GREEN - CAPE

Atlantis Industrial Factory Site
Portion of CA1183-4-1
Neil Hare Road

Services Report on Existing Civil and Electrical Infrastructure

October 2012

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GIBB ENGINEERING & SCIENCE

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ATLANTIS FACTORY SITE
PORTION OF CA1183-4-1
NEIL HARE ROAD
SERVICES REPORT ON EXISTING CIVIL AND ELECTRICAL INFRASTRUCTURE

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1 INTRODUCTION

This document reports on existing infrastructure services, site preparation, traffic access requirements and site clearance and bulk earthworks cost to a vacant site within the Atlantis Industrial area with respect to the establishment of a factory manufacturing components for wind power generation industry. The site location is indicated on **Appendix 1** and is approximately 45.45 hectares in extent, rectangular in shape roughly 300 m wide by 1515 m long.

This report comments on site features, site preparation and existing infrastructure services as follows:

1. Topography and Geology
2. Site Preparation
3. Potable Water
4. Foul Sewer (domestic and industrial effluent)
5. Storm Water
6. Electrical
7. Refuse Waste
8. Road Access and traffic

It also includes acknowledgement of guidelines concerning disposal of stormwater run-off and effluent (domestic and industrial) discharge as proposed by Atlantis Water Resource Management Scheme.

2 ATLANTIS WATER RESOURCES MANAGEMENT SCHEME (AWRMS)

There are strict guidelines set out by the AWRMS concerning the disposal of stormwater and effluent from sites within the Atlantis Industrial Zone. The purpose of these guideline is to ensure quality of potential waste water (stormwater and effluent), which is used to artificially recharge the Atlantis Aquifer, is of a quality which minimise contamination of ground water resource used as potable water supply for the Atlantis district, alternatively to dispose of unsuitable effluent to prevent contamination of the ground water.

3 TOPOGRAPHY AND GEOLOGY

The site is densely covered with Port Jackson trees and appears to be rising in elevation from south to north. Observations indicate the site profile was re-shaped and bulk earthworks has occurred sometime in the past, however the dense growth of vegetation makes it difficult to form a reliable assessment of the terrain.

Emanating from a limited walk about inspection of the site, the site generally indicates a likely probability of uniform underlay of aeolian (wind-blown deposited) sand. Usually these aeolian deposited sands are typically loose within the upper horizon (up to 1.5 m depth) becoming more dense with increasing depth.

No detailed geotech investigation has been undertaken, however based on observation of improvements (development) on adjacent sites, particularly the metal foundry to the east of the site, it is possible to achieve appropriate founding conditions for buildings, hard-stand storage areas and vehicle access circulation.

4 SITE PREPARATION

4.1 Introduction

This section provides general recommendations for the following site preparation operations:

- Terracing
- Construction and lay-down areas
- Access roads

4.2 Terracing

Prior to commencement of construction the site will have to be terraced to form a level platform on which the plant installations can be constructed. The terrace can be constructed using compacted sand excavated from the site (natural or stabilised), or using selected imported fill of G7 minimum standard. A wearing course for the terrace may be constructed of stabilised sand using a minimum of 8 % cement (requires laboratory verification), or alternatively from imported commercial gravel (G5). However, a stabilised wearing course will be liable to cracking under loads. In order to prepare the terrace we recommend the following sequence of earthworks:

1. Over the entire area of the proposed site, strip all vegetation and organic soils and spoil on site to form screening berms.

    - Prepare the exposed in-situ surface sands by sub-grade compaction:
        - Compacted layer thickness ±200 mm
        - Density 90 % Mod AASHTO
        - Moisture OMC ±2 %

2. Terrace fill can be constructed using the aeolian sands or imported gravel material. The thickness of the fill will be determined by the settlement criteria of light structures that are to be founded in the terraced fill.

    - Compacted layer thickness 150 mm

- Density 100 % Mod AASHTO for aeolian sand
- 95 % Mod AASHTO for G7 imported fill
- Moisture OMC ±2 %

3. In load bearing areas (ie building ffotprints), cut sections should be over-excavated and backfilled to create a terrace similar to the fill sections, i.e. thickness and density. The terrace should be capped with a wearing course at least 300 mm thick of selected imported commercial fill (G6 or better compacted to min 95 % Mod AASHTO density) should be used to form a wearing course in preference to stabilised in-situ sands.

   During construction of the engineered fill, the contractor should conduct regular density tests as required by SANS 1200 DM (or similar specification) using either the Nuclear Density Method or the Sand Replacement Method. The moisture contents from the nuclear density tests should always be confirmed by oven drying tests. Occasional checks on the accuracy of the nuclear test results should be carried out by conducting sand replacement tests in parallel with the nuclear tests to verify Nuclear Density Method results.

   The side slopes of temporary excavations within the loose erodible sands should be trimmed back to approximately 1:1.5. Fill slopes and permanent cut slopes should be trimmed at 1:2 and should be protected against wind and run-off erosion.

4.3 Construction and Lay-down Areas

Once the site has been leveled and terraced as described in Section 4.2, the resulting surface should be adequate to service construction traffic, serve as lay down areas and for supporting temporary structures.

Light, temporary structures such as site offices can be founded on slab-at-grade foundations on the terrace.

Crane outriggers may require local strengthening of the terrace, or other measures to safely carry these relatively high and concentrated loads.

4.4 Roads

Plant access roads must be designed for the expected traffic. The design should be based on the following sub-grade classes (refer TRH4):

- In-situ sand, un-compacted CBR < 3
- In-situ sand compacted to 90% Mod AASHTO CBR ~3
- In-situ sand compacted to 95% Mod AASHTO CBR 3 to 7
- Sand fill compacted to 100% Mod AASHTO CBR 7 to 15
- Compacted Terrace of imported selected fill CBR > 15

- Blend of in-situ sand and imported gravel compacted to 96% Mod AASHTO density CBR > 25

Materials for sub-base and base layers will have to be imported commercial gravel or crushed stone (min G5 or better compacted to minimum 96 % Mod AASHTO density).

4.5 General comments

It may be difficult to effectively remove the vegetation and organic soils from the aeolian sands without stripping large volumes of the surface sands. Since the soils are predominantly non-plastic and fine grained, they will erode easily under the action of wind and water. For this reason protection measures such as vegetation must be introduced to reduce erosion or wash-away on banks and in areas where there is no terrace capping.

The soils on site are also low in nutrient content, allowing only the hardiest of vegetation to survive. Topsoil may have to be imported to form a thin mantle over the non-terraced areas of the site. Alternatively, fertilisers will have to be added to sustain growth in the sands.

Due to the fine grading of the soils, dust may be a problem and dust suppression will be required during construction. This can be mitigated by use of water sprinkler system to suppress airborne dust during earthworks and construction.

Soils in both cut and fill are likely to be non-plastic with low cohesion, gradients up to 3 m in height should not be steeper than 1 vertical and 1,5 horizontal for temporary slopes and 1:2 or flatter for permanent slopes. Higher slopes, whether cut or fill, will need to be assessed as part of the bulk earthworks design once a materials management programme has been established. It may be necessary to provide lateral support for higher cuts and fills in the form of geotextile reinforced concrete-block retaining walls, gabions or similar.

Bulk earthworks and terrace construction should be completed before commencing with the piling contract in order to provide access and a stable platform for the piling operations and that the foundation excavations be formed into the completed terrace rather than constructing the foundations on a partially formed terrace and then completing the terrace construction around the foundations. Backfill above the foundations should be compacted to the same density as the remainder of the terrace to avoid zones of high porosity and permeability around the foundations.

5 POTABLE WATER FOR DOMESTIC CONSUMPTION AND FIRE-FIGHTING

The site is serviced from a 150 mm diameter pressurised pipe-line located along the western boundary of the site. The municipal pipeline provides for both domestic and fire-fighting requirements. Pressure within the pipeline is maintained between 7 to 9 bars, should water be required at higher pressure then booster pumps will have to be installed by the developer.

6 FOUL SEWER (WASTE WATER)

In the Atlantis district there are two parallel municipal gravity pipeline in the adjacent road network. Generally effluent is divided into two categories namely:

1. Domestic effluent generated from toilets, showers, hand basins and kitchen sinks.
2. Industrial effluent which could include noxious effluents (bye produfrom manufacturing process).

Industrial effluent is be treated on site in a “bioretention” facility to remove heavy and noxious elements. The “bioretention” facility then discharges into a separate municipal waste-water system specifically provided for effluent not suitable for recharging the ground water aquifer. Ideally this facility should be located such that “scrubbed/treated” effluent can gravitate into the dedicated municipal pipeline for industrial effluent.

Buildings which generate domestic effluent, and which require connection to the municipal sewerage reticulation should be situated close to the adjacent road to ensure domestic effluent can gravitate into the dedicated municipal pipeline for conveyance to treatment works for domestic wastewater.

The site is serviced by a 300 mm gravity pipeline adjacent to the western and south section of the eastern boundary. Buildings requiring connection into the municipal pipeline should be situated as close to the municipal sewer lines to ensure waste water can gravitate into the municipal pipeline without pumping.

7 STORM WATER DRAINAGE

7.1 Municipal Network (background)

The pipe network in the adjacent municipal roads is designed to take the pre-development 1:2 year recurrence interval storm run-off for low traffic volumes areas to 1:10 year recurrence interval storm run-off for prime commercial developments. The balance of the run-off is conveyed within defined overland flow routes utilising streets to discharge into green belts comprising parks and playing fields where flood peak attenuation techniques are applied in accordance with the CoCT's Management of Urban Storm Water Impacts Policy" document

7.2 Municipal Policy Governing Storm Water Drainage

7.2.1 General Comments

During May 2009 the City of Cape Town (CoCT) introduced a "Management of Urban Storm Water Impacts Policy" document for the purpose of minimising the undesirable impact of storm water runoff from developed areas into natural watercourses and wetlands via storm water culverts.

The policy document requires existing and new developments to comply with the following:

1. Ensure storm water discharged into the municipal drainage network is free from urban pollutants thereby improving the quality of the run-off discharging into natural watercourses and wetlands.
2. Control the quantity and rate of runoff to protect municipal infrastructure, downstream properties and floodplains from frequent nuisance floods and adverse impacts from extreme flooding.

7.2.2 Consequence of new Municipal Policy

The new policy came into effect in May 2009 and consequently requires brownfield and new developments to comply with the policy protocol in respect to the quality and quantity of stormwater runoff emanating from improvements to property.

The consequence to property owners / developers are as follows:

1. Construction of structures at source (i.e. on site) to remove in addition to suspended solids (SS) and total phosphates (TP),and trap litter, oil and grease, to approved levels to ensure a minimum standard of the quality of runoff discharged from developed sites.
2. Attenuate runoff to pre-development levels for 1:10 year recurrence interval

   Run-off from surfaced / improved areas (i.e. hard-stands, etc) will have to be conveyed to a lined bio-retention facility, to:

1. improve the quality of the water

2. Monitor the quality of the water before its released into the appropriate municipal infrastructure. (ie poor quality water into the industrial effluent network).

7.3 Management of Drainage off Site

The AWRMS describes stormwater run-off as three distinct categories on the grounds of water quality namely:

1. Base flow – run-off/drainage from watering activities and subsoil drains.
2. “First flush” - generated from run-off produced by showers from the earlier part of the rainy season.
3. “Better quality water” – from heavier downfalls in the latter part of winter rainy season.

In the instance of development of this site, only items 2 and 3 above are applicable

It is possible to construct infrastructure to manage the disposal of “first flush” run-off and “better quality run-off” by means of a diversion mechanism at the outlet of an on-site “lined bio-retention” basin. This will ensure contaminated run-off can be diverted into the waste-water system for industrial effluent and as the quality of retained water improves, if suitable for aquifer recharge, it can be diverted into the municipal network conveying effluent to the treatment works linked to recharge basin.

8 ROAD ACCESS

8.1 Local Road Network

The preferred access onto the local road network will be at the northern end of the site onto Neil Hare Road (refer **Appendix 2**) to avoid:

1. Road under Rail Bridge on Neil Hare Road to the west of the site.
2. Circuitous route if access was on the south side of the site onto Neil Hare Road.

Neil Hare Road is linked to Dassenberg Road via an “unnamed” road. The junction between the site access and Neil Hare Road, as well as the junction of Neil Hare Road and “unnamed” road and “unnamed” road and Dassenberg Road will all have to be widened to accommodate the sweep area for extra-large vehicle turning requirement.

The access location from the site onto Neil Hare Road will result in crossing an operational railway track. A level crossing and right of way servitude will have to be negotiated with Transnet to facilitate a road over rail level crossing to gain access onto Neil Hare Road.

8.2 Access route to N7 Freeway

Access to the N7 freeway will be as follows (refer **Appendix 3**):

1. Westward along Dassenberg Road (R307) to the junction with the West Coast Road (R27).
2. Southward along the West Coast Road to the intersection with Melkbosstrand Road (M19).
3. Eastward along Melkbosstrand Road (M19) to the junction with the N7 freeway.

Localised road widening of junctions and intersection *en route* will require municipal (CoCT) and Provincial Roads Department approvals.

A Traffic Impact Assessment (TIA) study is not required, however a study of vehicle movements to and from the industrial area onto the major routes must be considered.

9 ELECTRICAL

The City of Cape Town is the supplier of electricity to the Atlantis Industrial area. Currently the power supply network capacity in the area is limited.

The municipality indicates they could provide up to 2MVA to the site. Anything larger than 2 MVA can be accommodated, but with significant implications to their network.

10 REFUSE REMOVAL

The removal of refuse (solid waste) is managed by the municipality, alternatively this service can be provided by private contractors, depending on developers needs.

11 SITE CLEARANCE AND BULK EARTHWORKS COST (ESTIMATE)

Based on the footprint required for development (i.e. the north half of the site, approximately 20 hectares) the estimated cost for site clearance and bulk earthworks is approximately R7,200,000.00 (refer **Appendix 4**) for breakdown of cost.

12 CONCLUSION

12.1 Geology

A geological survey is required to guide the engineering and manage the use of in-situ materials to achieve cost effective construction of terracing, construction and lay-down areas and roads.

Based on heavy construction recently completed in the area (namely the Eskom Ankerlig Power Generation Plant) the following general considerations apply to this site:

1. The natural near-surface soils are loose and unsuitable for founding.
2. Basic preparation of the site should comprise cut, fill and compaction of the aeolian sands, once the site has been cleared of vegetation.
3. The terrace can be constructed using the aeolian sands (natural and/or stabilised) from the site or using imported selected fill.
4. To provide a trafficable surface and a stable platform for piling and/or other construction activities it is recommended that the plant terrace is capped with a minimum 300 mm thick layer of cement stabilised sand using 8 % cement or with an imported commercial (G5) gravel wearing course.
4. Light and flexible structures can be founded directly on the compacted terrace. The thickness of the terrace will govern the settlement of these foundations.
6. Heavy, dynamically loaded or settlement sensitive structures, such as the turbine units, should be founded on pile substructure.
7. If necessary seismic considerations and corrosion protection should be designed by specialist consultants.
8. The design of dynamic loaded structures should be confirmed once the plant layout is finalised. It is recommended that further geophysical tests are carried out once the terrace has been constructed to verify the dynamic properties of the terrace and sub-soils.

12.2 Site Survey

A topographical survey of the site is necessary to:

1. Determine platform levels for the building footprint and storage areas relative to the adjacent road levels and
2. Plan earthworks to minimise contamination of materials and calculate extent of earthworks.

12.3 Storm Water Drainage

Storm water retention / attenuation will have to be provided in the form of lined bio-retention facilities to comply with municipal by-laws and the Atlantis Water Resources Management Scheme to ensure control release of site discharge into appropriate municipal network. These facilities are to be designed such that they effectively contain and prevent accidental leakage and discharge of retained run-off.

12.4 Potable Water and Foul Sewer

Generally service connections (potable water and foul sewer) to the site are installed by the developer (i.e. the City of Cape Town), however they might not be in the position dedicated by the preferred placement of the building footprint. In this instance an application to the Municipality for new service connections would be necessary.

12.5 Effluent (Foul Sewer)

A dual on site effluent piped conveyance system will have be provided to separate domestic effluent from industrial effluent and these will have to be connected into the dual parallel Municipal network. Domestic effluent can be discharged directly into the municipal network provided for conveyance thereof and industrial effluent treated on site before release into the municipal network.

12.6 Traffic Access

As no rezoning is necessary there is no requirement for a Traffic Impact Assessment. However, due to the abnormal transport vehicle operating from the site, irrespective of whether access is onto the municipal of provincial road network, substantial localised road widening will be required. Applications for these improvements would have to be addressed with the relevant authorities.

12.7 Electrical

Once details of electrical requirement are received from the developer further discussions will be engaged with the Municipality to determine accommodating the power requirement within their local network.

Appendix 1

Industrial Area Site Layout

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GENERAL NOTES:

No	Date	Details	Ch'd	App'd

Revisions

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Project: ATLANTIS INDUSTRIAL FACTORY SITE PORTION OF CA1183-4-1 NEIL HARE ROAD

Description: LOCALITY PLAN

Scale	Date
1 : 25 000	NOV 2011

Project No	Drg. No	Rev
P8424	301	

Appendix 2

Access onto Neil Hare Road

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Project

ATLANTIS INDUSTRIAL
FACTORY SITE
PORTION OF CA1183-4-1
NEIL HARE ROAD

Description

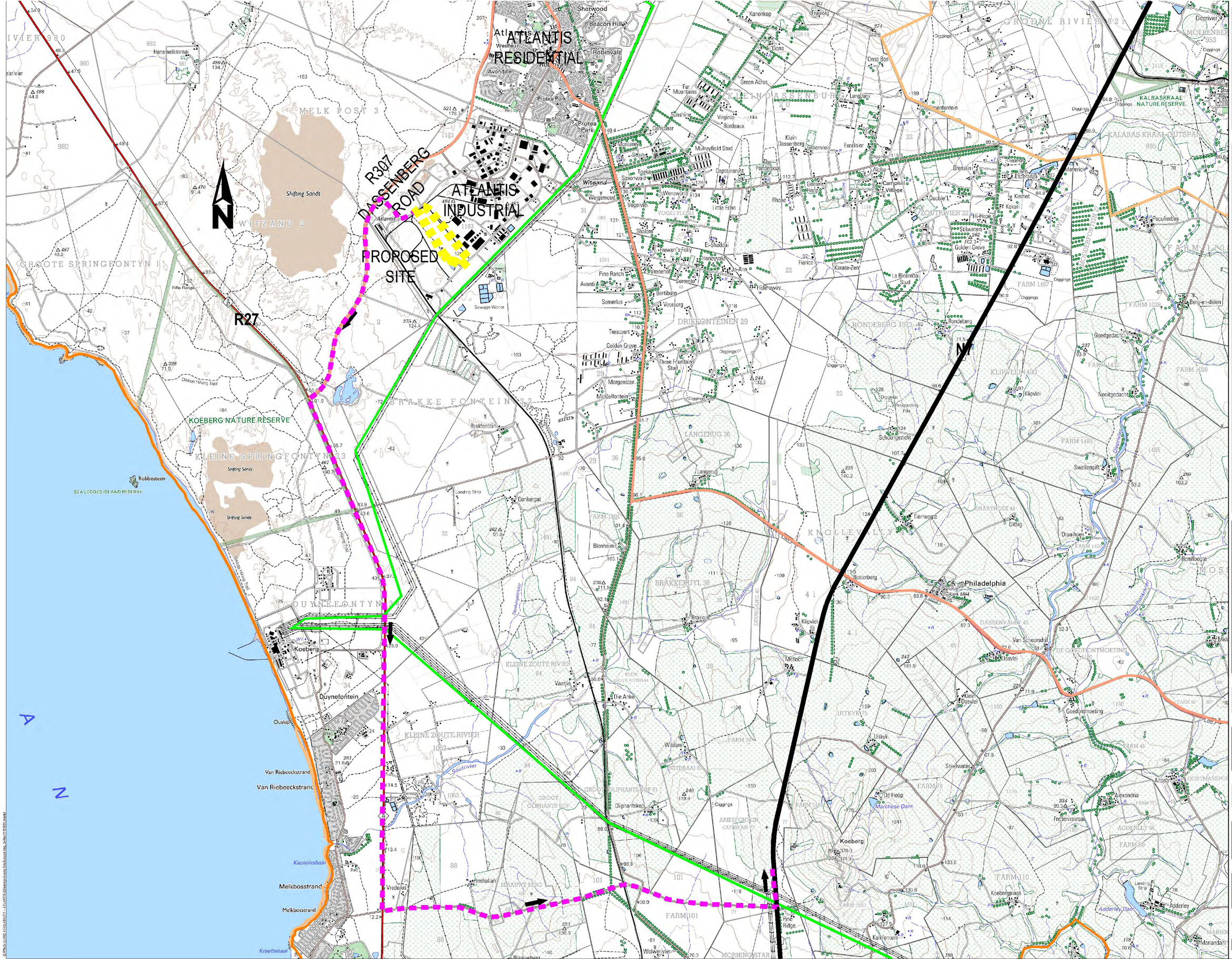
SITE 1
LAYOUT 1
ACCESS TO NEIL HARE ROAD

Scale	Date
1 : 2 500	SEPT 2011

Project No	Drg. No	Rev
P8424	102	

Appendix 3

Vehicular Routing to N7 via Dassenberg Road (R307), West Coast Road (R27) and Melkbosstrand Road (M19)



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GENERAL NOTES:

No	Date	Details	Ch'd	App'd

Revisions

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Project: ATLANTIS INDUSTRIAL FACTORY SITE PORTION CA1183-4-1 NEIL HARE ROAD

Description: VEHICULAR ROUTING TO N7 VIA DASSENEBRG RD (R307), WEST COAST RD (R27) AND MELKBOSSTRAND RD (M19)

Scale	Date
1 : 50 000	NOV 2011

Project No	Drg. No	Rev
P8424	303	

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Appendix 4

Schedule of Quantities with estimated rates
(based on recent / similar projects)

DOCUMENT CONTROL SHEET
(FORM IP180/B)

CLIENT	:	**GREEN CAPE**
PROJECT NAME	:	**ATLANTIS FACTORY SITES** **PROJECT No. : J31157**
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