5. DESCRIPTION OF THE ONSHORE TERRESTRIAL ENVIRONMENT

This section provides a general overview of the biophysical and socio-economic aspects of the environment associated with the proposed onshore pipeline routes. Where applicable, detailed descriptions are provided of the environment that may be directly affected by the proposed project components.

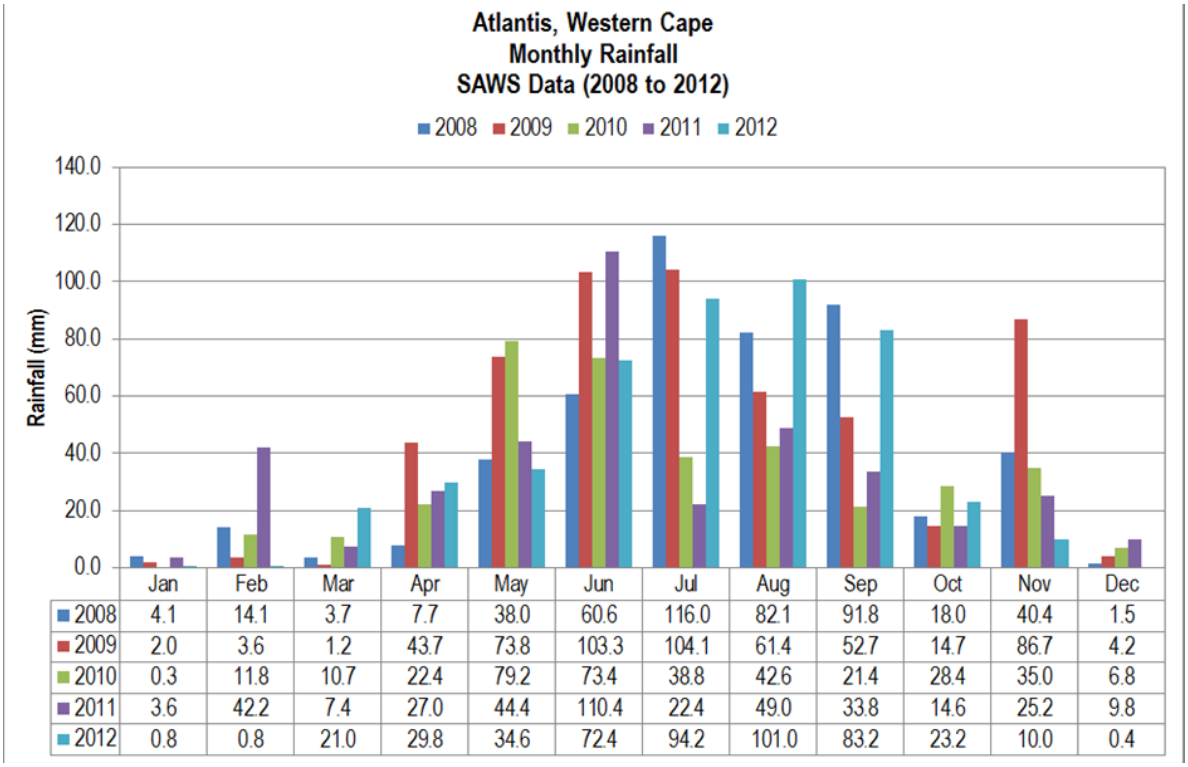
The target study area is essentially made up of two sections, referred to as the **southern shore-crossing route** between Grotto Bay and Duynefontein (see Section 5.2), and the **northern shore-crossing route** on the Saldanha Peninsula (see Section 5.3).

5.1 CLIMATE

5.1.1 RAINFALL

5.1.1.1 Southern study area

Rainfall data collected by the South African Weather Service (SAWS) at Atlantis from 2008 to 2012 indicates an annual rainfall of between 370 mm and 550 mm. On average the area receives 452 mm of rain per year. A summary of monthly rainfall recorded at Atlantis is provided in Figure 5.1. Most rain is received in the winter months (June to August). Summer months are the driest.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	4.1	14.1	3.7	7.7	38.0	60.6	116.0	82.1	91.8	18.0	40.4	1.5
2009	2.0	3.6	1.2	43.7	73.8	103.3	104.1	61.4	52.7	14.7	86.7	4.2
2010	0.3	11.8	10.7	22.4	79.2	73.4	38.8	42.6	21.4	28.4	35.0	6.8
2011	3.6	42.2	7.4	27.0	44.4	110.4	22.4	49.0	33.8	14.6	25.2	9.8
2012	0.8	0.8	21.0	29.8	34.6	72.4	94.2	101.0	83.2	23.2	10.0	0.4

Figure 5.1: Monthly rainfall at Atlantis between 2008 and 2012 (SAWS data).

5.1.1.2 Northern study area

Saldanha Bay falls within a winter rainfall region and receives most of its rain during June, July and August (see Table 5.1). The region, as observed at Langebaanweg, is relatively dry with an average annual rainfall of 278 mm. The annual average relative humidity is 50% and 76% for day and night, respectively, with ±10% variance over the yearly average. The annual average cloud cover is 35% and 29% for day and night, respectively.

Table 5.1: Long-term rainfall at Langebaanweg.

Month	Average monthly (mm)	Average Number of days with >= 1mm	Highest 24-hr rainfall (mm)
January	8	1.9	14
February	4	1.2	10
March	11	2.2	21
April	24	3.9	30
May	40	6.3	30
June	41	6.4	27
July	47	7.1	35
August	45	6.8	57
September	24	4.9	29
October	12	2.8	40
November	12	2.4	23
December	10	2.4	14
Year	**278**	**48**	**57**

5.1.2 TEMPERATURE

5.1.2.1 Southern study area

Diurnal and average monthly temperature trends are presented in Figure 5.2. Monthly mean and hourly maximum and minimum temperatures are given in Table 5.2. Temperatures generally range between -1.8ºC and 40ºC. The highest temperatures occur in January, February and March. The lowest occur between June and September. During the day, temperatures increase to reach maximum at around 13h00. Ambient air temperature decreases to reach a minimum at around 07h00.

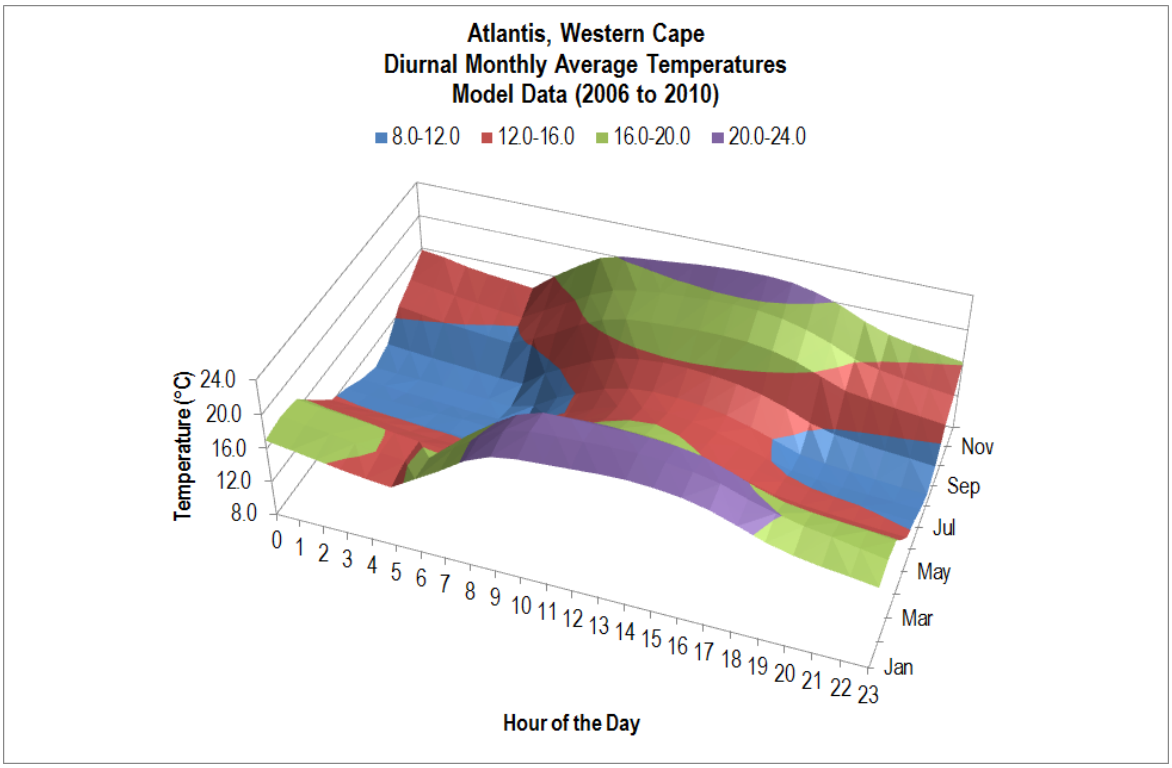


Figure 5.2: Diurnal temperature profile at Atlantis between 2006 and 2010.

Table 5.2: Monthly temperature summary for Atlantis between 2006 and 2010.

Hourly Minimum, Hourly Maximum and Monthly Average Temperatures (°C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum	11.4	12.6	9.4	9.4	7.3	5.8	4.5	3.5	6.1	6.1	7.6	8.9
Maximum	40.0	40.9	37.7	36.6	32.5	30.0	28.0	29.9	38.6	37.5	37.5	39.9
Average	21.7	22.0	20.2	18.4	15.8	13.9	13.6	13.0	15.4	16.6	18.6	20.1

5.1.2.2 Northern study area

The Saldanha Peninsula experiences a temperate climate with temperatures reaching a maximum during the months of January and February. July and August are generally the coldest months. Monthly mean and hourly maximum and minimum temperatures are presented in Table 5.3. From observations made by SAWS in Vredenburg, hourly averaged temperatures generally ranged between a minimum of 6ºC - 7ºC during the winter months (May to August) to a maximum of 36.8ºC during February. February is also the month with the highest monthly average temperature of 20.4ºC, with the lowest monthly average occurring in August (12.9ºC).

The observations along the coast at Cape Columbine show lower temperatures with hourly averaged temperatures generally ranging between a minimum of 6.8ºC during August to a maximum of 33.7ºC during February. As with Vredenburg, February is also the month with the highest monthly average temperature of 18.4ºC, with the lowest monthly average occurring in August (13.9ºC).

Table 5.3: Monthly temperature summary for Atlantis between 2006 and 2010.

Hourly Minimum, Hourly Maximum and Monthly Average Temperatures (°C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cape Columbine												
Minimum	12.2	12.2	11.0	11.0	10.9	8.8	6.8	8.9	8.7	9.9	11.6	12.4
Maximum	23.5	33.7	32.7	34.0	29.1	24.7	24.7	26.5	21.1	27.2	29.1	26.1
Average	17.7	18.4	17.1	16.3	15.5	15.1	14.9	13.9	14.4	16.3	17.7	18.0
Vredenburg												
Minimum	12.0	12.0	11.0	10.0	7.0	6.0	7.0	7.0	8.0	7.0	10.0	12.0
Maximum	36.0	36.8	40.0	37.0	30.0	27.0	24.0	26.0	24.0	31.0	34.0	36.0
Average	18.5	20.4	19.9	17.1	14.8	13.7	14.1	12.9	13.5	15.9	17.0	18.4

5.1.3 WIND

5.1.3.1 Southern study area

Predominant winds in the study area between 2006 and 2010 were from the north-west and east-south-east with an average wind speed of 4 m/s (see Figure 5.3). The strongest winds (> 10 m/s) were from the north and north-north-west. During this period calm conditions occurred 7.9% of the time. There is a distinct difference between the day and night-time wind field. The day-time wind field is dominated by winds from the west-north-west, an average wind speed of 4.1 m/s and 6.6% calm conditions. During the night the wind field is dominated by winds from the east-south-east, an average wind speed of 3.9 m/s and 9.2% calm conditions. Predominant winds in summer are from the south, with intermittent south-easterly and south-westerly winds. North-westerly winds dominate during winter months.

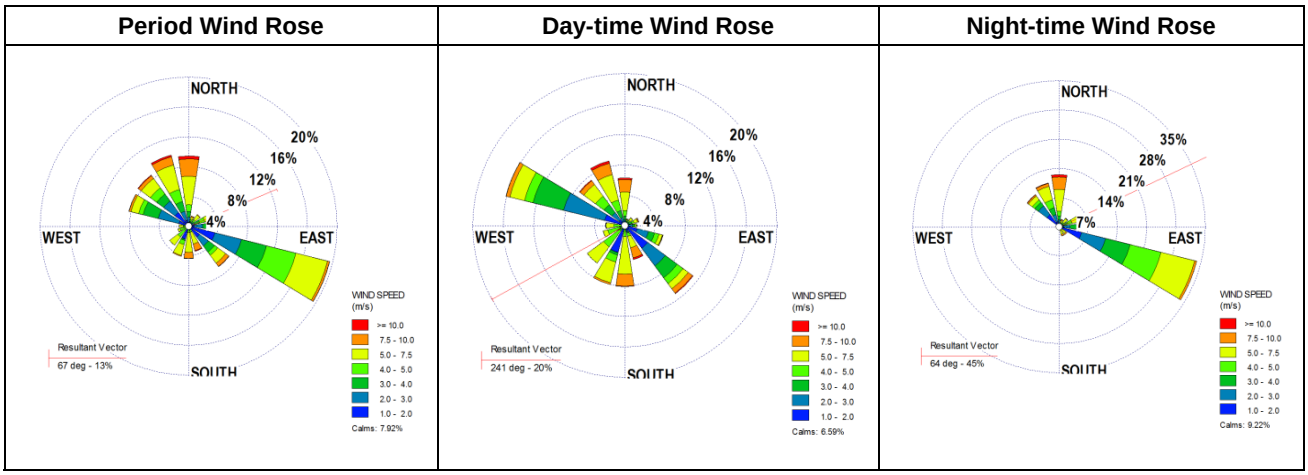


Figure 5.3: Period, day- and night-time wind roses for the onshore study area (2006-2010).

5.1.3.2 Northern study area

The northern study area is dominated by the southern wind sector at both Cape Columbine and Vredenburg) (see Figure 5.4). Cape Columbine has more frequent south-south-easterly winds than Vredenburg, where the south-south-westerly winds are more prevalent. Both the southerly (summer) and northerly (winter season) wind components are associated with frequent, strong wind speeds above 10 m/s. Whilst this is evident at both sites, the south-south-westerly winds at Vredenburg are not as strong as the south-south-easterly winds at Cape Columbine. There are also more calm wind conditions at Cape Columbine (9.9%) than at Vredenburg (3.5%). The land-sea breeze condition is clearly illustrated at Cape Columbine, where the frequency of westerly winds is high during the day, but nearly non-existent at night-time.

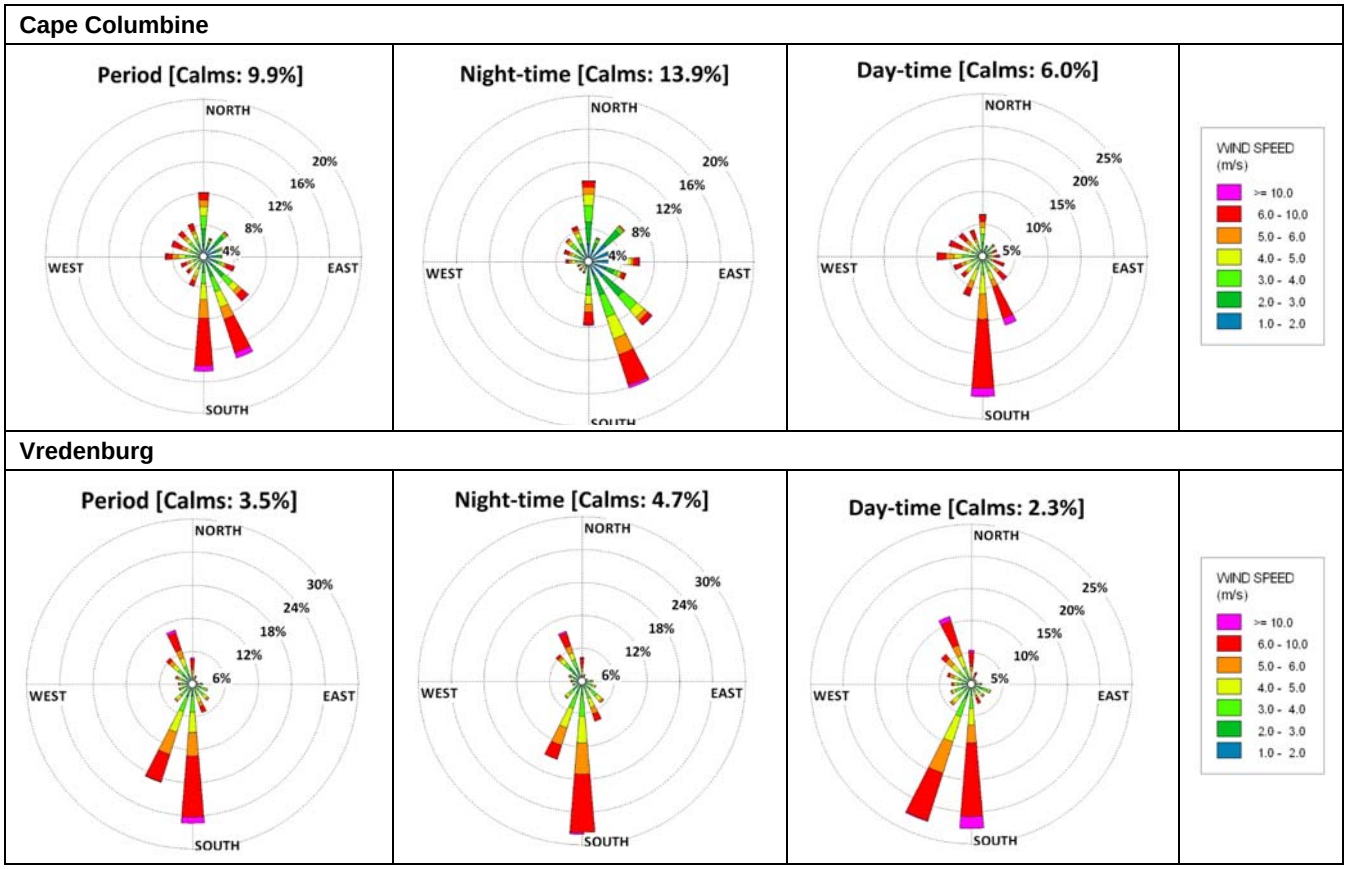


Figure 5.4: Wind roses for Case Columbine and Vredenburg.

5.2 SOUTHERN SHORE-CROSSING ROUTE (GROTTO BAY TO DUYNEFONTEIN)

5.2.1 TOPOGRAPHY

The general topography of the area is fairly flat, but more undulating towards the east and with dunes near the coast. The northern parts of the pipeline routes reaches ±100 metres above mean sea level (mamsl) and the southern part varies between 50 and 70 mamsl.

5.2.2 GEOLOGY, SOILS AND GROUNDWATER

Shales and greywacke of the Tygerberg Formation and Malmesbury Group are the older rocks that underlie the area. These rocks often weather to produce a substantial thickness of clay. The Tygerberg Formation outcrops in the eastern portion. The younger rocks of the Springfontein Formation, which is the main water-bearing formation, are predominant on the western side of the study area. The overlying unconsolidated sand layer increases in thickness to the north and west across the area.

The most dominant soil types for the study area tend to be imperfectly drained grey sandy soils. The soils tend to be highly calcareous at the coast, often underlain by calcrete and susceptible to wind erosion.

The study area falls within several protection zones of the Atlantis Aquifer (see Figure 5.5). This aquifer forms an important component of the water supply system for the City of Cape Town. Groundwater levels are between 2 - 12 m below natural ground level, although there are significant seasonal fluctuations. Groundwater flow is in a south-westerly direction.

5.2.3 FLORA

5.2.3.1 General description

The southern area lies at the boundary of the Swartland and Sandveld bioregions. Five vegetation types occur along the proposed pipeline route and at the onshore facility sites (see Figure 5.6), including:

- *Cape Seashore Vegetation (Least Threatened)*: This vegetation type is an azonal vegetation type associated with the mobile or semi-mobile dunes in a saline environment. It is described by Mucina *et al*. (2006) as grassy, herbaceous or sometimes dwarf-shrubby vegetation on beaches and coastal dunes.
- *Cape Flats Dune Strandveld (Endangered D1)*: The coastal dunes on the Cape West Coast at Silwerstroom Strand and the Atlantis dune plume support Cape Flats Dune Strandveld (Rebelo *et al.* 2006). This thicket-like vegetation with evergreen, hard-leaved shrubs, grasses and annuals was previously referred to as Dune Thicket (Low & Rebelo 1996) and Cape Flats Fynbos – Thicket Mosaic (Cowling & Heijnis, 2001).
- *Atlantis Sand Fynbos (Critically Endangered D1)*: This vegetation type is very similar to Cape Flats Sand Fynbos in appearance and is mainly restioid and proteoid fynbos with ericaceous fynbos and asteraceous fynbos in seepages (Rebelo *et al.* 2006). It differs from Cape Flats Sand Fynbos in species composition and is well-known for the endemic proteoid, *Leucospermum parile*, a threatened Red Data listed species. The loss of this vegetation is largely due to transformation by agriculture and sand mining.
- *Langebaan Dune Strandveld (Vulnerable* according to NSBA*)*: This vegetation type is a shrubland formation strongly associated with calcareous dunes from Grotto Bay, approximately 60 km north of Cape Town, for approximately 100 km northwards to Elands Bay (Rebelo *et al.* 2006; Helme 2007). It is, therefore, not restricted to the Langebaan / Saldanha area although best expressed at Langebaan. This vegetation is similar to Cape Flats Dune Strandveld being an evergreen sclerophyllous shrubland up to 2 m tall, with a prominent annual spring flora.

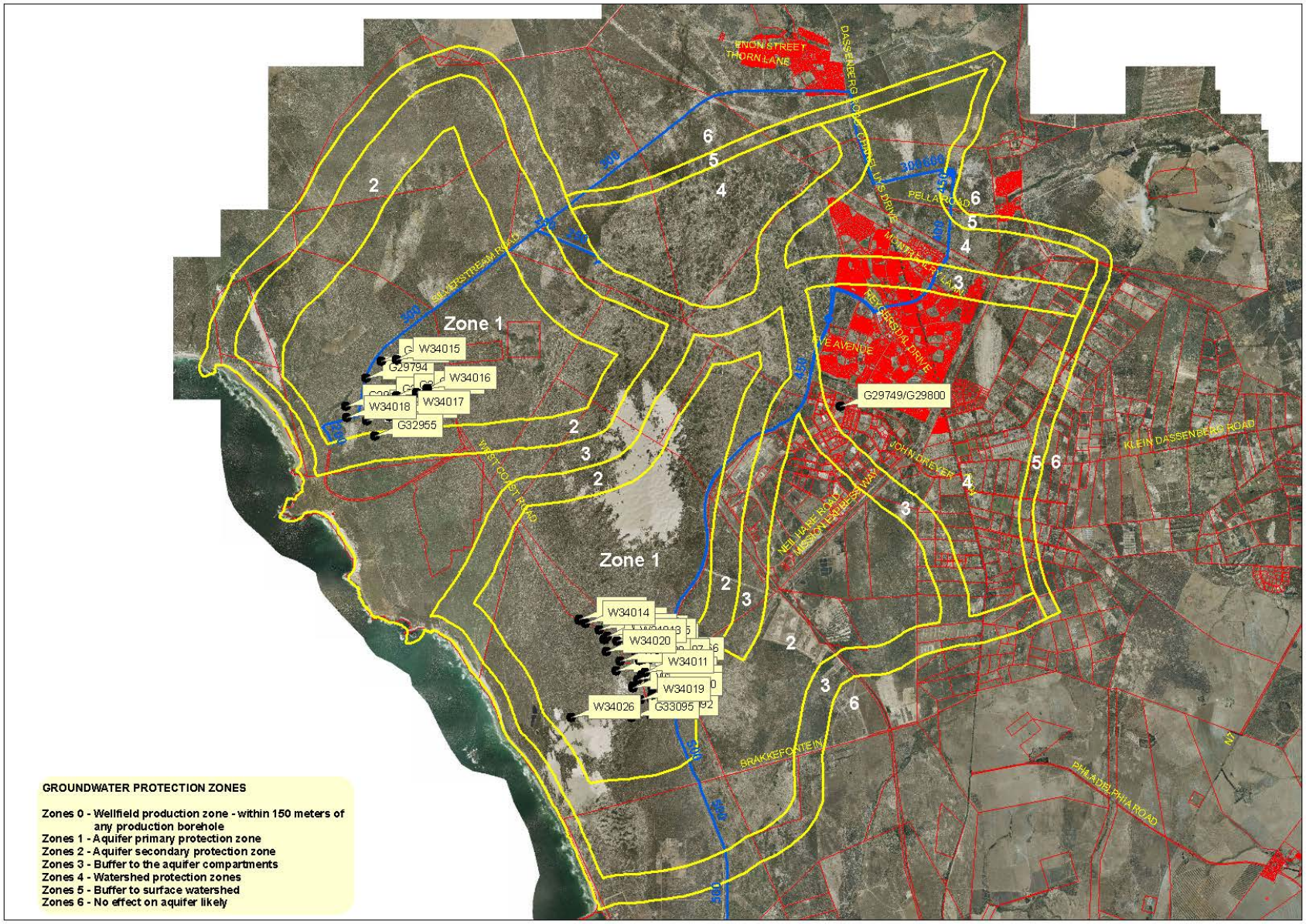


Figure 5.5: Groundwater Protection Zones (After CoCT: Water Demand Management & Strategy Branch).

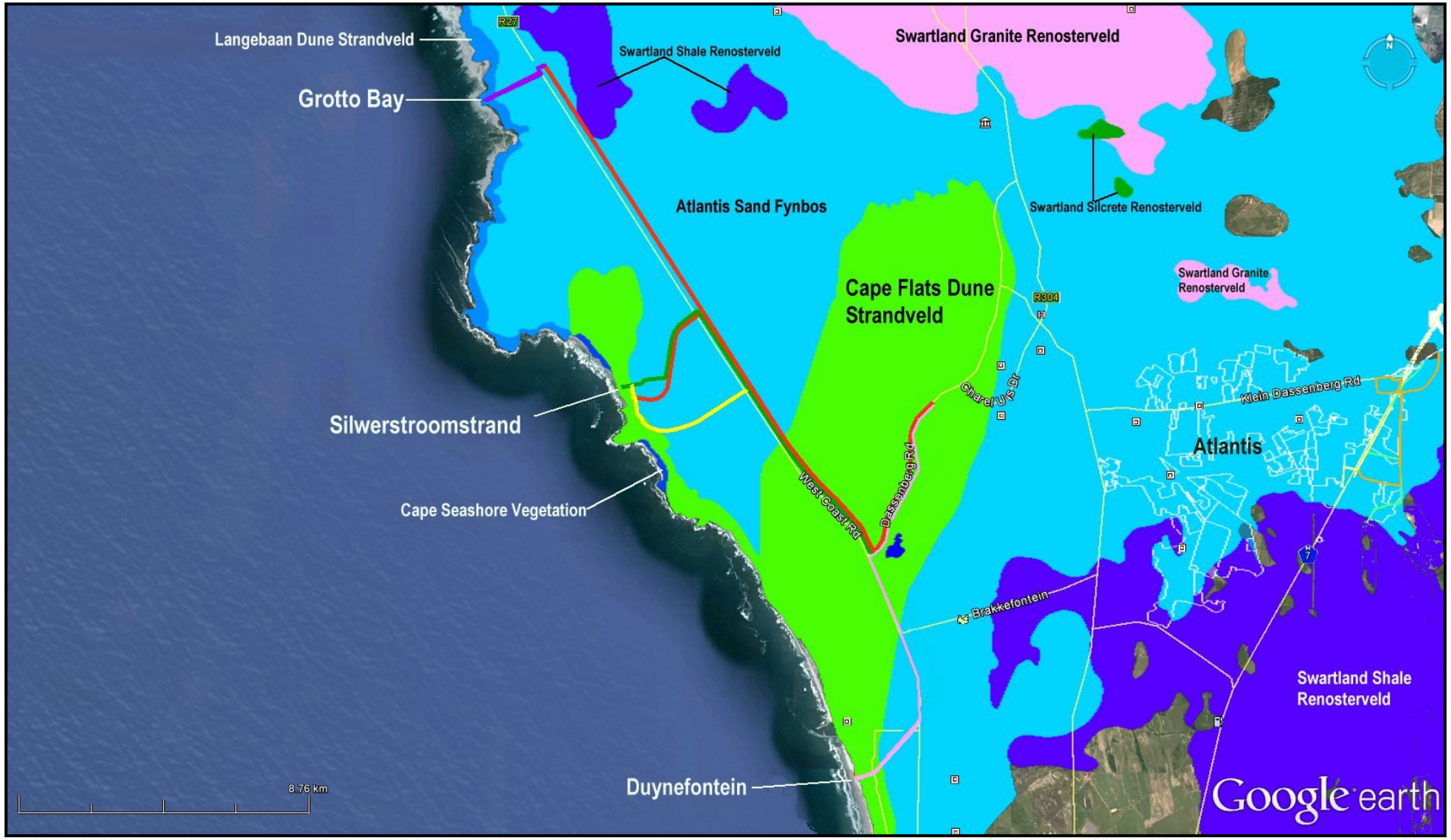


Figure 5.6: Southern onshore pipeline route alternatives in relation to the vegetation types in the area (after Mucina *et al.* 2005).

- *Swartland Shale Renosterveld (Critically Endangered A1 & D1)*: This vegetation type is found exclusively in the Western Cape and is one of the most endangered vegetation types in South Africa due to the arable nature of its clay-rich soils and the conversion of large proportions to agriculture. Only small areas of this annual and geophytic-rich shrubland vegetation, which generally has a wealth of plant species, with many endemic to this vegetation type, remain intact. Those areas are vital for its conservation.

Cape Inland Salt Pans (Vulnerable according to NSBA) are seasonal pans, typically supporting a saltmarsh community, are scattered throughout the study area.

Much of the area around Ankerlig and along the R27 that occurs within the City of Cape Town Municipality has been mapped as a Critical Biodiversity Area (CBA) (see Figure 5.7). Similarly, much of the area within the Swartland Municipality through which the pipeline routes pass is mapped as an 'Endangered' ecosystem (Job & Driver 2006) (see Figure 5.8).

5.2.3.2 Grotto Bay

Near the coast the proposed pipeline would pass through a short section of Cape Seashore Vegetation and Langebaan Dune Strandveld. Thereafter the pipeline would be aligned on the southern side of the Grotto Bay Road within an existing firebreak in Atlantis Sand Fynbos (see Plate 5.1). The vegetation within the firebreak is cut regularly and is, therefore, subjected to regular disturbance.

5.2.3.3 Silwerstroom Strand

The three Silwerstroom Strand pipeline alternatives would all traverse Cape Flats Dune Strandveld over a small distance close to the coast and then through Atlantis Sand Fynbos between the coastal zone and the R27 (see Figure 5.6). The whole of the Silwerstroom Strand area is included as a CBA (see Figure 5.7).

The first section of the pipeline would pass through the Silwerstroom Strand Resort, where there would be minimal impact on any natural vegetation (previously Cape Flats Dune Strandveld). The pipeline then would follow one of three routes. These are described briefly below.

- Alternative 1 (Northern Route) – Alignment via the existing Silwerstroom Water Treatment Plant: The pipeline would pass through Atlantis Sand Fynbos from the resort until the Water Treatment Plant. The pipeline would then follow the existing Water Treatment Plant gravel road (see Plate 5.2) and Silwerstroom Strand Road, resulting in the further loss of Atlantis Sand Fynbos vegetation.
- Alternative 2 (Central Route) - Alignment follows the existing Silwerstroom Strand Road: In this case the pipeline would run along the east boundary of the Silwerstroom Strand Resort in a disturbed area. It would then follow the Silwerstroom Strand Road on the north side and would impact Atlantis Sand Fynbos up to the R27 (see Plate 5.3).
- Alternative 3 (Southern Route) – This alignment would follow an existing gravel / sand road (see Plate 5.4) and fence line to the south of the resort: Although the route would follow an existing access road on the farm Groote Springfontein, it would directly affect Atlantis Sand Fynbos due to the required 15 – 20 m wide construction servitude.

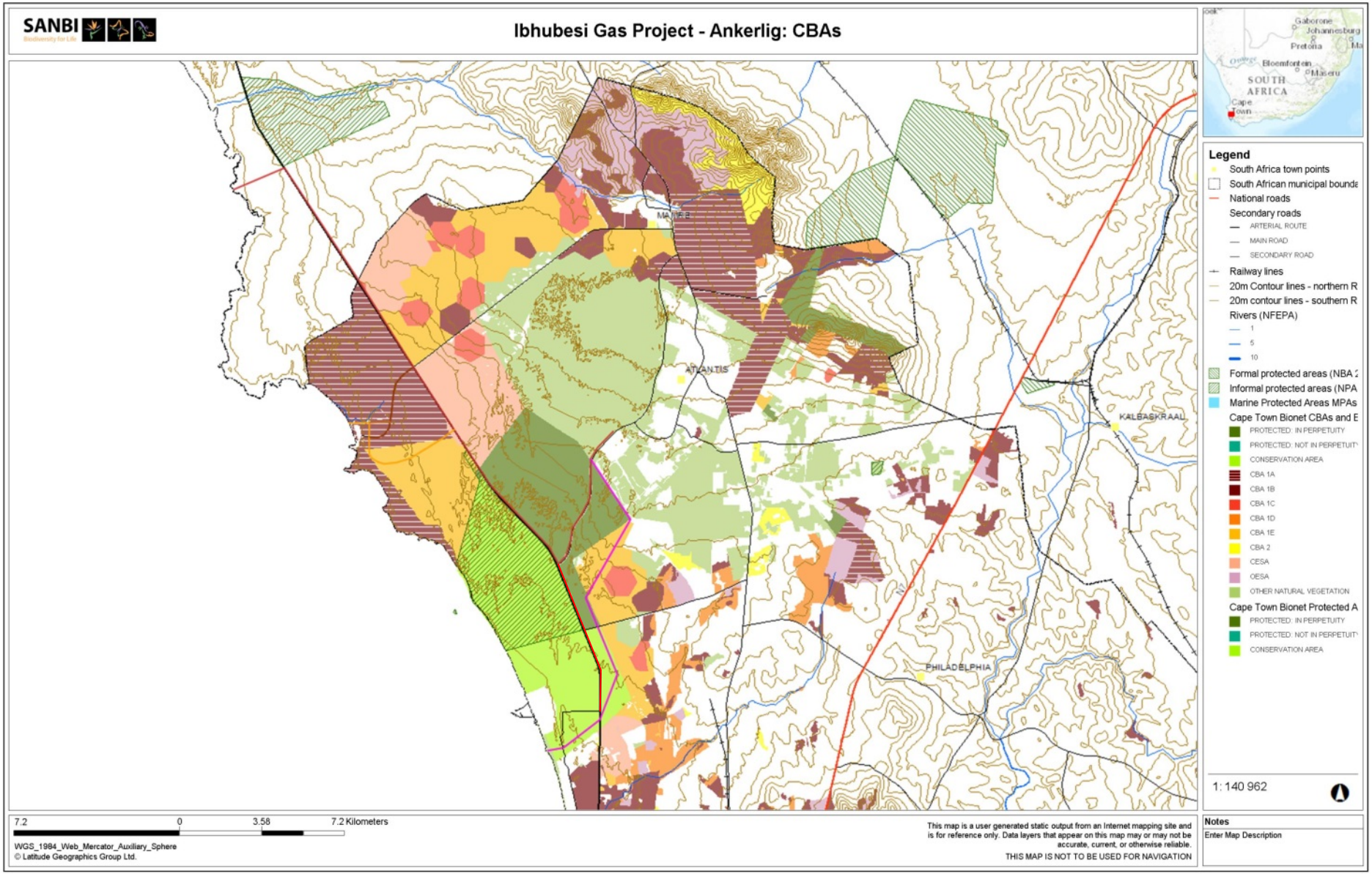


Figure 5.7: Southern onshore pipeline route alternatives in relation to the City of Cape Town's Critical Biodiversity Areas map (SANBI Biodiversity GIS, 2014).

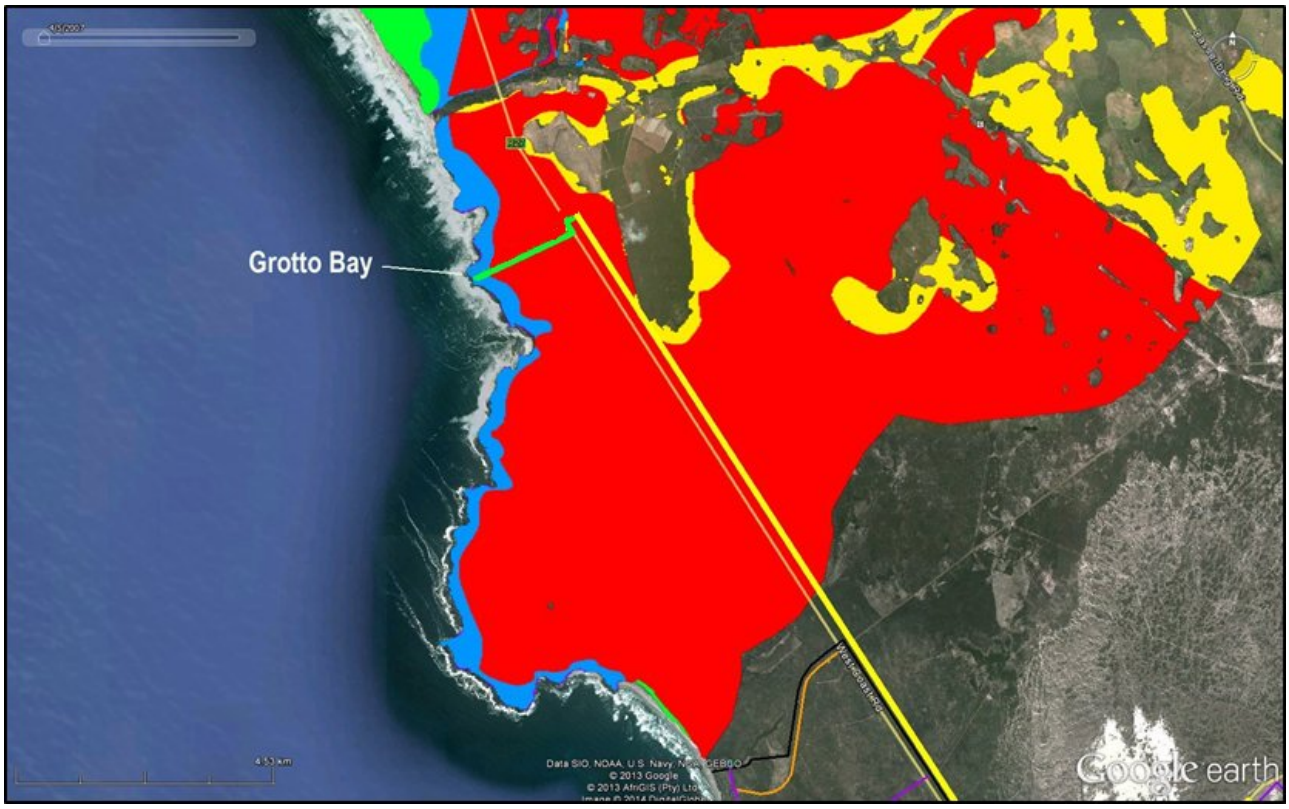


Figure 5.8: **Ecosystem Status Map (after Job & Driver, 2005) showing the Grotto Bay route located within Vulnerable (blue) and Endangered (red) ecosystems.**

Plate 5.1: **Grotto Bay - Pipeline would be located within the existing firebreak (looking east).**

Plate 5.2: **Silwerstroom Strand Route 3 – Access road to the Silwerstroom Strand Water Works (looking east).**

Plate 5.3: **Silwerstroom Strand Route 1 - Atlantis Sand Fynbos along the northern side (left of fence) of the Silwerstroom Strand Road (looking east).**

Plate 5.4: **Silwerstroom Strand Route 2 – Sand track on Groot Springfontein with pristine Atlantis Sand Fynbos on either side (looking south).**

5.2.3.4 Duynefontein

The Duynefontein alternative, which is aligned adjacent to an existing track, passes though the Koeberg Nature Reserve. Near the coast the alignment would pass through Cape Seashore Vegetation and then Cape Flats Dune Strandveld over a small distance (see Plate 5.5) before passing though through Atlantis Sand Fynbos between the coastal zone and the R27 (see Figure 5.6).

5.2.3.5 North-South Corridor (R27 or adjacent to Chevron pipeline)

The north-south alignment would either run parallel and just outside the eastern fence line of the R27 road reserve (see Plate 5.6) or run parallel to the Chevron pipeline (see Plate 5.7). All routes would pass mainly through Atlantis Sand Fynbos and Cape Flats Dune Strandveld. The alternative from Grotto Bay adjacent to the Chevron pipeline would pass through a small section of Swartland Shale Renosterveld.

5.2.3.6 East link to Ankerlig

From the R27 / Dassenberg Road intersection it is proposed to locate the pipeline on the south side of Dassenberg Road. It would traverse mainly Cape Flats Dune Strandveld and then Atlantis Sand Fynbos in the vicinity of Ankerlig Power Station. This area is significantly invaded by rooikrans (*Acacia cyclops*) and Port Jackson (*Acacia saligna*) (see Plate 5.8). The pipeline would also pass through a number of small wetlands, dominated by *Typha capensis* (bulrush), in the dunes near the R27 / Dassenberg Road intersection.

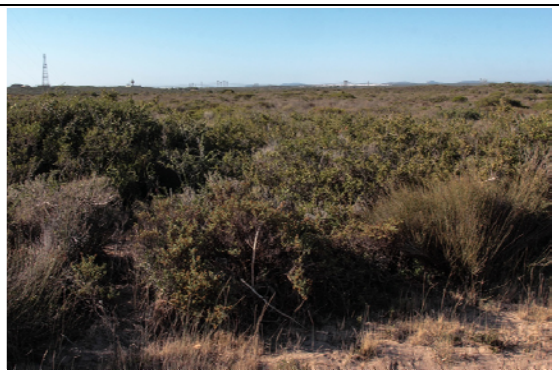


Plate 5.5: Cape Flats Dune Strandveld in the Koeberg Nature Reserve north of Duynefontein (looking north).

Plate 5.6: North-South link - Cape Flats Dune Strandveld adjacent to the R27 (looking north).

Plate 5.7: North-South link - Atlantis Sand Fynbos along the Chevron oil pipeline.

Plate 5.8: East link - Cape Flats Dune Strandveld along Dassenberg Road between the R27 and Ankerlig (looking south-west).

5.2.3.7 Ankerlig Gas Receiving Facility

The natural vegetation occurring at both sites in the industrial area is Atlantis Sand Fynbos. The vegetation has been heavily impacted by disturbance and invasion by woody alien invasive species (see Plate 5.9).

5.2.3.8 Silwerstroom Strand Gas Receiving Facility

The natural vegetation occurring at both sites adjacent to the Silwerstroom Water Treatment Plant is Cape Flats Dune Strandveld (see Plate 5.10) and is considered to be botanically sensitive.

Plate 5.9: Ankerlig facility site (Alternative 1b) - Atlantis Sand Fynbos heavily invaded by rooikrans and Port Jackson.

Plate 5.10: Silwerstroom facility site (Alternative 2a) – Pristine Cape Flats Dune Strandveld.

5.2.4 FAUNA

Sixty-one mammal species may occur within the larger study area (Friedmann & Daly, 2004). Only one species potentially occurring in the area is classified as a threatened Red Data species, namely the White-tailed Rat (*Mystromys albicaudatus*), which is listed as Endangered (Friedmann & Daly 2004). This species has a fairly wide distribution throughout South Africa and is known to favour sandy soils with good cover. It is not expected to occur in large numbers along the proposed pipeline routes or at the alternative gas receiving facility sites.

More than 130 bird species have been recorded in the area (South African Bird Atlas Project 2). Of these, the African Marsh Harrier is classified as Vulnerable. There are no Important Bird Areas (IBAs) in close proximity to the proposed pipeline routes.

Thirty-one reptile species have been recorded in the area (Bates *et al.* 2014). These include 19 lizard species, 11 snake species and one tortoise species. Of these, the following three species are currently listed as of conservation concern:

i) Cape sand snake (*Psammophis leightoni*) is listed as *Vulnerable* (Bates *et al.*, 2014). It potentially occurs in sand fynbos and strandveld habitats along all of the proposed pipeline routes. It is, however, of rare occurrence and is thus not expected to be encountered in significant numbers along any of the proposed pipeline routes or at the proposed gas receiving facility sites;

ii) Cape dwarf chameleon (*Bradypodion pumilum*) is listed as *Vulnerable* (Bates *et al.*, 2014). It is generally absent from agricultural landscapes, but occurs in a variety of habitats, including fynbos, renosterveld, thicket, riparian vegetation and exotic and native trees. It is unlikely that significant numbers of Cape dwarf chameleons would be encountered along any of the southern pipeline route alternatives as these routes are located along the northern edge of its known distribution range; and

iii) Bloubergstrand dwarf burrowing skink (lizard) (*Scelotes montispectus*) is listed as *Near Threatened* (Bates *et al.*, 2014). In the study area it is known from Bloubergstrand, Blaauwberg Conservation Area, Koeberg Nature Reserve, Mamre Nature Reserve and Melkbosstrand. It is known to inhabit sparsely-vegetated coastal dunes. It is only known from 10 recorded specimens and is thus not expected to occur in significant numbers along the coastal sections of the southern shore crossing alternatives.

Six frog species have been recorded in the area (Minter *et al.*, 2004). Of these only the Cape Caco (*Cacosternum capense*) is deemed to be of conservation concern, rated as Near Threatened (Measy, 2011).

No Red Data butterfly species have been recorded in the area.

5.2.5 FRESHWATER FEATURES

5.2.5.1 General description

There are few surface water features within the study area. The area lies within the quaternary catchments G21A and B, with the Modder River located just north of Grotto Bay and the Salt River just south of Duynefontein. The only rivers of note within the study area are the Buffels and Silverstroom Rivers, which are relatively small coastal rivers.

- The Silverstroom River (see Plate 5.11) is only approximately 2 km in length and lies within a CBA, which is linked with the Witsand Aquifer Protected Area. It is a perennial river that is both unique and important in terms of its habitat and the indigenous fish (Cape galaxias, *Galaxia zebratus*) that it supports. The river is considered to be in a moderately modified ecological condition as a result of water infrastructure that has been constructed within the river by the City of Cape Town.
- The Buffels River is a seasonal river that has been modified by agriculture and has a moderate infestation of alien *Acacia* trees.

The larger catchment of these rivers has been mapped as a Freshwater Ecosystem Priority Area (FEPA) river catchment (see Figure 5.9), with the management implication being that it should not be allowed to degrade but rather be rehabilitated where possible.

A number of small seeps and valley-floor depressions occur within the study area and are discussed in more detail under the specific routes below.

5.2.5.2 Grotto Bay

This route would cross the upper reaches of one small coastal stream approximately mid-way between the coast and the R27 (see Figure 5.10).

5.2.5.3 Silwerstroom Strand

All three route alternatives are located in a relatively sensitive area in terms of ground and surface water interaction. The northern-most alternative via the existing water works is located adjacent to a small branch of the Silverstroom River (see Figure 5.11 and Plate 5.11).

5.2.5.4 Duynefontein

The proposed route passes a number of smaller wetland areas (see Figure 5.12) that mostly occur within already disturbed areas along roads and are thus in an ecologically modified state.

5.2.5.5 North-South Corridor (R27 or adjacent to Chevron pipeline)

The central portion of the Grotto Bay and Silwerstroom Stand alternatives pass through the Witsand and Silverstroomstrand Protected Areas. The proposed route along the R27 from the Duynefontein shore-crossing passes through a number of smaller wetland areas (see Figure 5.12), mainly as it approaches the R27 / Dassenberg Road intersection. This wetland system is described in the "East link to Ankerlig" below.

5.2.5.6 East link to Ankerlig

Most of the wetland areas within the study area are associated with the rivers described above. The only wetland system that is of any significance that is not associated with these freshwater features is the wetland area at the R27 / Dassenberg Road intersection (see Figure 5.12 and Plate 5.12). This wetland system is associated with the City of Cape Town Wastewater Treatment Works at Atlantis and has been significantly impacted by the surrounding land use activities and changes to the topography in the area. Due to the high water table in winter as well as surface runoff, the wetlands tend to hold water for much of the year and be dominated by bulrushes *Typha capensis*.

5.2.5.7 Ankerlig Gas Receiving Facility

The proposed onshore gas receiving facility sites adjacent to the Ankerlig power station would have minimal impact on the surrounding freshwater features. There is a small wetland area to the south of Alternative 1a, which appears to have been created for stormwater attenuation purposes.

5.2.5.8 Silwerstroom Strand Gas Receiving Facility

The proposed onshore facility sites adjacent to the existing Silwerstroom Water Treatment Plant are situated close to the sensitive Silwerstroom River and are likely to have some additional impacts on the river system.

Plate 5.11: The Silwerstroom River Mouth.

Plate 5.12: Wetland area at the R27 / Dassenberg Road intersection.

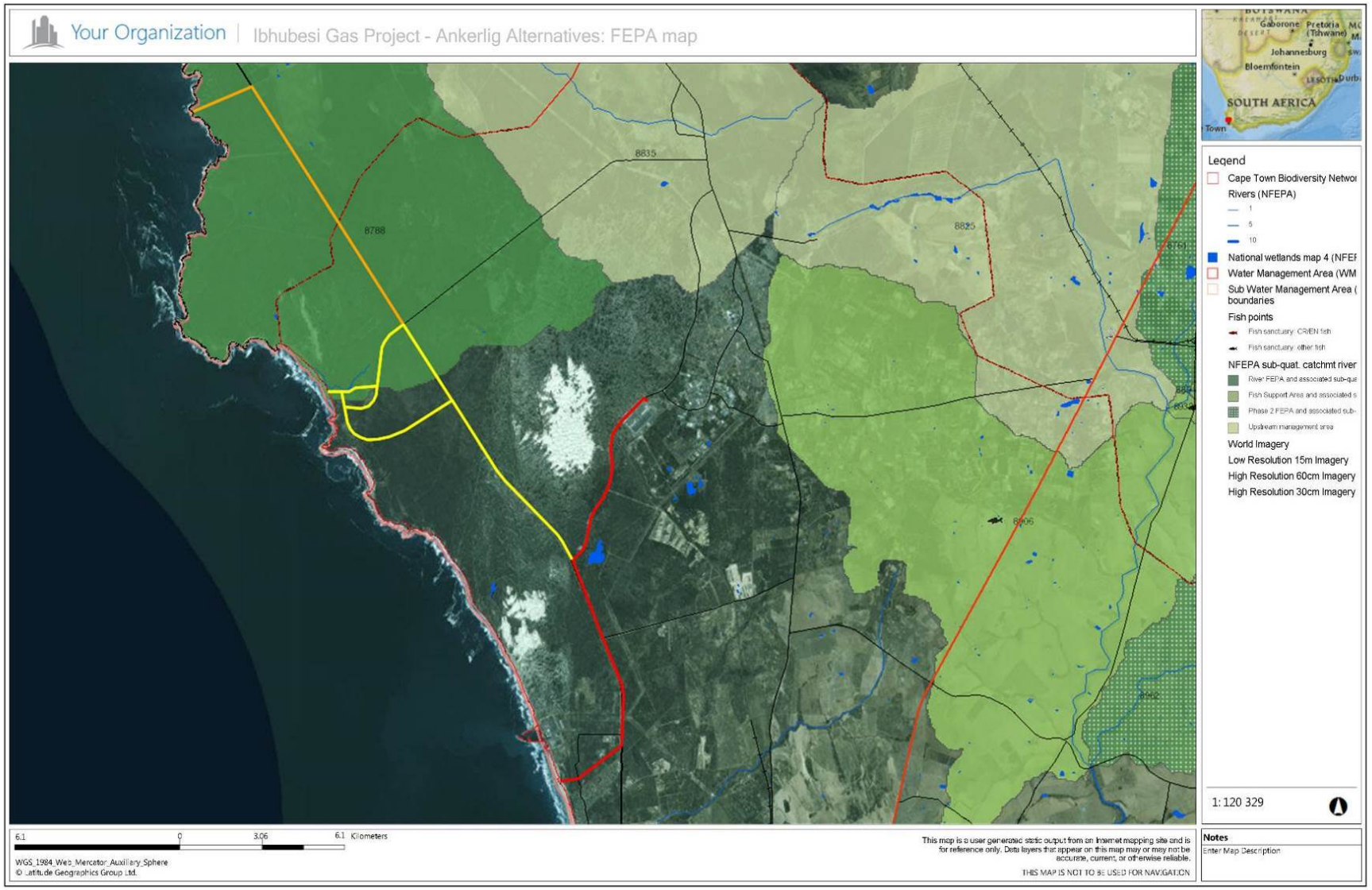


Figure 5.9: Southern onshore pipeline route alternatives in relation to the National Freshwater Ecosystem Priority Areas map (SANBI Biodiversity GIS, 2014).

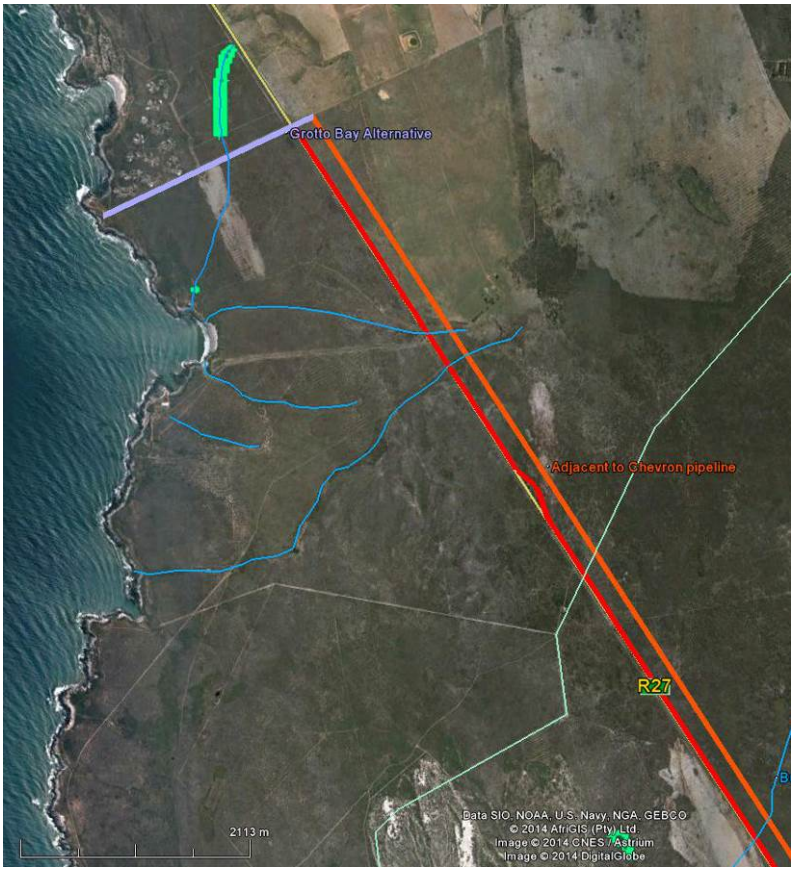


Figure 5.10: **GoogleEarth image showing the proposed Grotto Bay route alignment in relation to rivers or streams (blue lines) and wetland areas (green areas).**

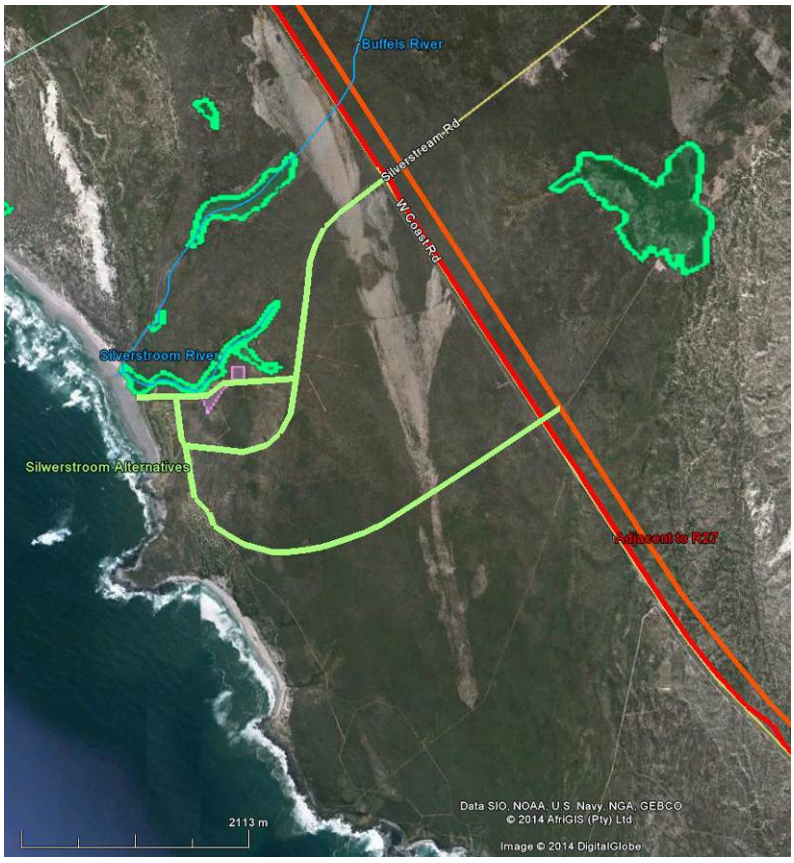


Figure 5.11: **GoogleEarth image showing the proposed Silwerstroom Strand route alignments in relation to rivers / streams (blue lines) and wetland areas (green areas).**

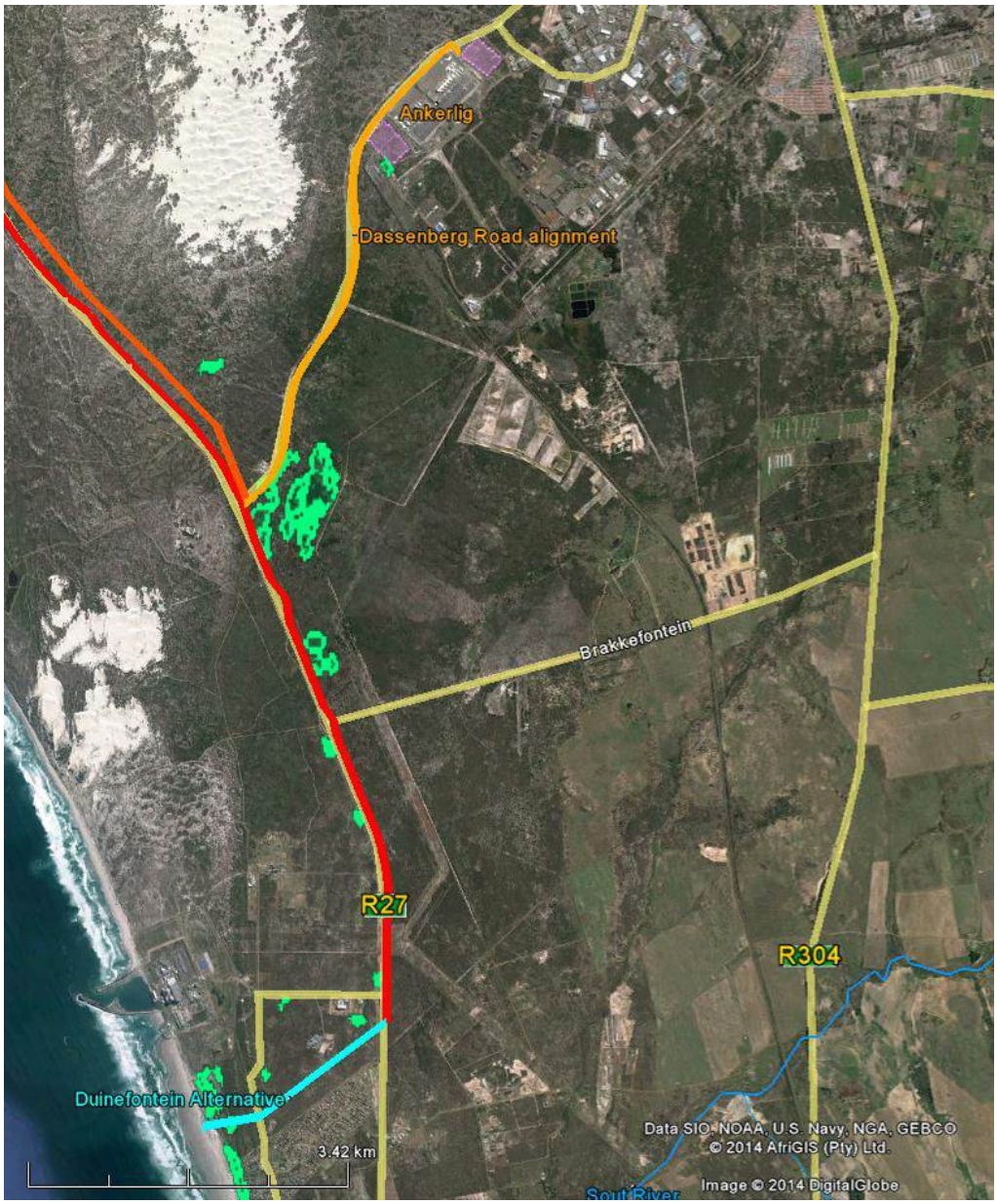


Figure 5.12: GoogleEarth image showing the proposed Duynefontein route and the east link to Ankerlig in relation to wetland areas (green areas).

5.2.6 HERITAGE

5.2.6.1 Grotto Bay

(a) Palaeontology

Apart from the Late Pleistocene hyena accumulations on the Modder River, little is known of the fossil potential along this proposed alignment. No fossils were observed on the surface during the site inspection. However, given the proximity to Duynefontein and Bokbaai, where there are pleistocene fossils in relatively shallow calcretised sands and Springfontein formation within the Koeberg Nature Reserve, palaeontological material could be encountered along this route.

(b) Archaeology

The headland has been heavily damaged by informal parking areas, secondary gravel deposits and various apparently *ad hoc* attempts to ”formalise” the parking area. The presence of shell midden material manifesting itself at areas where the surface of the parking area had been disturbed indicates that there may

be much more of this under the various layers of fill material. The material consists of a typical mixture of *Patella sp, C. Meridionalis, Burnupena sp*, (limpets, mussels and whelks).

Although no cultural material was noted, previous observations on the West Coast show that almost every headland is littered with Late Stone Age shell midden material. Thus finding such material at this site would not be unexpected.

5.2.6.2 Silwerstroom Strand

(a) Palaeontology
This is the same as described under Grotto Bay (see Section 5.2.6.1).

(b) Archaeology
The proposed shore-crossing site (beach) does not contain any evidence of surface archaeological material. The field inspection also revealed that all Silwerstroom Stand alternatives and the onshore gas facility sites (Alternatives 2a and 2b) do not contain any indications of surface archaeological material. However, there is always the possibility of buried archaeological material being unearthed during excavation of the pipeline trench.

5.2.6.3 Duynefontein

(a) Archaeology/palaeontology
The bulk of the heritage sensitive landscape, both aesthetically and in terms of material heritage lies to the north of the power station. In this area there are Pleistocene fossil beds throughout overlain by dune systems and coastal fynbos. However, indications in the southern area are far scarcer. Late Stone Age shell middens are uncommon at Duynefontein, none would be expected to be impacted by the proposed pipeline.

5.2.6.4 North-South Corridor and east link to Ankerlig

The R27 to Ankerlig and the Ankerlig site itself have been subject to a number of heritage surveys in the past, which have revealed that the site is not sensitive in terms of general heritage and little evidence of heritage has been found.

Since the proposed pipeline would be buried approximately 1 m to 1.5 m below ground it is unlikely that deep fossils of the Miocene and Pleistocene epochs would be impacted. However, there is a possibility that there could be occasional impacts of Pleistocene fossils in more recent sands.

5.2.7 SOCIO-ECONOMIC ENVIRONMENT

The proposed landing points for the southern pipeline routes fall under the jurisdiction of the Swartland Local Municipality (Grotto Bay) and the City of Cape Town Metropolitan Municipality (Silwerstroom Strand, Duynefontein and Atlantis) (see Figure 5.13).

5.2.7.1 Local municipalities and affected towns

(a) Swartland Local Municipality

The Grotto Bay shore-crossing falls within the Swartland Local Municipality, one of the main wheat producing areas within the winter rainfall region. The estimated population of the Swartland Local Municipality is 113 762 (Statistics South Africa 2011). The percentage population growth over ten years was 57.75% with an annual population growth rate of 4.56% (2001-2011). Afrikaans is the most spoken language (76.2%), followed by Xhosa at 8.2% and English at only 4.3% with other languages making up the remaining 9.9%. The official unemployment rate in the Swartland Municipality is 12.70% which is lower than some other municipalities within the province. Of the economically active youth (15–34 years) 17.9% are unemployed. Swartland has a lower population density than Atlantis and Saldanha and is largely a farming area.

Malmesbury is an important town in the region, having a diversified economic and infrastructure base and a high development potential, which supports not only agriculture but also well-developed industrial and commercial sectors. Other major towns include Darling, Moorreesburg, Riebeeck Kasteel, Riebeeck West and Yzerfontein.

Figure 5.13: Western Cape Municipalities.

(b) City of Cape Town Metropolitan

The estimated population of the City of Cape Town Metropolitan area is approximately 3.7 million (Statistics South Africa 2011), the second largest in South Africa by population size. The population growth rate between 2001 and 2011 was 29.3%. The population is predominantly Coloured (42.4%), followed by African (38.6%), White (15.7%) and Indian/Asian (1.4%). The predominant languages spoken are primarily Afrikaans (34.9%), IsiXhosa (29.2%) and English (27.8%). The main sectors in the metropolitan's economy are finance, insurance, property and business services (34.2%); wholesale and retail trade, catering and accommodation (16.3%); and manufacturing (14.3%). The poverty rate for the Metropolitan of 19.7% (percentage of people living in poverty) is the lowest in the province. The unemployment rate is slightly lower than the national average at 23.9%.

Atlantis and Duynefontein are the closest urban centres to the proposed southern shore-crossing pipeline routes and the gas receiving facility. Atlantis is an urban area located 45 km north of the Cape Town Central Business District (CBD). It has a population of approximately 67 491. The area is predominantly Coloured (85%), although some recent migration from the Eastern Cape has increased the size of the African community (12.9%). The community is predominantly Afrikaans speaking (79.5%), followed by English (9.4%) and isiXhosa (7.7%). Unemployment (26.6%), crime and lack of housing are major issues in the area.

Duynefontein is an upper middle-class area within the Melkbosstrand suburb and is located 33 km north of Cape Town. It was originally developed for housing during the construction of the Koeberg Nuclear Power Station. Melkbosstrand has a population of 11 303 and is predominantly White (82%). 94% of the labour force is employed and most of the dwellings (98%) are formal and have well-developed household services.

Silwerstroom Strand Resort is a City of Cape Town recreation facility with chalets, camping sites and picnic area, along with conference facilities. Silwerstroom Strand is mostly used by the residents of Atlantis and Mamre and is not a permanently occupied site.

5.2.7.2 Planning

(a) Draft Infrastructure Development Bill (2013) and Strategic Integrated Projects

The proposed project falls under SIP 5, SIP 8 and SIP 9 (see Section 3.1.1).

(b) National Development Plan (2030)

The development of the Ibhubesi Gas Field and the proposed Ibhubesi Gas Project would meet a number of the objectives in the National Development Plan 2030 (see Section 3.1.2).

(c) Western Cape: Provincial Spatial Development Framework (2014)

The Provincial Spatial Development Framework (PSDF) (2014) for the Western Cape provides the spatial agenda for all the provincial departments. It intends to promote effective public investment in the built and natural environment through:

- Adopting credible planning principles to underpin all capital investment programmes;
- Spatially targeting and aligning the various investment programmes; and
- Opening up opportunities for community and business development in targeted areas.

Growing the Western Cape economy is a primary objective of the provincial government. Policy R4 of the PSDF includes the following objectives related to energy:

- Pursue energy diversification and energy efficiency in order for the Western Cape to transition to a low carbon, sustainable energy future, and delink economic growth from energy use; and
- Investigate and develop the West Coast gas opportunity, with a focus on imported Liquid Natural Gas.

(d) Western Cape Infrastructure Framework (2013)

The Western Cape Infrastructure Framework (2013) quantifies the scale and nature of the infrastructure requirements in the Western Cape. The framework also sets out high-level transitions required to achieve the optimised development agenda and is broken down in sub-infrastructure sectors. The transitions related to the energy sector include, *inter alia*, the introduction of natural gas processing infrastructure to use gas as a transition fuel.

(e) Micro-Economic Development Strategy for the Western Cape (2006)

The Micro-Economic Development Strategy (MEDS) is a provincial industrial policy framework that aims to reduce the incidence of government failure, market failure and network failure in the Western Cape. The MEDS included an extensive research programme that identified a number of sectors that have the potential to contribute significantly to the growth of the Western Cape. One of the 25 sectors researched was the Oil and Gas industry. This sector was identified as one that had substantial opportunities in terms of growth and job creation. However, this potential was contingent on the achievement of an 8% new build fabrication market share over the next five years. It was noted that the Western Cape did not immediately offer any advantages from a production or sourcing perspective to the upstream oil and gas services sector. It was, therefore, recommended that Cape Oil and Gas Supply Initiative (COGSI) become a nationally identifiable brand that builds a national cluster. COGSI was subsequently renamed the South African Oil and Gas Alliance (SAOGA) to reflect the growing involvement of upstream suppliers from other regions and the fact that no other South African organisation focuses on the upstream supplier base. SAOGA has been instrumental in the coordination of oil and gas industry stakeholders and is, therefore, reflective of the provincial government's intention to support and promote this industry.

(f) One Cape 2040 (2012)

One Cape 2040 articulates a development vision for the Western Cape. It seeks to set a common direction to guide planning and action for the province. It is a long-term strategy rather than a government planning document. The document resonates with the thinking in the National Development Plan, ensuring alignment at a regional level with the national development strategies, while ensuring a narrower regional focus, taking into account the distinct provincial differences with the rest of the country.

The vision identifies six transitions that need to take place and 12 associated goals for those transitions (or two per transition) and for each goal a primary change lever has been identified. The goals and levers are quite high-level, but within the long-term change roadmap there are some shifts identified that are relevant for the proposed project. Directly relevant to the project is the development of "hard infrastructure", which includes energy infrastructure. Indirectly related to the proposed project is the focus on skills development and support for enterprise growth and innovation. So the proposed Ibhubesi Gas Project would be assisting with the development of energy infrastructure and be supported through the improvement of the skills base in the area.

(g) Cape Town Spatial Development Framework (2012)

The Cape Town Spatial Development Framework (2012) (CTSDF) is a long-term plan (20 years) to manage the growth and change in Cape Town, and future vision of the desired spatial form and structure of Cape Town.

The CTSDF identifies Silwerstroom Strand for further development as a 'coastal node' to be designed for mixed uses. It notes that the actual footprint of development within this node would need to be determined through more detailed studies / plans.

(h) City of Cape Town's Integrated Development Plan (2012 – 2017)

An Integrated Development Plan (IDP) provides a strategic framework to guide the planning and budgeting over the course of each political term. The City of Cape Town's IDP views the oil and gas market as a key sector to develop the potential of. The City of Cape Town looks to attract the oil and gas industry in order to expand their foothold in Cape Town. However, the IDP does not provide details as to how this will be achieved beyond suggesting that the development of this sector will be investigated in partnership with the private sector.

Atlantis is identified in the IDP as the location for a green-technology cluster park, noting its location, good road access, well-priced industrial land and access to port facilities. This strategic focus for Atlantis is in alignment with the Special Economic Zone (SEZ) site for renewable energy manufacturing.

(i) Swartland Municipality IDP (2012 – 2017)

The development of the oil and gas sector is not seen as relevant for this municipality, although it views the development of the Saldanha IDZ as potentially boosting the manufacturing profile of the province and manufacturing is a significant contributor to the Swartland GDP. The IDZ would also improve infrastructure to and from the area, some of which may pass through the Swartland. Construction has been highlighted as an area that has the potential for significant growth as demand for residential and industrial developments continues. An effective, efficient, motivated and appropriately skilled work force is also envisioned as one of the seven key policy developments.

(j) Blaauwberg District Plan (2012)

The Blaauwberg District Plan (2012) identifies Silwerstroom Strand for further development as a 'coastal node' to be designed for mixed uses including residential, recreational and for environmental education (see Figure 5.14). The plan also allows for a secondary (lower order) nodal cluster on Springfontein (e.g. permanent residential development of varying densities).

The plan notes that further investigation is required to determine the extent of development possibilities (i.e. development footprint) at these coastal nodes and that development possibilities should be sensitive to the natural environment and visual impact, taking into account biodiversity, sea level rise and infrastructure capacity informants.

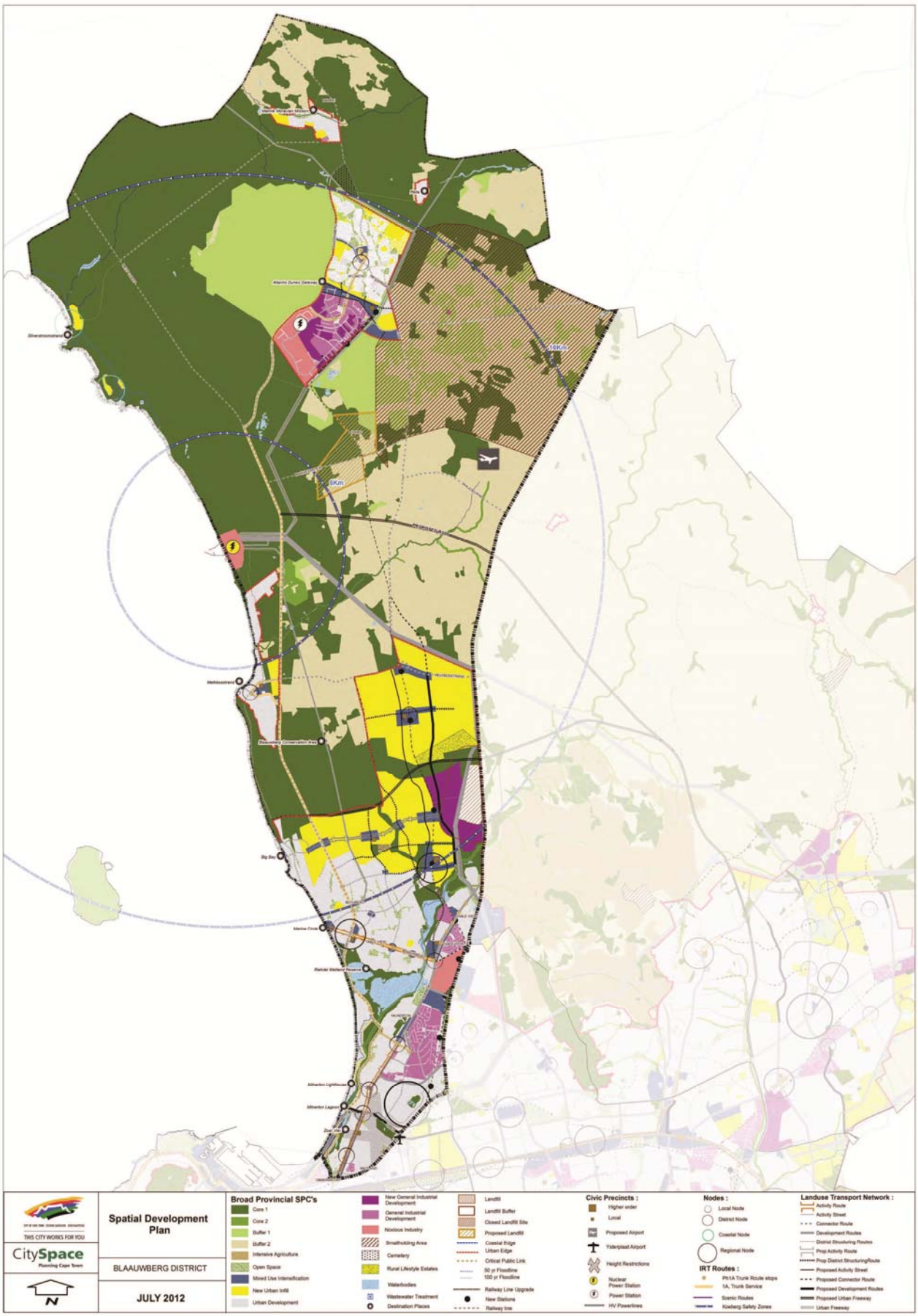


Figure 5.14: Blaauwberg District Spatial Development Framework (Blaauwberg District Plan 2012).

5.3 NORTHERN SHORE CROSSING ROUTE (SALDANHA PENINSULA)

5.3.1 TOPOGRAPHY

The surrounding area is characterised by a gently undulating coastal plain with low hills. The highest points in the area include Malgaskop (173 mamsl), Karringberg (175 mamsl) and Postberg on the Langebaan Peninsula (192.8 mamsl). Several smaller hills and outcrops of granite boulders are also evident in the surrounding area.

5.3.2 GEOLOGY, SOILS AND GROUNDWATER

The Saldanha Bay area is underlain by older bedrock of Malmesbury Shale and Cape Granite, which in turn are covered by Langebaan Formation limestones. The study area is mostly covered with recent sands with some outcrops of calcrete (limestone) and granite. In this area the Langebaan Formation is known for its fossil content (as evident in the West Coast Fossil Park).

The most dominant soil types for the study area tend to be imperfectly drained grey sandy soils. The soils tend to be highly calcareous at the coast, often underlain by calcrete and susceptible to wind erosion. The river valleys and greater floodplain of the Berg Estuary tend to consist of soils with a marked clay accumulation, which tend to have favourable water holding properties. Along the west coast of the Saldanha Peninsular the soils tend to be shallow overlying hard or weathering rock.

The area in the vicinity of the pipeline routes is underlain by the western section of the Langebaan Road Aquifer System, which extends regionally towards Vredenburg in the north-west, Velddrift in the north and Hopefield in the east.

5.3.3 FLORA

5.3.3.1 General description

Four vegetation types are mapped in the northern study area (see Figure 5.15), including:

- *Cape Seashore Vegetation (Least Threatened)*: Described in Section 5.2.3.
- *Langebaan Dune Strandveld (Vulnerable* according to NSBA*)*: Described in Section 5.2.3.
- *Saldanha Limestone Strandveld (Endangered* according to NSBA*)*: This vegetation type is a low shrubland consisting of succulent-stemmed and deciduous fleshy-leaved shrubs with geophytes and annuals being an important feature. It is restricted to shallow sandy soil over calcrete or limestone (hardpan) with annuals and geophytes found in cracks and shallow depressions in exposed limestone. One of the typical indicator species is *Thamnochortus spicigerus* (Restionaceae) and no Proteaceae or Ericaceae are found. Helme & Koopman (2007) consider this to be one of the two richest vegetation types in the Saldanha area in terms of regional habitat endemic species.
- *Saldanha Flats Strandveld (Endangered* according to Pence, 2014*)*: This vegetation type is a sclerophyllous shrubland with a low open shrub layer and emergent mid-high shrub stratum. It is species-rich and well-known for colourful displays of annuals in spring. Geophytes are common but are also usually only seen during the winter and spring season when they are growing and flowering. The upper shrub stratum is characterised by species such as *Euclea racemosa, Muraltia spinosa and Searsia glauca. Species of lower stature include Euphorbia mauritanica, Ruschia macowanii, Tetragonia decumbens, Tetragonia fruticosa, Zygophyllum cordifolium* and *Zygophyllum morgsana*. A wide array of low succulent 'vygies', annual Asteraceae and geophytic herbs make up the greater proportion of the species complement (Rebelo et al. 2006; Helme, 2006). *Aloe perfoliata* (Least Concern) occurs in occasional patches in Saldanha Flats Strandveld. Other endemic and rare species such as *Afrolimon capense* (Near Threatened) also occur in this vegetation type. Saldanha Flats

Strandveld has been impacted by agriculture and around Saldanha by industrial development. Helme (2006) estimated that about 59% of Saldanha Flats Strandveld still remains. Although it is listed as being Vulnerable (A1) in the List of Threatened Ecosystems of South Africa (Government Gazette, 2011), it is considered to be Endangered by Pence (2014).

Cape Inland Salt Pans (Vulnerable according to NSBA) are seasonal pans, typically supporting saltmarsh communities, are scattered throughout the study area.

5.3.3.2 St Helena East

At the St Helena East landing site the shoreline consists of a narrow strip of Cape Seashore vegetation and Saldanha Flats Strandveld (1 – 1.5 m tall), dominated by *Lycium spp*. (see Plate 5.13). The field stratum is low (< 20 cm) and dominated by *Galenia sarcophylla* and grasses. Plant species recorded include *Arctotheca calendula, Atriplex cinerea, Conicosia pugioniformis, Drosanthemum floribundum, Ehrharta villosa, Lebeckia sp*., Legume- exotic clover, *Lycium ferocissimum* – co-dominant, *Lycium tetrandrum* – co-dominant, *Mesembryanthemum guerichianum*, *Oxalis pes-caprae, Rapistrum rugosum, Septulina glauca, Trachyandra sp*. and *Zaluzianskya villosa*. Further inland the pipeline route would traverse completely transformed farm lands with a possibility of impinging on natural vegetation on the farm Nooitgedacht (see Figure 5.16 and Plate 5.14). The St Helena Bay East alternative does not traverse any CBA areas (see Figure 5.16).

5.3.3.3 St Helena West

The St Helena Bay West route would cross the shore where there is a narrow zone of coastal Cape Seashore Vegetation that is grassy (see Plate 5.15). It would then traverse low dunes supporting mid-dense Saldanha Flats Strandveld (see Plate 5.16) with the following additional species recorded, *Euphorbia mauritanica, Pteronia divaricata, Tetragonia fruticosa* and *Pelargonium gibbosum*. Inland of the low dunes the land has been converted to pastures (grazed by cattle) and wheat fields (see Plate 5.14). The only exception is the possibility of impinging on natural vegetation on the farm Nooitgedacht. The St Helena Bay West alternative does not traverse any CBA areas (see Figure 5.16).

Plate 5.13: St Helena East - Saldanha Flats Strandveld dominated by *Lycium spp*.

Plate 5.14: St Helena East and West - transformed agricultural fields south of the coast.

Plate 5.15: St Helena West - Cape Seashore Vegetation (looking west).

Plate 5.16: St Helena West - Saldanha Flats Strandveld (looking west).

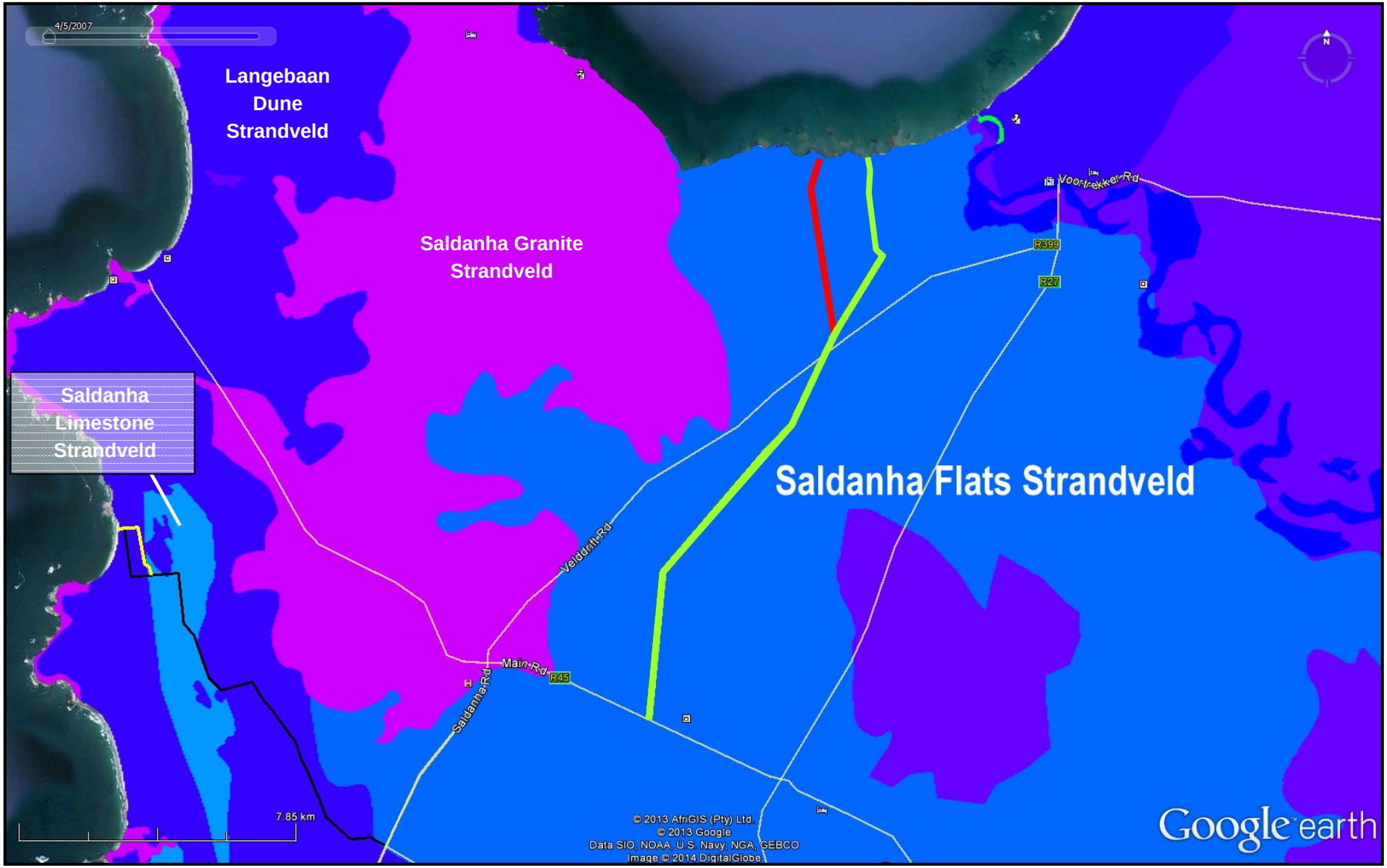


Figure 5.15: Northern onshore pipeline route alternatives in relation to the vegetation types in the area (after Mucina *et al.* 2005).

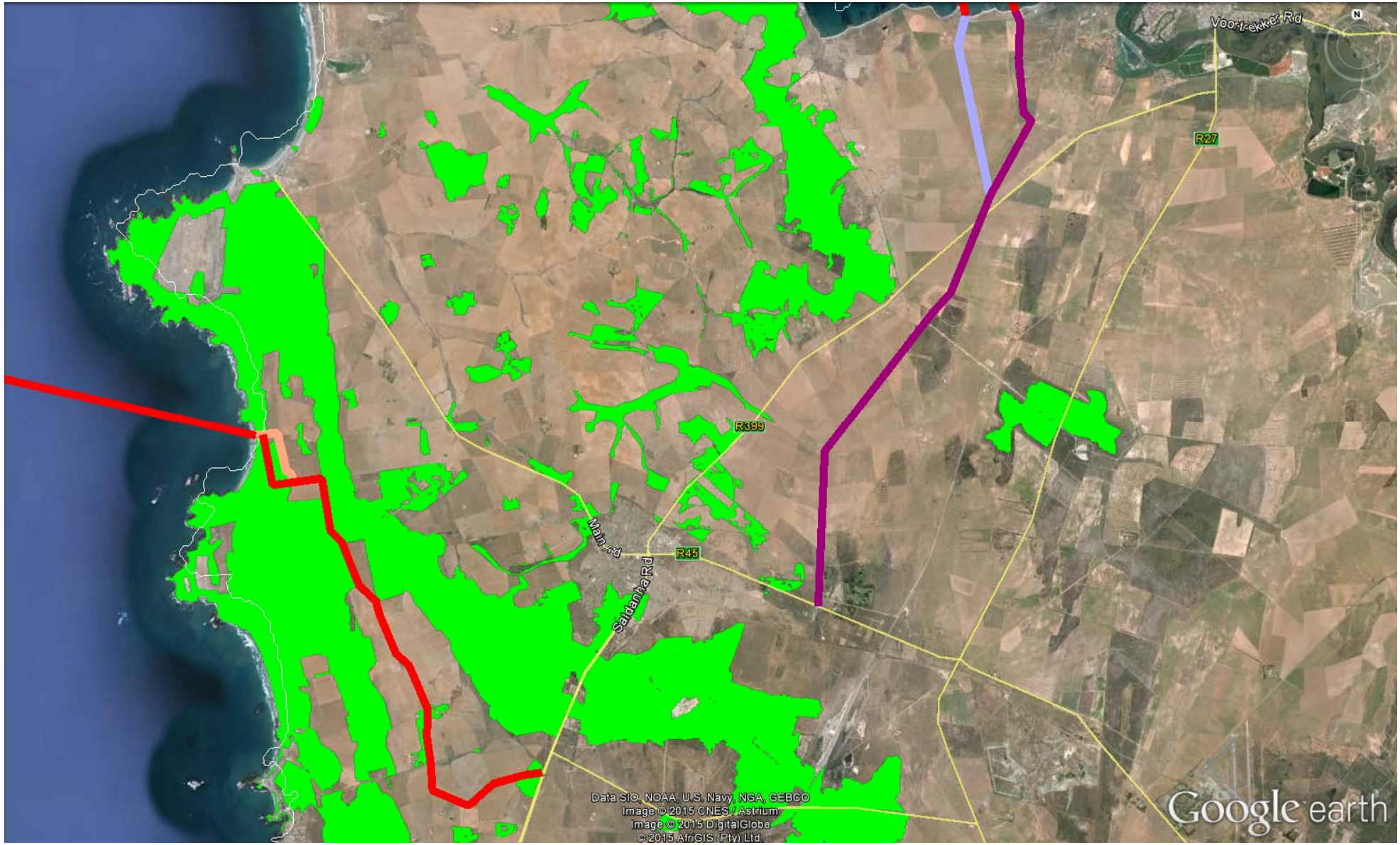


Figure 5.16: Northern onshore pipeline route alternatives in relation to Critical Biodiversity Areas (green).

5.3.3.4 Noordwesbaai

The first section of the pipeline route would follow an existing dirt track through Langebaan Dune Strandveld, which is mapped as a CBA (see Figures 5.15 and 5.16; Plate 5.17). In order to minimise the disturbance within the CBA, a second alternative is proposed (i.e. Noordwesbaai East), which is aligned to the east of the CBA. Where the two alternatives join up, the pipeline passes through Saldanha Limestone Strandveld (see Plate 5.18), which is also mapped as a CBA. Further east, on a south-east trajectory, the pipeline would mainly traverse areas that would have been Langebaan Dune Strandveld but have now been largely converted to agriculture.

Plate 5.17 Noordwesbaai – Dune habitat (Langebaan Dune Strandveld).

Plate 5.18: Noordwesbaai - Saldanha Limestone Strandveld inland of the shore-crossing.

5.3.4 FAUNA

Fifty-five mammal species may occur within the larger study area around Saldanha (Friedmann & Daly, 2004). Only one species potentially occurring in the area is classified as a threatened Red Data species, namely the White-tailed Rat (*Mystromys albicaudatus*) which is listed as Endangered (Friedmann & Daly 2004). This species has a fairly wide distribution throughout South Africa and is known to favour sandy soils with good cover. It is not expected to occur in large numbers along the proposed pipeline routes.

More than 200 bird species have been recorded in the area (South African Bird Atlas Project 2). Three of these are listed as threatened species, including:

i) African Marsh Harrier (*Circus ranivorus*) is listed as *Endangered* (Barnes 2000) and *Least Concern* (IUCN 2013). It is considered to be a waterbird, often nesting in extensive reedbeds with some breeding also taking place in short sedge areas and fynbos vegetation. It is known to forage over reeds, lake margins, floodplains and occasionally woodland in search of small mammals (Southern African Bird Atlas Project (SABAP) 1). It may be encountered where the pipeline routes traverse drainage lines or wetland areas;

ii) Ludwig's Bustard (*Neotis ludwigii*) is listed as *Vulnerable* (Barnes, 2000) and *Endangered* (IUCN, 2012). Its range is centred around the Nama-Karoo and Succulent Karoo biomes, but it has also been known to visit the agricultural regions of the south-western Cape in the Fynbos biome. Collision with overhead power lines has been identified as an important threat to this species. According to the SABAP2 data it has a very low recording rate in the Saldanha area and has not been recorded in the southern area. It is thus not expected that these birds would be encountered in notable numbers along any of the proposed pipeline routes; and

iii) Blue Crane (*Anthropoides paradisea*) is listed as regionally *Near Threatened* (2014 Red Data List) and as globally *Vulnerable* (IUCN 2013). It favours open grassland and cultivated fields, nesting on bare ground, often in moist places. Although they are not expected to occur in large flocks in the study area, they may be encountered where the pipeline routes cross cultivated fields.

Thirty-four reptile species have been recorded in the Saldanha area (Bates *et al.* 2014). These include 20 lizard species, 13 snake species and one tortoise species. Of these, the following species are listed as being of conservation concern.

i) Cape Sand Snake (see above description) is listed as *Vulnerable.* As no intact natural vegetation patches would be crossed by the St Helena route alternatives, this species is only expected to occur in strandveld habitat along the Noordwesbaai alternative. It is, however, not expected to occur in significant numbers.

ii) Black Girdled Lizard (*Cordylus niger*) is listed as *Near Threatened* (Bates *et al*. 2014). This species is restricted to rocky areas and is only known from four isolated subpopulations in the study area. None of these habitats occur along any of the proposed pipeline route alternatives.

iii) Burrowing skink (lizard) species: Three dwarf burrowing skink species (*Scelotes gronovii*, *S. kasneri* and *S. montispectus*) are listed as *Near Threatened*. All three species are known to occur in sandy coastal dune habitats. None of these are expected to occur in significant numbers along the coastal sections of the proposed pipeline route alternatives.

Six frog species have been recorded in the vicinity of Saldanha (Minter *et al.*, 2004). Of these only the Cape Caco (*Cacosternum capense*) is deemed to be of conservation concern, rated as Near Threatened (Measy, 2011).

No Red Data butterfly species have been recorded in the area. The closest Red Data species, the Atlantic Skollie (*Thestor dicksoni malagas,* Vulnerable) is known to occur at Kreef Bay on the Langebaan Peninsula (Henning *et al*., 2009) to the south of the proposed pipeline routes.

5.3.5 FRESHWATER FEATURES

The freshwater features within this area consist largely of valley bottom wetlands associated with streams.

5.3.5.1 St Helena East and West

During the Scoping Phase, the northern extent of the St Helena East route was repositioned approximately 1.2 km to the west in order to avoid the Berg River Ecosystem Priority Area (see Figure 5.17). It is still, however, located within the larger floodplain of the Berg River estuary which has been mapped as wetland area (see Figure 5.18).

The Berg River estuary is a river-dominated estuary that is one of only four perennial estuarine systems on the West Coast of South Africa. The estuary, including floodplain, is estimated to cover an area of 61 km^2 and to be about 65 km long, although seawater does not penetrate this far upstream. The main channel at Velddrift is about 100-200 m wide, becoming progressively narrower and shallower upstream. The estuary is rated among the top three estuaries in South Africa in terms of its conservation importance. It has been identified as a particularly important estuary for birds, as well as marine and estuarine fish. Approximately 92 water bird species are known to occur on the estuary, while a total of 35 fish species have been recorded in the Berg Estuary, of which nearly half can be regarded as either partially or completely dependent on the estuary for their survival.

Both routes cross or travel adjacent to smaller drainage channels, which are in general not well defined and seasonal to ephemeral in their flow patterns. As with the surrounding vegetation, most of these systems have also been highly modified by agricultural activities.

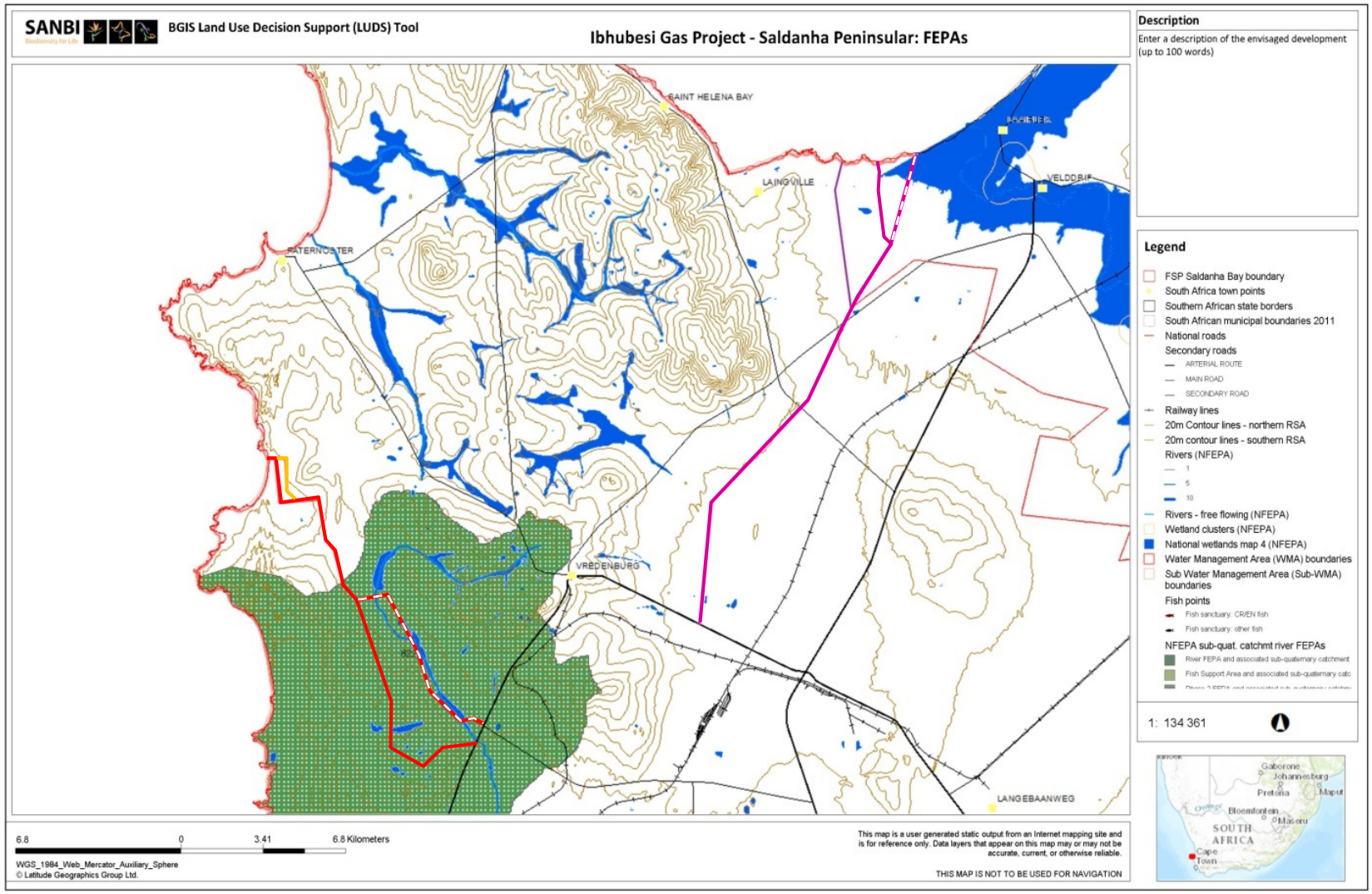


Figure 5.17: Proposed northern onshore pipeline routes in relation to the National Freshwater Ecosystem Priority Areas map (SANBI Biodiversity GIS, 2014). Note: the alternatives shown as stippled lines were dropped during the Scoping Phase and are no longer being considered.

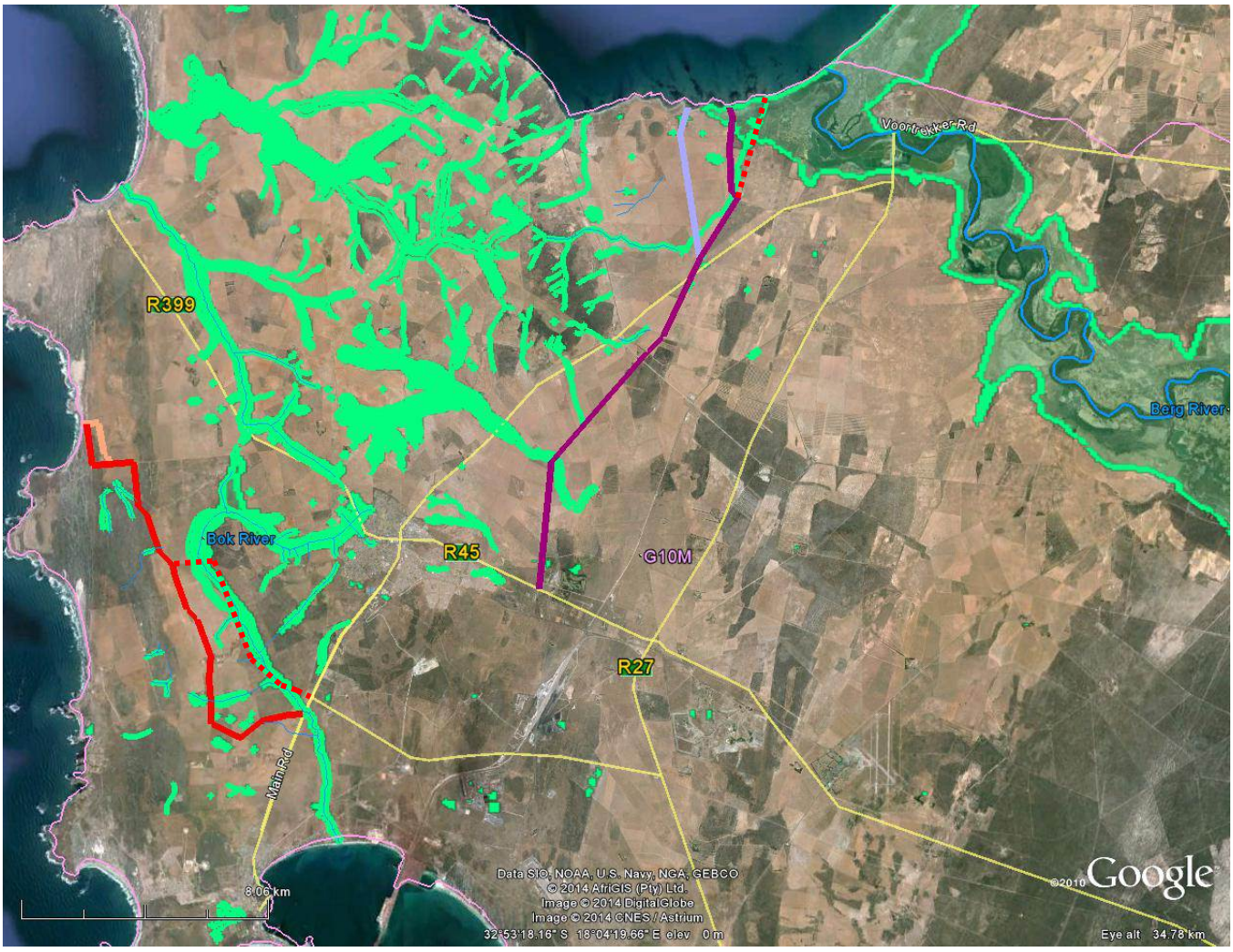


Figure 5.18: GoogleEarth image showing the northern onshore pipeline routes in relation to freshwater features (green areas). Note: the alternatives shown as stippled lines were dropped during the Scoping Phase and are no longer being considered.

5.3.5.2 Noordwesbaai

The only river of note within the vicinity of the Noordwesbaai alternative is the Bok River (see Figure 5.18 and Plate 5.19), which originates in Vredenburg at an elevation of 110 m. The river drains a relatively small catchment of approximately 66 km^2 that has largely been developed. The catchment is also very flat with a total river length of approximately 18 km. This low lying and flat catchment lends itself to the formation of Strandveld valley bottom wetland areas that occur mostly in the middle reaches of the river. The upper river and wetlands are highly seasonal in nature due to the low annual rainfall. Dry-land agriculture and some urban development have, however, not only altered the terrestrial vegetation in the catchment of the Bok River, but also resulted in the removal of much of the indigenous riparian vegetation and straightening of the river. Although the river is in a moderate to largely modified ecological state, it has been mapped as a Phase 2 FEPA (i.e. should not be degraded further).

The original route was located within the Bok River corridor and Ecosystem Priority Area (see stippled lines in Figures 5.17 and 5.18). However, during the Scoping Phase the route was repositioned approximately 1 km to the west in order to avoid the Bok River system and its associated Strandveld wetlands areas. The proposed pipeline would cross the river at the R399 where the river is significantly impacted due to the removal of much of the indigenous riparian vegetation and straightening of the river.

Plate 5.19: Noordwesbaai – middle reaches of the Bok River.

5.3.6 HERITAGE

There are numerous archaeological sites (associated with granite outcrops) on the Saldanha Peninsula, as the area was a major settlement point for the Khoikhoi population. The major archaeological site, "Kasteelberg", has been nominated for Provincial Heritage Site status. Occasional historical buildings can also be found here.

The flat coastal plain on the edge of Saldanha Bay is used mainly for agriculture but has an increasingly industrial ambience. Its primary heritage significance is the fossil deposit associated with fluctuations of the Langebaan Lagoon complex and the proto-berg estuary. The main part of this fossil rich system is represented at the West Coast Fossil Park National Heritage Site. The coastal plain to the north of Saldanha Bay is not archaeologically sensitive.

5.3.6.1 St Helena West and East

(a) Palaeontology

The fossil record along these routes is relatively unknown. However, fossil sharks' teeth and terrestrial fossils have been reported from deposits exposed on the banks of the Berg River estuary. Given the sedimentology of the region, it is likely that marine and/or terrestrial fossils would occur in Varswater, Springfontyn and Langebaan Lagoon Formation sediments should they be encountered during excavations. Indications are, however, that much of the proposed activity would take place in recent and more superficial surface deposits that are not as sensitive.

(b) Pre-colonial archaeology

Immediately west of the mouth of the Berg River are a series of at least nine early fish traps built into the shallow waters of the bay (Hart & Halkett 1992) (see Figure 5.19 and Plate 5.20). The unique shoreline topography west of the Berg River mouth is suited to the construction of traps – a shallow and long intertidal zone with plenty of rocks and boulders. The traps take the form of elliptical coffer dams. The walls are steep sided on the inside and gently sloping on the outsides. At times of spring tides these could be very effective at trapping fish that came inshore to feed. Initially it was thought that prehistoric people were responsible for building the traps. However, it is now known that stone wall fish traps were maintained throughout historical times by both farming and mission communities. The duration of use is unknown and may well have its origins in precolonial times. A survey of the area reports no other finds of archaeological material (Hart & Halkett 1992).

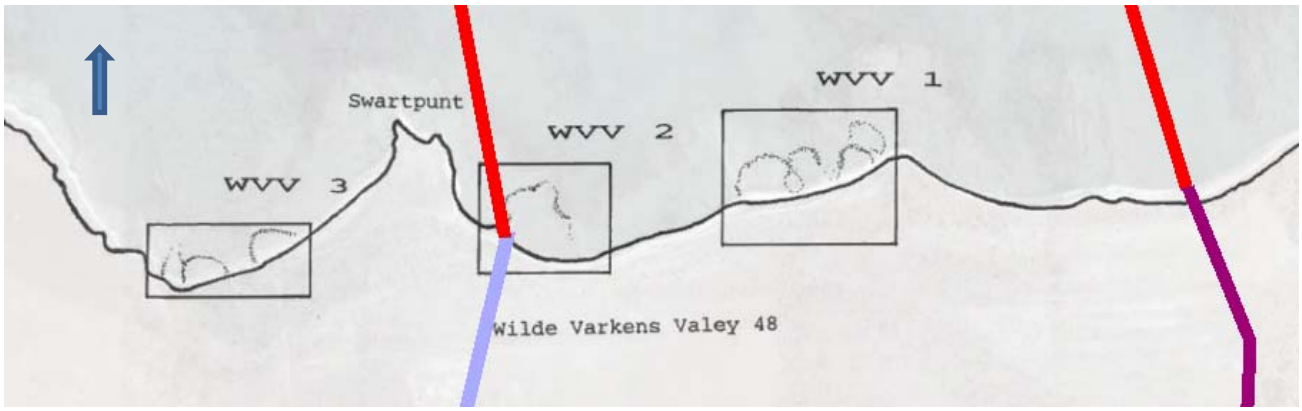


Figure 5.19: The location of the St Helena shore-crossing sites relative to fish trap clusters west of the Berg River mouth (adapted from Hart & Halkett 1992).

Plate 5.20: A fish trap located at Swartpunt near the St Helena West alternative.

5.3.6.2 Noordwesbaai

(a) Palaeontology

Given the sedimentology of the region, it is likely that marine and/or terrestrial fossils would occur in Varswater, Springfontyn and Langebaan Lagoon Formation sediments should they be encountered during excavations. However, it is doubtful if the pipeline excavation would penetrate deep enough to have any impacts. There may be occasional fossils within the calcretes that characterise this area.

(b) Archaeology

The proposed shore-crossing site avoids any surface manifestations of archaeological material. Similarly, the pipeline through the dunes would not impact surface archaeological material. Inland of the dunes agricultural land commences where the soils appear shallow and are strewn with chunks of calcrete ploughed up from below.

5.3.7 SOCIO-ECONOMIC ENVIRONMENT

The proposed landing points for the northern pipeline routes fall under the jurisdiction of the West Coast District Municipality (Saldanha) (see Figure 5.20).

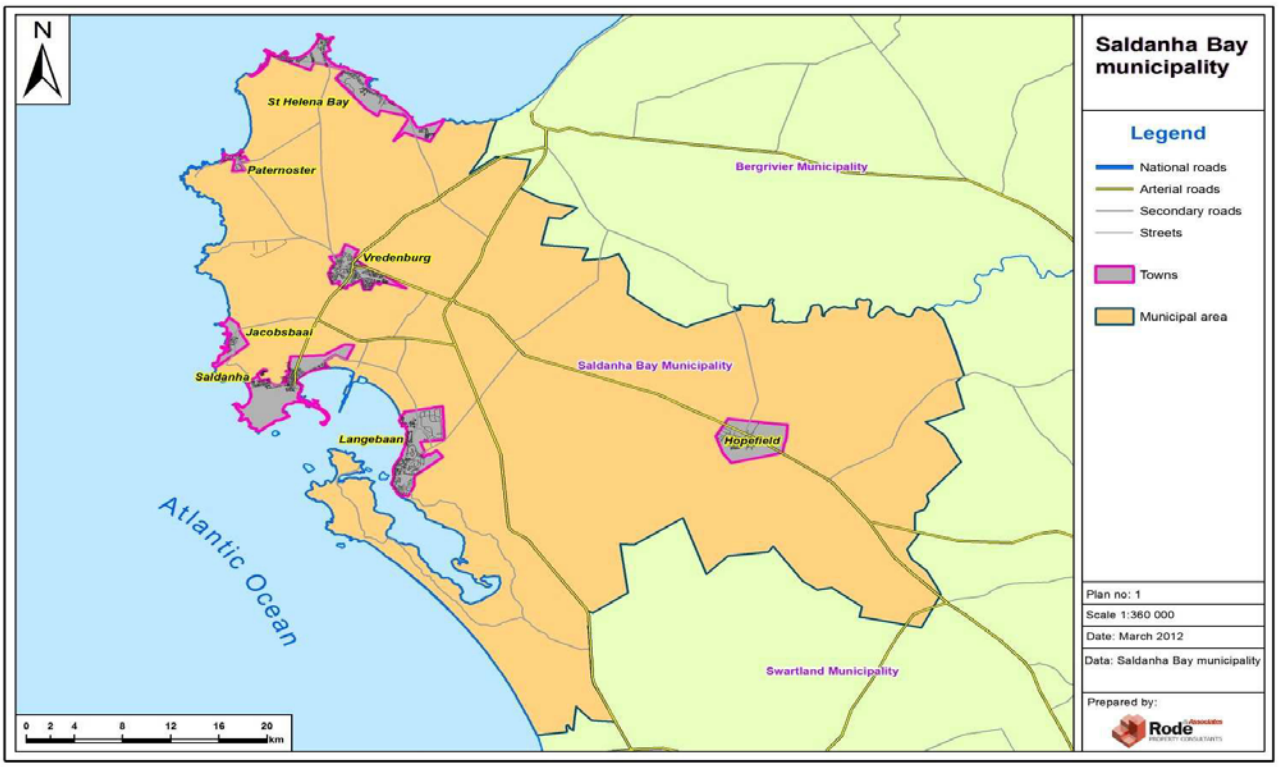


Figure 5.20: Map showing the municipal boundaries of the Saldanha Bay Municipality along the southwest coast of South Africa (IDP 2012-2017).

5.3.7.1 Local municipalities and affected towns

The estimated population of the West Coast District Municipality (WCDM) is 391 766 (Statistics South Africa, 2011). This equates to a population density of 12.6 persons/km^2. The population growth rate between 2001 and 2011 was 38.6%. This population increase was at a higher rate than any other district in the Western Cape. The key sectors in the district's economy are finance, insurance, property and business services; manufacturing; and agriculture, hunting, forestry and fishing. Despite agriculture, hunting, forestry and fishing only accounting for 16.7% of the contribution to the district's GDP, it employs significantly more of the labour force than any other sector at 27.9%. The poverty rate for the district was the second highest in the province, only second to the Central Karoo, at 30.4%. The unemployment rate is relatively low for South Africa at 15.5% (Western Cape Government, 2012).

The Saldanha Bay Local Municipality is one of five local municipalities occurring within the WCDM. It covers an area of 2 015 km² with a coastline of 238 km. The head office is located in Vredenburg, with satellite offices in Hopefield, St Helena Bay, Paternoster, Saldanha and Langebaan.

Saldanha Bay has the largest population in the WCDM, at the current census it was 99 193 with a growth rate between 2001 and 2011 of 40.8%. The population is made up of 14.3% Black, 56.9% Coloured and 28.2% White. Afrikaans is the most widely spoken (72.5%), followed by isiXhosa (16.4%) and English (6.6%). Saldanha Bay employs the largest percentage of the labour force in the West Coast district (29.3%) and has a relatively low unemployment rate of 17.9%, although this is higher than the district overall. The poverty rate for the municipality was the lowest in the district, at 23.9%. The key sectors in the municipality's economy are agriculture, hunting, forestry and fishing; community, social and personal services; and finance, insurance, property and business services.

The Saldanha Bay Local Municipality is predominantly urban and the major settlements in the area are Vredenburg, Saldanha and Langebaan. The area is very dry and arid. Therefore, despite Saldanha Bay having the deepest and largest natural harbour in the Southern Hemisphere, little large-scale industrial development has occurred until recently. A railway line was built from Sishen in the Northern Cape to Saldanha Bay in order to transport iron-ore and more recently, Saldanha was designated as an Industrial Development Zone (IDZ). The IDZ activities are specifically focused on the oil and gas sector, as the IDZ looks to capitalize on the growing oil and gas sectors on the East and West coast of Africa. The first phase of the IDZ will be the development of 128 ha of industrial land adjacent to the Port of Saldanha.

5.3.7.2 Planning

Refer to Section 5.2.7.2 for descriptions of the following:

- Draft Infrastructure Development Bill (2013) and Strategic Integrated Projects;
- National Development Plan (2030);
- Western Cape: Provincial Spatial Development Framework (2014);
- Western Cape Infrastructure Framework (2013);
- Micro-Economic Development Strategy for the Western Cape (2006); and
- One Cape 2040 (2012).

(a) West Coast District Municipality Integrated Development Plan (2012-2016) and Spatial Development Framework (2014)

A key objective of the WCDM Integrated Development Plan (IDP) (2012-2016) is "pursuing economic growth and the facilitation of job opportunities". Economic development and progress with the implementation of the Saldanha Bay IDZ are identified as district-wide development issues and priorities. The IDP further states that the district is to be promoted as an investment destination and that projects which provide a catalyst for job creation and income should be supported.

The WCDM Spatial Development Framework (SDF) identifies the Vredenburg-Saldanha area as a major regional growth centre. The Saldanha Bay harbour is considered as a key economic centre and major growth node within the district for unlocking trade and manufacturing opportunities. The SDF also identifies as a priority the utilisation and optimisation of the Saldanha Bay harbour by making better use of the back of port areas and considering and promoting oil and gas industries within the port. The improvement and expansion of infrastructure at the Saldanha Bay IDZ area and iron ore railway line is identified as a key and strategic spatial objective in the WCDM SDF.

(b) Saldanha Bay Municipality IDP (2012– 2017) and SDF (2011)

The oil and gas industry is seen as an important growth sector for the Saldanha Bay Municipality, along with tourism, steel fabrication and aquaculture. Saldanha Bay's importance as a development node comes from its natural and locational comparative advantages. The most significant of these natural advantages are:

- Best deep water harbour on the African Continent; and
- Close proximity to Cape Town

As noted earlier, Saldanha has been identified as an IDZ, which looks to capitalize on the growing oil and gas sectors on the East and West coast of Africa.