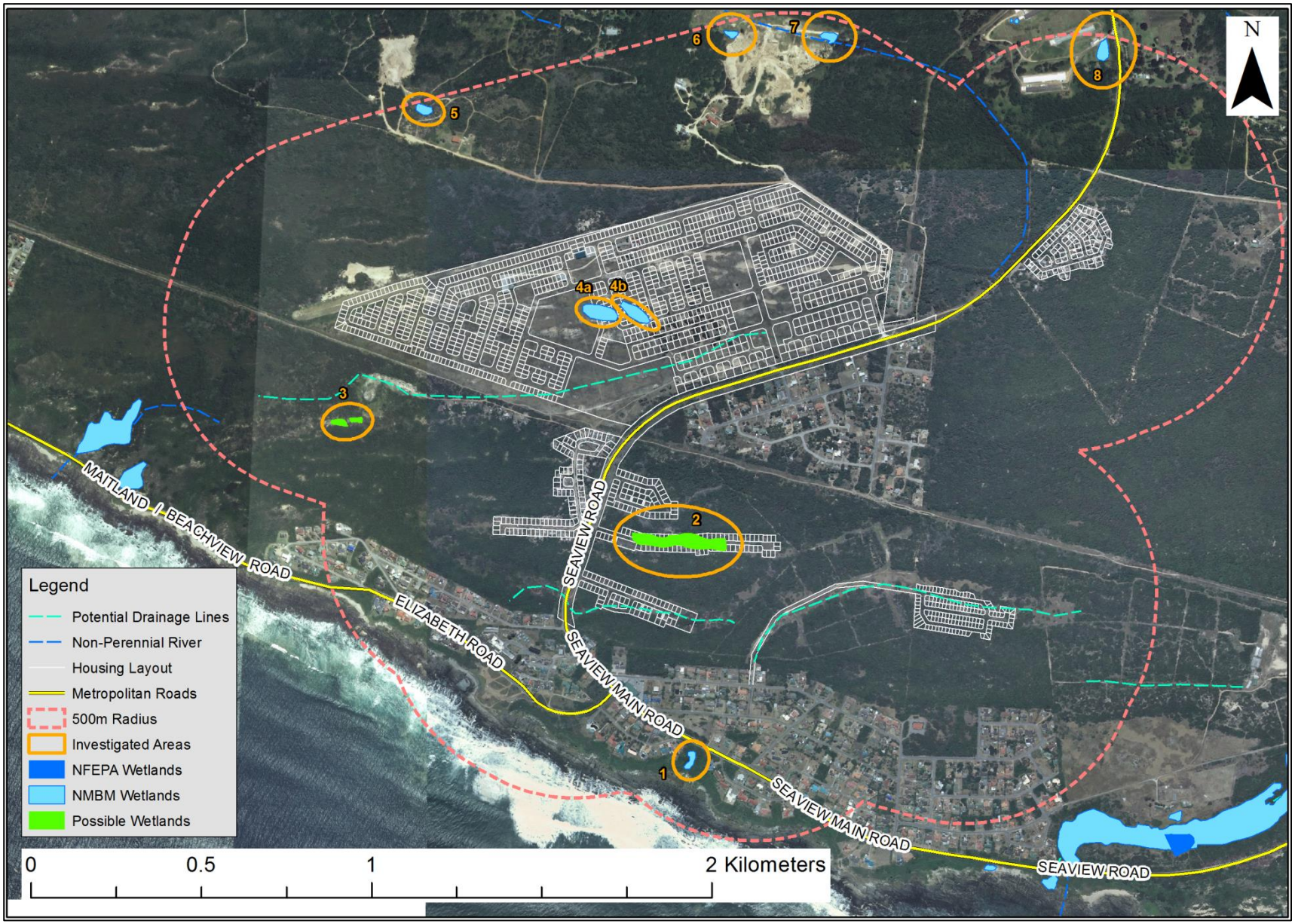

Figure 5-1: Overview of identified wetlands and other watercourses within 500 m of the proposed development

Table 5-1: Main plant species observed

Scientific Name	Common Name	Classification	Indigenous/ Alien
Phragmites australis	Common Reed	Obligate Wetland	Indigenous
Typha capensis	Bulrush	Obligate Wetland	Indigenous
Chrysanthemoides monilifera	Bitou Bush/ Tick Berry	Terrestrial	Indigenous
Atriplex semibaccata var. semibaccata	Creeping saltbush	Facultative	Indigenous
Pennisetum clandestinum	Kikuyu grass	Facultative	Alien
Carpobrotus sp	Sour Fig	Terrestrial	Indigenous
Acacia karroo	Sweet Thorn	Terrestrial	Indigenous
Zanthoxylum capense	Small Knobwood	Terrestrial	Indigenous
Acacia cyclops	Rooikrans	Terrestrial	Alien
Eucalyptus grandis	Blue Gum		
Disparago sp		Terrestrial	Indigenous
Metalasia sp	Blombos	Terrestrial	Indigenous
Acacia saligna	Port Jackson Willow	Terrestrial	Alien
Cynodon dactylon	Kweek grass	Facultative	Indigenous

6 Key Findings and Recommendations

Seven wetlands and a non-perennial drainage line were identified as occurring in the area using existing databases. During the desktop study, an additional three potential wetlands and three potential drainage lines were identified for further investigation. Following two site visits, each of the potential sites identified in the desktop analysis were investigated and it is concluded that no wetlands or other watercourses occur within 500 m of the proposed development sites. Due to the lack of wetlands and other watercourses in close proximity to the proposed construction activities, no impacts on aquatic resources are anticipated as a result of the proposed development. Therefore, no mitigation measures have been recommended.

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Luc Strydom

Environmental Consultant

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Karissa Nel MEM, CEAPSA

Senior Environmental Scientist

Reviewed by

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Rob Gardiner Pr Sci Nat

Principal Environmental Scientist, Partner

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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Appendix A: Photographs

	
Photo 1: Area 1 – View of Area 1. *Phragmites australis* in the foreground.	Photo 2: Area 1 – Channel formed as a result of the stormwater outlet (indicated by the red arrow).
	
Photo 3: Area 2 – Illegal dumping on the western edge of the area.	Photo 4: Area 2 – *Carpobrutus sp*. covering the ground.
	
Photo 5: Area 2 – Taking soil samples.	Photo 6: Area 2 – Soil sample – not signs of wetness.

Photo 7: Area 2 – View of the center of Area 2.

Photo 8: Area 3 – View of Area 3.

Photo 9: Area 4 – View of Area 4(b).

Photo 10: Area 4 - View of Area 4(a).

Photo 11: Area 5 – View of Area 5.

Photo 12: Area 6 – View of Area 6.

	
Photo 13: Area 7 – View of Area 7.	Photo 14: Area 8 – View of Area 8.

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