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PRE-APPLICATION BASIC ASSESSMENT REPORT FOR THE PROPOSED CONSTRUCTION OF THE SOUTH EMERGENCY ACCESS ROAD AT THE KING SHAKA INTERNATIONAL AIRPORT, KWAZULU NATAL

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EXECUTIVE SUMMARY

PROJECT DESCRIPTION

The current situation at the King Shaka International Airport (KSIA) is that the emergency road from the end of Runway 06 is not in line with the designated emergency gate (Emergency gate 3) and this affects the necessary response time required for emergency vehicles to react to an incident at the airport.

At Emergency gate 3, ambulances and other emergency LDVs cannot gain access to due to the raised concrete curb being too high. Currently a temporary solution is in place where sandbags are being used to enable these LDVs to mount the curb. This warrants a permanent solution which will provide a hardstanding surface between the M65 and the gate capable of withstanding a carrying capacity of 80 tons.

The emergency road triggering the requirement of environmental authorisation will be located at the southern end of the airport property in order to allow access to the runway in an event of an emergency. This road is proposed to be 6m wide and 320m long.

The proposed development triggers the requirement for an environmental authorisation in terms of the following listed activity:

Activity 61: “The expansion of airports where the development footprint will be increased “

PROCESS FOLLOWED

The Basic Assessment (BA) process for the proposed King Shaka International Airport (KSIA) emergency access road has been undertaken in accordance with the Environmental Impact Assessment Regulations (2017) published in Government Notices R. 326 of 07 April 2017 read with Section 44, of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

This Basic Assessment Report provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed emergency access road. The findings conclude that the construction and operation of the proposed development is likely to have both negative and positive impacts with the most significant impact being the availability of an airport emergency access which is compliant to the legislation and regulations of the Civil Aviation Authorities. The findings of the specialist studies undertaken in support of the proposed development are summarised below.

FINDINGS OF SPECIALIST STUDIES

Geotechnical Investigation- The materials underlying the gravel wearing course, and those present from ground level where the gravel wearing course has been completely eroded away, appears to have been compacted in order to serve as a base layer. These materials generally comprise silty clayey sands but behaved as clays when inspected on site. They generally classify in the range of G8 to G10 in terms of TRH 14 and are of excellent to good subgrade material.

All other areas investigated were found to be underlain by fill of varying composition (silty and clayey sands and gravels with clay rich layers occurring in areas). These soils vary from G7 to less than G10 quality and are not suitable for use in structural pavement layers but may be used as subgrade materials (in certain areas).

Freshwater Impact Assessment- The closest watercourse to the proposed emergency road development is an artificial wetland located within a stormwater drain located approximately 5m from the proposed activities at the closest point. The closest natural watercourse is a steam located approximately 350m downstream of the proposed activities. Although the artificial wetland was assessed as having limited biodiversity benefits, it was found to have some value in terms of toxicant removal and erosion control and thus provides some regulating functions in the landscape that can reduce impacts to downstream aquatic ecosystems.

A number of key risks and impacts associated with the proposed development activities were identified and assessed. All of the risks and impacts were assessed as being low in significance. This was due to the predicted change in downstream watercourse resource quality being low, as well as the probability of resource quality impacts. This was driven largely by the distance between the proposed activities and the closest natural watercourses, and the fact that the artificial stormwater wetland would act the reduce most of the potential impacts and risks to downstream aquatic ecosystems.

Terrestrial Vegetation Assessment- The proposed road development stands to have a number of potential direct and indirect impacts to the grasslands assessed. However, considering the small area of grassland to be directly and indirectly impacted, the low intensity of the indirect impacts considering the gentle gradient of the grassland and the intense management regimes, and the fact that the grasslands encountered were of low value in terms of the maintenance of biodiversity, there is high confidence that the proposed development activities will have limited impacts on local floral biodiversity and that all of the anticipated impacts will be of low significance under poor and good mitigation scenarios. There are thus no fatal flaws associated with the proposed development activities.

Furthermore, due to the low biodiversity value of the grassland, and the majority of the forb species being pioneer and/or opportunistic in nature, widespread in distribution and not threatened, plant rescue and relocation is not recommended for conservation purposes. However, some plant rescue (i.e. sod translocation) may assist in reducing the costs of post-development grassland rehabilitation.

EAP'S RECOMMENDATION

Based on the findings of this BA Process, it is the opinion of the EAP that there are no significant negative impacts that should be considered as "fatal flaws" from an environmental perspective, and therefore the proposed development may proceed given that the mitigation and management measures recommended are followed. The assessment undertaken indicates that the development benefits outweigh the negative environmental impacts, and that the project will result in increased response time should an incident take place at the airport.

Mitigation measures that must be applied to reduce negative impacts have been consolidated with the impact management measures from specialist reports presented in Section 10. Appendix E of the report contains the Draft EMPr which has been compiled for the purpose of offering management and mitigation measures for potential impacts that have been identified to be associated with the development's planning, construction and operational phases.

1. INTRODUCTION

Airports Company South Africa (ACSA) was formed in 1993 as a public company under the Airports Act (No. 44 of 1993) and, although majority owned by the South African Government, it is legally and financially autonomous and operates under commercial law. Over the years, the company has transformed a fragmented, infrastructural parastatal into a focused, customer driven, efficient and commercially successful business, whose airports have become critical success factors to Brand South Africa. The company currently manages a network of nine airports in South Africa, including the three main international gateways of O.R. Tambo International, Cape Town International and King Shaka International Airports. The current situation at the King Shaka International Airport (KSIA) is that the emergency road from the end of Runway 06 is not in line with the designated emergency gate (Emergency gate 3) and this affects the necessary response time required for emergency vehicles to react to an incident at the airport.

At Emergency gate 3, ambulances and other emergency LDVs cannot gain access to due to the raised concrete curb being too high. Currently a temporary solution is in place where sandbags are being used to enable these LDVs to mount the curb. This warrants a permanent solution which will provide a hardstanding surface between the M65 and the gate capable of withstanding a carrying capacity of 80 tons.

The emergency road triggering the requirement of environmental authorisation will be located at the southern end of the airport property in order to allow access to the runway in an event of an emergency. This road is proposed to be 6m wide and 320m long.

It must be noted that there will also be a road construction north of the airport, four route options were presented to ACSA as a “permanent option” for the north road, but due to uncertainty over future use and development layout of the land owned by Tongaat Hulett Development, ACSA currently cannot construct a permanent emergency access road at the north of the airport.

The applicant then decided to construct a road which will serve for emergency access temporarily whilst it further engages the relevant stakeholders for a permanent solution. The proposed road will follow the alignment of the existing access road and will be constructed as follows:

- The road will be constructed east of the runway and be in line with the existing emergency access gate (represented in yellow in the figure below).
- The area out the emergency access gate will be re-gravelled as it has been severely eroded over the years (represented in orange in the figure below).
- The rest of the road up until Watson Highway will be left in its current state, as it is accessible and will only require normal maintenance for gravel roads (represented in green in the figure below).

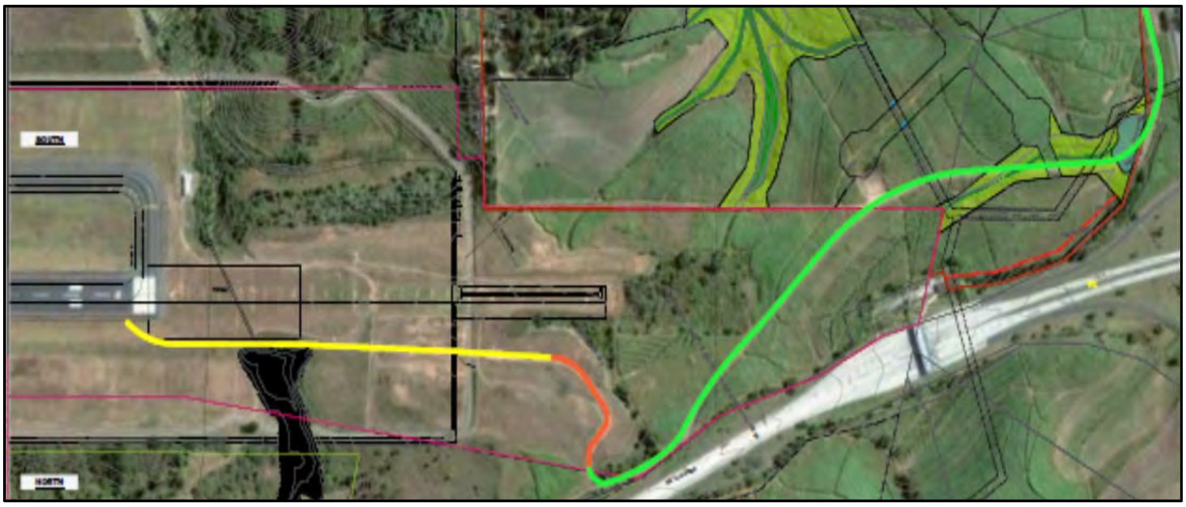

Figure 1 Proposed KSIA North Emergency Road

Confirmation of whether the construction of the KSIA north road would require authorisation was requested from DEA (competent authority) and correspondence dated 11th May 2018 confirmed that there are no trigger activities, hence no authorisation is required. The letter is attached on Appendix F of this report.

This BA Report is therefore for the emergency road proposed at the south of the airport.

1.1 PROPOSED LOCATION

The King Shaka International Airport is located on King Shaka Drive in the area of La Mercy. Site coordinates are 29°36'34.72" S and 31°07'00.72" E

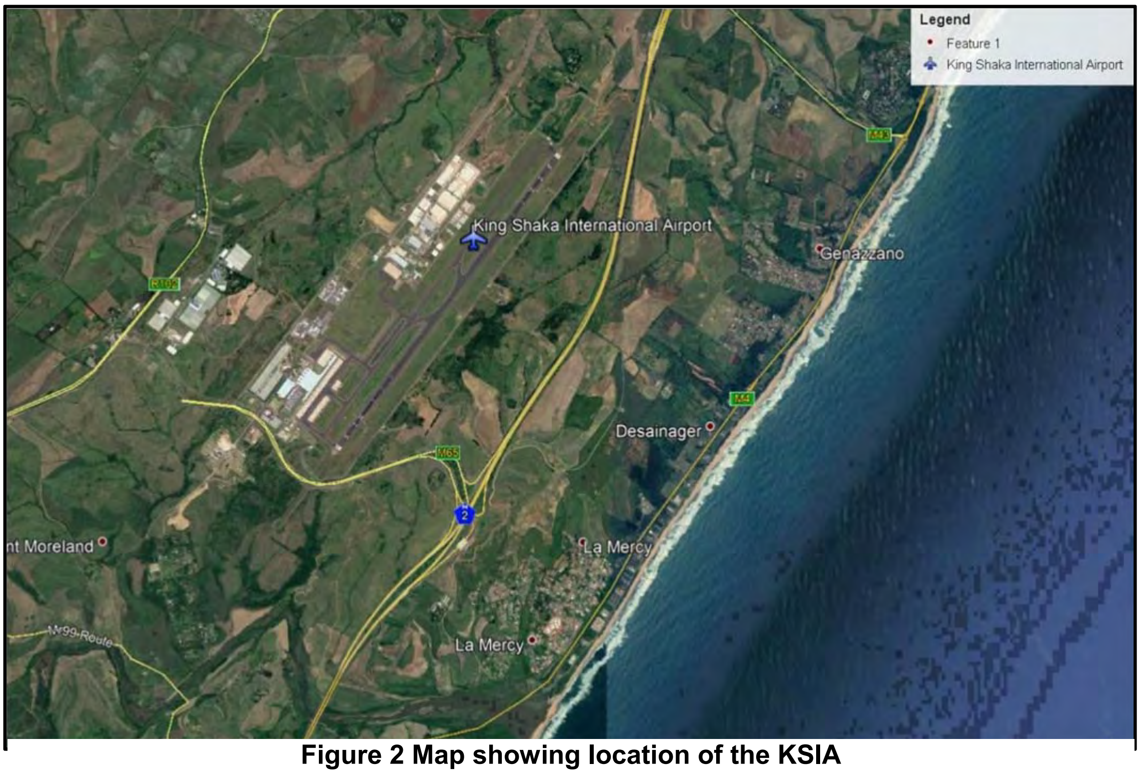

Figure 2 Map showing location of the KSIA

1.2 PROPOSED LAYOUT OF THE PROPOSED EMERGENCY ACCESS ROAD

The road is proposed to be 6m wide and 320m long, from Runway end 06 to the Dube Boulevard, the road will have capacity to withstand 80 tons and will be in line with emergency access gate 3.

Figure 3 Proposed South Road Layout

1.3 DETAILS AND EXPERTISE OF EAPS WHO PREPARED THE REPORT

Table 1 Details of EAPs

Full Names	Ms. Vicki King Miss Nokukhanya Gasa
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Years' experience	27 years 9 years
Professional Affiliation	EAPSA and SACNASP
Areas of expertise	EMPs, public participation, EIA, environmental awareness training, facilitation, waste management licence applications

1.4 2014 EIA REGULATIONS LISTED ACTIVITY (PROJECT TRIGGER)

Geomeasure Group (Pty) Ltd has been appointed by the Airports Company of South Africa (ACSA) to undertake an Environmental Authorisation process for the road to be submitted to the National Department of Environmental Affairs (DEA) as per the requirements of Section 24(5) of the National Environmental Management Act (Act 107 of 1998).

A legislative review has indicated that the proposed development triggers the requirement for a Basic Assessment under the National Environmental Management Act: GNR 983:

Activity 61: "*The expansion of airports where the development footprint will be increased* "

The proposed scope of work for the environmental process follows the procedure detailed in GNR 982 (Appendix 1) of the EIA Regulations (2014), promulgated in terms of Section 24(5) of the National Environmental Management Act (Act 107 of 1998). The diagram below displays the key activities and applicable timeframes forming part of the BA Process.

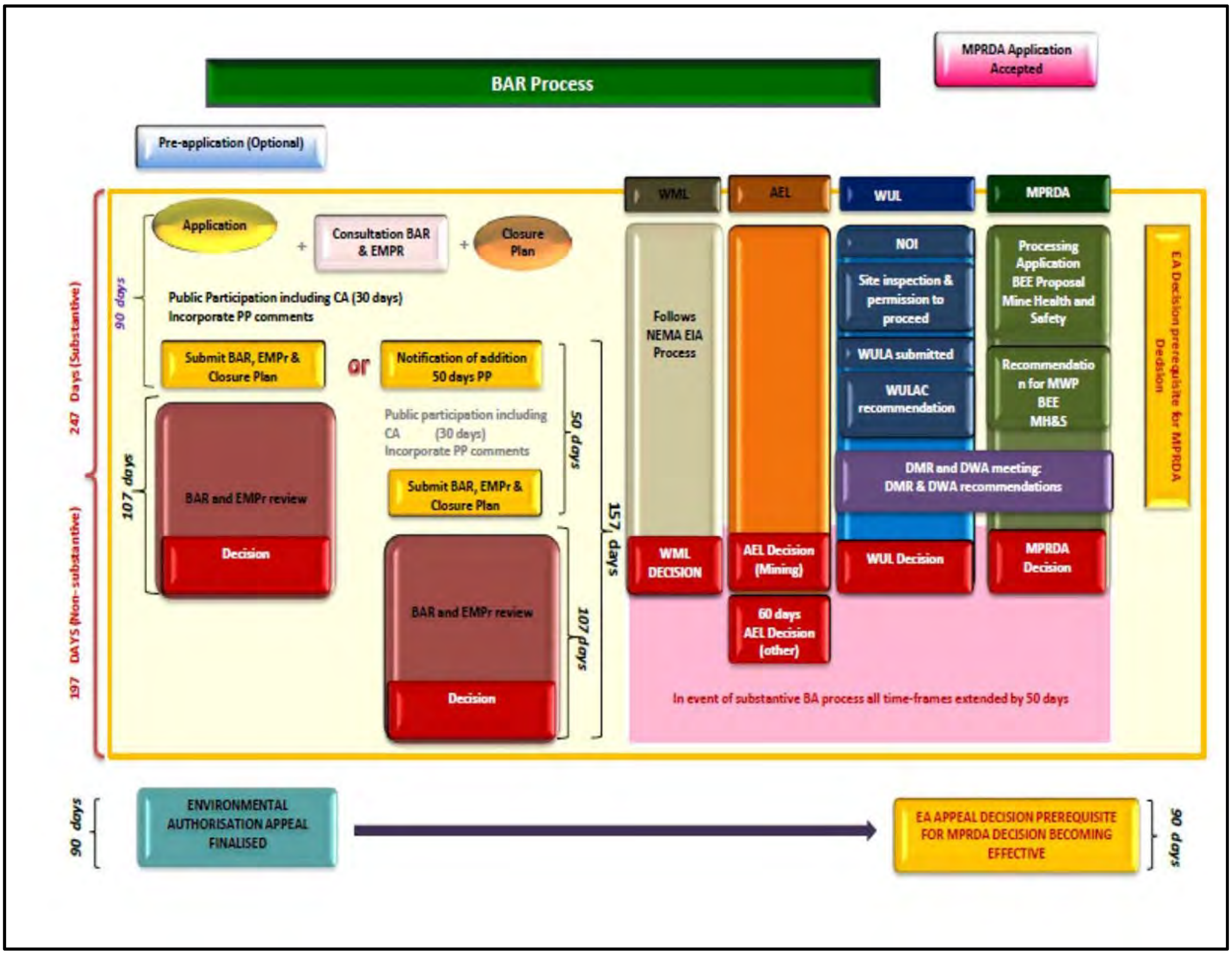

Figure 4 Basic Assessment Process Diagram

1.5 A DESCRIPTION OF ANY ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

- All information provided by ACSA to the EAP was correct and valid at the time it was provided;
- Information provided by the appointed specialists has been extracted from the specialist reports as is and incorporated into the Draft Basic Assessment Report.
- Specialist findings presented in this report are entirely from the appointed specialist and not views of the EAP that compiled the report.

2. LEGAL FRAMEWORK APPLICABLE TO THE PROPOSED DEVELOPMENT

The construction of the emergency access road will need to comply with all relevant South African policy and legislation governing environmental management. The principles of the key pieces of legislation relevant to the proposed development are outlined below, and are important in creating the environmental management guidelines for the development.

2.1 CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA (ACT NO. 108 OF 1996)

The proposed development must comply with the Constitution of the Republic of South Africa (Act No. 108 of 1996), with special reference to Section 24 of Chapter 2, i.e.;

Everyone has the right to;

(a) an environment that is not harmful to their health or well-being, and

(b) have the environment protected, for the benefit of future and present generations, through reasonable legislative and other measures that –

(i) prevent pollution and ecological degradation,

(ii) promote conservation, and,

(iii) secure ecological sustainable development and use of natural resources while promoting justifiable economic and social development.

This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development.

2.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT NO. 107 OF 1998)

The National Environmental Management Act (Act No. 107 of 1998) is the key overarching environmental legislation in South Africa. The objective of the Act is to provide for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state; and to provide for matters connected therewith. The National Environmental Management Act (NEMA) has given rise to a number of relevant subsidiary Acts, including the National

Environmental Management: Air Quality Act (Act No. 34 of 2004), the National Environmental Management: Waste Act (No. 59 of 2008). The 2010 EIA Regulations are also promulgated in terms of this Act.

NEMA puts forward a number of principles for environmental management, to be considered during the BA process and the construction and operation of the service station. These include:

1. *The principles set out in this section shall apply throughout the Republic to the actions of all organs of state that may significantly affect the environment and –*

   (a) shall apply alongside all other appropriate and relevant considerations, including the state's responsibility to respect, protect, promote and fulfill the social and economic rights of Chapter 2 of the Constitution and in particular the basic needs of categories of persons disadvantaged by unfair discrimination,

   (b) serve as the general framework within which environmental management and implementation plans must be formulated,

   (c) serve as guidelines by reference to which any organ of state must exercise any function when taking any decision in terms of this Act or any statutory provision concerning the protection of the environment,

   (d) serve as principles by reference to which a conciliator appointed under this Act may make recommendations; and
   (e) guide the interpretation, administration and implementation of this Act, and any other law concerned with the protection or management of the environment.

2. *Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.*

3. *Development must be socially, environmentally and economically sustainable.*

4. *(a) Sustainable development requires the consideration of all relevant factors, including the following;*

   the disturbance of ecosystems and loss of biological diversity are avoided or, where they cannot be avoided, are minimized and remedied,

   that pollution and degradation of the environment are avoided, or where they cannot be altogether avoided, are minimized and remedied,

   that the disturbance of landscapes and sites that continue the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimized and remedied,
   that waste is avoided, or where it cannot be altogether avoided, minimized and re-used or recycled where possible and otherwise disposed of in a responsible manner,

   that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the depletion of the resource,
   that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed do not exceed the level beyond which their integrity is jeopardized,

that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge and the consequences of decisions and actions, and

that negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot altogether be prevented, are minimized and remedied.

(b) Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.
(c) Environmental justice must be pursued so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons.

(d) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.

(e) Responsibility for the environmental health and safety consequences of a policy, programme, project, process, service or activity exists throughout its lifecycle.

(f) The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.

(g) Decisions must take into account the interests, needs and values of all interested and affected parties, and this includes recognizing all forms of knowledge, including traditional and ordinary knowledge.

(h) Community well-being and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.

(i) The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.

(j) The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.

(k) Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.

(l) There must be an intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment.

(m) Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures.

(n) Global and international responsibilities relating to the environment must be discharged in the national interest

(o) The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.

(p) The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimizing further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.

(q) The vital role of women and youth in environmental management and development must be recognized and their full participation therein must be promoted.
(r) Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

The process identifies potential negative and positive impacts likely to be associated with the proposed development; this is presented through the impact assessment process (detailed in Section 8 of this report). Relevant mitigation measures are provided for potential negative impacts that cannot be avoided to ensure that harm to the environment is minimised.

2.2.1 National Environmental Management Act (Act 107 of 1998) Duty of care and pollution prevention

The duty of care and remediation of environmental damage is defined in Section 28 of the National Environmental Management Act;

(1) Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped and rectify such pollution or degradation of the environment.

The measures required in terms of subsection (1) may include measures to –

- *investigate, assess and evaluate the impact on the environment;*
- *inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment;*
- *cease, modify or control any act, activity or process causing pollution or degradation;*
- *contain or prevent the movement of pollutants or the cause of degradation;*
- *eliminate any source of the pollution or degradation; or*
- *remedy the effects of the pollution or degradation.*

The applicant therefore has full responsibility to ensure that the appointed contractors and employees are aware of the requirements of the EMPr in order to ensure that the activities undertaken do not pose negative impacts to the environment. Should there be pollution to the environment; the applicant will have to cover the costs related to the remediation and rehabilitation of the impacted environment.

2.2.2 Emergency incident reporting (Section 30 of NEMA)

In this section -
(a) "incident" means an unexpected sudden occurrence, including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed;
(b) "responsible person" includes any person who -
(i) is responsible for the incident;
(ii) owns any hazardous substance involved in the incident; or
(iii) was in control of any hazardous substance involved in the incident at the time of the incident;
(c) "relevant authority" means –
(i) a municipality with jurisdiction over the area in which an incident occurs;
(ii) a provincial head of department or any other provincial official designated for that purpose by the MEC in a province in which an incident occurs;
(iii) the Director-General;
(iv) any other Director-General of a national department.
In the event of an emergency incident (spill or fire, explosion etc), the applicant is advised to refer to section 30 of NEMA which states the following:

(3) *The responsible person or, where the incident occurred in the course of that person´s employment, his or her employer must forthwith after knowledge of the incident, report through the most effective means reasonably available—*
(a) the nature of the incident;
(b) any risks posed by the incident to public health, safety and property;
(c) the toxicity of substances or by-products released by the incident; and
(d) any steps that must be taken in order to avoid or minimise the effects of the incident on public health and the environment to—
(i) the Director General;
(ii) the South African Police Services and the relevant fire prevention service; (iii) the relevant provincial head of department or municipality; and
(iv) all persons whose health may be affected by the incident.
(4) *The responsible person or, where the incident occurred in the course of that person´s employment, his or her employer, must, as soon as reasonably practicable after knowledge of the incident—*
(a) take all reasonable measures to contain and minimise the effects of the incident, including its effects on the environment and any risks posed by the incident to the health, safety and property of persons;
(b) undertake clean-up procedures;
(c) remedy the effects of the incident;
(d) assess the immediate and long term effects of the incident on the environment and public health.
(5) *The responsible person or, where the incident occurred in the course of that person´s employment, his or her employer, must, within 14 days of the incident,*
report to the Director General, provincial head of department and municipality such information as is available to enable an initial evaluation of the incident, including—
(a) the nature of the incident;

(b) the substances involved and an estimation of the quantity released and their possible acute effect on persons and the environment and data needed to assess these effects;
(c) initial measures taken to minimise impacts;
(d) causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure; and
(e) measures taken and to be taken to avoid a recurrence of such incident.
***(6)** A relevant authority may direct the responsible person to undertake specific measures within a specific time to fulfil his or her obligations under subsections (4)*
and (5): Provided that the relevant authority must, when considering any such measure or time period, have regard to the following:
(a) the principles set out in section 2;
(b) the severity of any impact on the environment as a result of the incident and the costs of the measures being considered;
(c) any measures already taken or proposed by the person on whom measures are to be imposed, if applicable;
(d) the desirability of the State fulfilling its role as custodian holding the environment in public trust for the people;
(e) any other relevant factors.
***(7)** A verbal directive must be confirmed in writing at the earliest opportunity, which must be within seven days.*
***(8)** Must—*
(a) the responsible person fail to comply, or inadequately comply with a directive under subsection (6);
(b) there be uncertainty as to who the responsible person is; or
(c) there be an immediate risk of serious danger to the public or potentially serious detriment to the environment,
a relevant authority may take the measures it considers necessary to—
(i) contain and minimise the effects of the incident;
(ii) undertake clean-up procedures; and
(iii) remedy the effects of the incident.

2.3 NATIONAL WATER ACT (ACT NO. 36 OF 1998)

The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors;

(a) Meeting the basic human needs of present and future generations;

(b) Promoting equitable access to water;

(c) Redressing the results of past racial and gender discrimination;

(d) Promoting the efficient, sustainable and beneficial use of water in the public interest;
(e) Facilitating social and economic development;

(f) Providing for growing demand for water use;

(g) Protecting aquatic and associated ecosystems and their biological diversity;

(h) Reducing and preventing pollution and degradation of water resources;

(i) Meeting international obligations;

(j) Promoting dam safety;

(k) Managing floods and droughts;

and for achieving this purpose, to establish suitable institutions and to ensure that they have appropriate community, racial and gender representation.

2.3.1 Section 20 of the National Water Act (Control of emergency incidents)

Section 20 of the National Water Act (Act 36 of 1998) states the following:
(2) *In this section, ``responsible person'' includes any person who -*
(a) is responsible for the incident;
(b) owns the substance involved in the incident; or
(c) was in control of the substance involved in the incident at the time of the incident.
(3) *The responsible person, any other person involved in the incident or any other person with knowledge of the incident must, as soon as reasonably practicable after obtaining knowledge of the incident, report to -*
(a) the Department;
(b) the South African Police Service or the relevant fire department; or
(c) the relevant catchment management agency.
(4) *A responsible person must -*
(a) take all reasonable measures to contain and minimise the effects of the incident;
(b) undertake clean-up procedures;
(c) remedy the effects of the incident; and
d*) take such measures as the catchment management agency may either verbally or in writing direct within the time specified by such institution.*

Therefore in the event of an incident, the authorities must be notified immediately.

The National Water Act (Act No. 36 of 1998) is relevant to the proposed development with regards to the protection of the groundwater as well as any nearby surface water bodies (especially during construction). It is important to understand the fundamentals of the Act in order to ensure that water resources are not negatively impacted in any way.

2.4 NEM: WASTE ACT (ACT 59 OF 2008)

The purpose of the National Environmental Management: Waste Act (No. 59 of 2008) reads;

To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licensing and control of waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

The objectives of the National Environmental Management: Waste Act (No. 59 of 2008) are as follows;

(a) *To promote health, well-being and the environment by providing reasonable measures for:*

  (i) *Minimizing the consumption of natural resources;*

  (ii) *Avoiding and minimizing the generation of waste;*

  (iii) *Reducing, re-using, recycling and recovering waste;*

  (iv) *Treating and safely disposing of waste as a last resort;*

  (v) *Preventing pollution and ecological degradation;*

  (vi) *Securing ecologically sustainable development while promoting justifiable economic and social development;*

  (vii) *Promoting and ensuring the effective delivery of waste services;*

  (viii) *Remediating land where contamination presents, or may present, a significant risk of harm to health or the environment; and*

  (ix) *Achieving integrated waste management reporting and planning.*

(b) *To ensure that people are aware of the impact of waste on their health, well-being and the environment;*

(c) *To provide for compliance with the measures set out in paragraph (a); and*

(d) *Generally, to give effect to Section 24(b) of the Constitution in order to secure an environment that is not harmful to health and well-being.*

The disposal of any other wastes generated during the establishment of the access road will be governed by the principles of this Act, therefore it is important to identify and understand its objectives.

2.5 NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT (ACT 39 OF 2004)

The objective of the act is to reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto.

Management and mitigation measures contained in the Environmental Management Programme relating to dust and possible emissions during the construction of the road must be adhered to at all times.

2.6 NATIONAL HERITAGE RESOURCES ACT (NO 25 OF 1999)

The protection, management and evaluation of heritage resources are specifically addressed in the following:

Section 34 – Structures older than 60 years: In most cases evaluated and handled by Conservation Architects.

Section 35 - *Archaeology, palaeontology and meteorites:*

- Provides protection for these sites on Provincial and National levels.
- Stipulates State ownership of all archaeological objects, palaeontological material and meteorites.
- Protects archaeological and palaeontological sites and meteorites from unlawful destruction, trade and excavation without permitting.
- Makes provision for mediated action to protect archaeological and palaeontological sites and meteorites being damaged.
- Register private collections of archaeological objects, palaeontological material and meteorites.

Section 35 – *Burial grounds and graves:*

- Provides protection for graves of conflict, as well as burial grounds containing graves of conflict.
- Graves and burial grounds older than 60 years outside formal cemeteries administered by local authorities.
- The issuing of permits for the exhumation and relocation of such graves and burial grounds.

Section 38 – *Heritage Resources Management:*

- Subsection (1) stipulates the types of development that require the developer to contact the relevant heritage authority, to determine the need for a Heritage Impact Assessment (HIA).
- Stipulates the minimum information required in such a HIA. These requirements and the minimum requirements for Archaeological Impact Assessments were issued by SAHRA in 2006.
- Indicates evaluation timeframes by the relevant heritage Authority of the submitted HIA report.
- Indicates guidelines on the appeal process on decisions by the heritage Authority.

Elements related to heritage sensitivity must be protected once identified. This is the responsibility of the applicant as well as the appointed contractor.

2.7 OCCUPATIONAL HEALTH AND SAFETY ACT (NO 85 OF 1993)

The Occupational Health and Safety Act provides for the health and safety of persons at work and for the health and safety of persons in connection with the use of machinery; the

protection of persons other than persons at work, against hazards to health and safety arising out of or in connection with the activities of persons at work.
It is important that activities that take place on site promote the health and safety of the staff working on site during all phases of the development. The appointed contractor has the responsibility to follow the ACSA Health and Safety Procedures as well as provide the workers with Personal Protective Equipment (PPE).

The EMPr provides further management measures that will ensure the health and safety of the staff on site as well as surrounding environments.

2.8 DEVELOPMENT COMPLIANCE WITH OTHER PLANNING FRAMEWORKS

2.8.1 The Provincial Spatial Development Framework (PSDF)

The proposed development is an addition to activities already in existence (airport), in terms of the KZN Provincial Spatial Development Framework dated 03 March 2016, airport development is included as part of strategic objectives which form part of the 2030 vision.

KZN PGDS STRATEGIC FRAMEWORK

provincial planning commission
PROVINCE OF KWAZULU-NATAL

STRATEGIC GOALS

① INCLUSIVE ECONOMIC GROWTH
② HUMAN RESOURCE DEVELOPMENT
③ HUMAN & COMMUNITY DEVELOPMENT
④ STRATEGIC INFRASTRUCTURE
⑤ ENVIRONMENTAL SUSTAINABILITY
⑥ GOVERNANCE AND POLICY
⑦ SPATIAL EQUITY

Vision 2035

KwaZulu-Natal will be a prosperous Province with a healthy, secure and skilled population, living in dignity and harmony, acting as a gateway to Africa and the World

STRATEGIC OBJECTIVES

1. Develop and promote the agricultural potential of KZN
2. Enhance sectoral development through trade, investment & business retention
3. Enhance spatial economic development
4. Improve the efficiency, innovation and variety of Government-led job creation programmes
5. Promoting SMME, Entrepreneurial and Youth Development
6. Enhance the Knowledge Economy
7. Early Childhood Development, Primary and Secondary Education
8. Skills alignment to Economic Growth
9. Youth Skills Development & Life-Long Learning
10. Eradicate poverty & improve social welfare services
11. Enhancing health of communities and citizens
12. Safeguard and enhance sustainable household food security
13. Promote Sustainable Human Settlements
14. Enhance safety & security
15. Advance social cohesion and social capital
16. Promote youth, gender and disability advocacy and the advancement of women
17. Development of seaports and airports
18. Develop road and rail networks
19. Develop ICT infrastructure
20. Ensure availability and sustainable management of water and sanitation for all
21. Ensure access to affordable, reliable, sustainable and modern energy for all
22. Enhance KZN waste management capacity
23. Enhance resilience of ecosystem services
24. Expand application of green technologies
25. Adapt and respond to Climate Change
26. Strengthen policy and strategy co-ordination & IGR
27. Building government capacity
28. Eradicating fraud & corruption
29. Promote participative, facilitative & accountable governance
30. Enhance the resilience of new and existing cities, towns and rural nodes, ensuring equitable access to resources, social and economic opportunities
31. Ensure integrated land management use across the Province, ensuring equitable access to goods and services, attracting social and financial investment

65

Figure 5 KZN PGDS Strategic Framework

From the above, it can be noted that the construction of the emergency access road will positively contribute to the operations at the airport, fast reaction time to emergencies will minimise unnecessary financial loss to ACSA. The proposed development therefore complies with the Provincial Spatial Development Framework.

2.8.2 Integrated Development Plan

The Municipal Systems Act (No.32) of 2000 (MSA) requires that local municipal structures prepare Integrated Development Plans (IDPs). The IDP serves as a tool for transforming local governments towards facilitation and management of development within their areas of jurisdiction. The eThekwini Municipality's Draft 2017/2018 IDP has an eight (8) point plan which aims to better the social, economic and environmental aspects within the Municipality. The operation of the King Shaka International Airport is line with Plan 2 of the IDP which is "*Developing a Prosperous, Diverse Economy and Employment Creation*". The desired outcome of this plan is to create strong economic growth, sustainable job creation and poverty alleviation.

As mentioned from the IDP, this plan is geared towards positioning the municipal economy as Africa's Southern Gateway to Trade and Travel. The further development of the Port of Durban, Dube TradePort and King Shaka International Airport, as well as infrastructure improvements such as provision of water, energy, road, freight rail and fibre optics networks highlight the critical linkages of the municipality to key value chains located throughout Southern Africa.

It can therefore be confirmed that the proposed development is aligned with the City's IDP objectives, as it will take place at the airport which is identified as one of the economic hubs with potential to create jobs and alleviate poverty.

2.8.3 Spatial Development Framework

The formulation and adoption of our Municipal Spatial Development Framework (SDF) is in line with the requirements of both the Municipal Systems Act (MSA), No. 32 of 2000 and the Spatial Planning and Land Use Management Act (SPLUMA, Act No.16 of 2013). The SDF is the primary spatial strategy response to the development context, needs and vision of the municipality as described in the IDP.

From the above, it can be realised that the objectives of the IDP are similar to those of the SDF, with the SDF focusing more on how the implementation of the IDP should occur in space. The SDF therefore guides the desirable spatial distribution of land uses within a Municipality in order to give effect not only to the spatial vision, goals and objectives of the Municipality but by directing where the city should intervene in space to achieve its transformational objective.

King Shaka International Airport (KSIA) has a total area of 878ha for conservation through rehabilitation and restoration, Specific rehabilitation and restoration objectives include the following:

- Removal of alien and invasive vegetation;
- Correction of current alien removal practices;
- Remediation of sites at risk of degradation through erosion and pollution;
- Remediation of soil conditions;

- Control of indigenous pioneer species that have encroached on the site and established in large monospecific stands;
- Rehabilitation and restoration of wetlands on site;
- Rehabilitation and reconnection of fragmented riparian areas;
- Maintaining areas of Scarp Forest and Albizia adianthifolia Woodland;
- Maintaining the areas containing mixed woodland and increasing the species diversity of the grassy component in selected areas;
- Restoring areas that are currently and were previously under sugarcane to secondary grassland with the aim of increasing species diversity (according to the reference ecosystem) over time; and
- Introduction of rare and threatened species (according to the reference ecosystem) over time but not until the habitats have stabilised. The state of the potential habitats for these species will be monitored over time and through adaptive management, a suitable environment established.

It must be noted that the proposed south road will not impact to the KSIA conservation zone as planning and design considered that no construction must take place in this area. The requirements of the KSIA Appeal Decision (Reference No: 12/12/20/686) and its associated decision in respect of the KSIA Conservation Area informed the planning of the proposed emergency access.

3. ALTERNATIVES CONSIDERED

In terms of the 2014 EIA Regulations (amended), Appendix 1 (3) (h) (i), details of all alternatives considered must be discussed in the report. An alternative in relation to a proposed activity refers to the different means of meeting the general purpose and requirements of the activity, which may include alternatives relating to:

a. Property on which or location where the activity is proposed to be undertaken;
b. Type of activity to be undertaken;
c. Design or layout of the activity;
d. Technology to be used in the activity, or
e. Operational aspects of the activity, and includes the option of not implementing the activity.

The section below provides an overview of the alternatives considered for the proposed development.

3.1 LOCATION ALTERNATIVES

In terms of location, no alternatives were considered as emergency access is required to allow emergency access south of the airport. ACSA has the responsibility to provide emergency rescue services at the airport in accordance with Civil Aviation Authority regulations and International Civil Association Organisation (ICAO) standards.

Response time to emergency situations must be short as possible; access to the runway directly means that the “accident scene” is accessed at the best possible point before further damage is incurred at the airport and lives endangered.

3.2 LAND USE / ACTIVITY ALTERNATIVES

No land use alternatives were considered for the proposed development, the emergency access road is an extension of airport infrastructure. The development area is already allocated for airport activities as it is already in existence.

The airport site was identified in 1972 for the purposes of relocating the Durban International Airport (DIA). The property was tied cadastrally in terms of 74 independent properties and their 60 Title Deeds. Major levelling and drainage work was undertaken on the site between 1972 and 1975. In short, the land was earmarked for airport development for more than 40 years.

3.3 ROAD LAYOUT ALTERNATIVES

Three (3) alternatives were considered for the south road as shown in yellow, green and blue in Figure 5 and discussed in detail on Table 2.

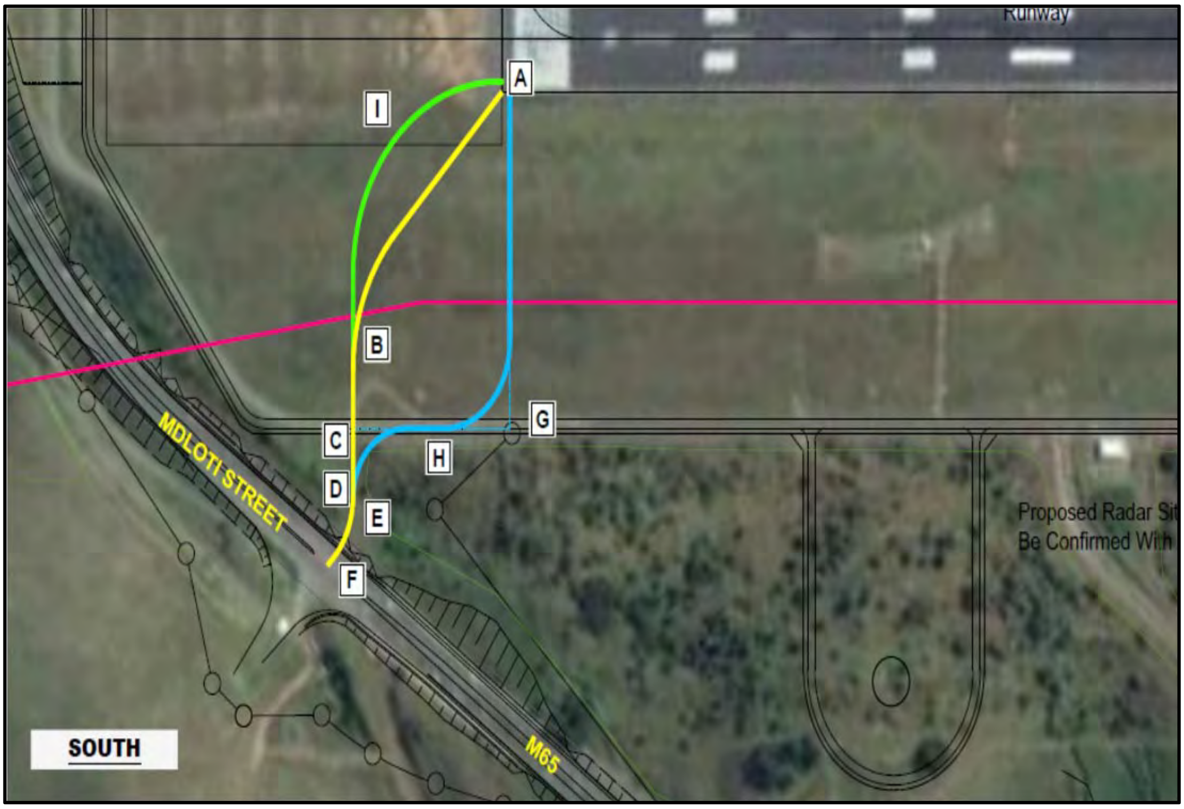

Figure 6 KSIA South Road Alternatives

Table 2 Detail on considered south road layout alternatives

OPTION 1		OPTION 2		OPTION 3	
NODE	**DESCRIPTION**	**NODE**	**DESCRIPTION**	**NODE**	**DESCRIPTION**
A	TIE TO RUNWAY PAVING, APPROX. 45DEG ANGLE TO FACILITATE ACCESS TO EITHER RUNWAY OR TAXIWAY	A	TIE TO RUNWAY PAVING, PARALLEL TO RUNWAY DIRECTION, EASES ACCESS TO RUNWAY	A	TIE TO RUNWAY PAVING, PERPENDICULAR TO RUNWAY DIRECTION, EASES ACCESS TO TAXIWAY
B	RADIUS 110M, SMS 45KM/H	I	RADIUS 110M, SMS 45KM/H	G	TIE TO EXISTING PERIMETER ROAD WITH CONVENTIONAL BELLMOUTH PRIORITY OF ROUTES TO BE DETERMINED OR TIE TO EXISTING PERIMETER ROAD WITH RADIUS 50M, SMS <30KM/H, INTERSECTION WITH PERIMETER ROAD WOULD BE UNCONVENTIONAL
C	CROSS EXISTING PERIMETER ROAD, PRIORITY OF ROUTES TO BE DETERMINED	C	CROSS EXISTING PERIMETER ROAD, PRIORITY OF ROUTES TO BE DETERMINED		
D	CROSS STORMWATER GULLEY AT EXISTING CULVERT, THROUGH EXISTING GATE 3	D	CROSS STORMWATER GULLEY AT EXISTING CULVERT, THROUGH EXISTING GATE 3		
E	RADIUS 50M. SMS <30KM/H	E	RADIUS 50M. SMS <30KM/H	H	UTILISE EXISTING PERIMETER ROAD
F	CONVENTIONAL BELLMOUTH ON TO m65, STOP CONDITION	F	CONVENTIONAL BELLMOUTH ON TO m65, STOP CONDITION	C	TIE TO EXISTING PERIMETER ROAD WITH CONVENTIONAL BELLMOUTH, PRIORITY OF ROUTES TO BE DETERMINED OR TIE TO EXISTING PERIMETER ROAD WITH RADIUS 40M, SMS <20KM/H. INTERSECTION WITH PERIMETER ROAD WOULD BE UNCONVENTIONAL AND MAY IMPACT ADJACENT ENVIRONMENTAL ZONE
SMS (SAFETY MAXIMUM SPEED)				D	CROSS STORMWATER GULLEY AT EXISTING CULVERT, THROUGH EXISTING GATE 3
				E	RADIUS 50M. SMS <30KM/H
				F	CONVENTIONAL BELLMOUTH ON TO m65, STOP CONDITION

3.4 NO-GO ALTERNATIVE

The No-Go Alternative refers to “the option of not implementing the activity” or “maintaining the status quo at the site”.

If the proposed emergency access road is not constructed, access to the airport’s runway 06 during an emergency will be challenging and compliance with the CAA Regulations will not be met as required. Should this option be considered the following impacts would be applicable:

Negative impacts associated with the No-Go Alternative include:

- No proper emergency access roads for the King Shaka International Airport;
- Extended reaction time for emergency vehicles/personnel to reach the "scene";
- Non-compliance with the Civil Aviation Authority regulations and International Civil Association Organisation (ICAO) standards;
- Increased possibility for fatalities if an incident occurs;
- Potential halt of operational activities at the airport;
- Loss of revenue whilst the incident is being attended to.

Positive impacts associated with the development include:

- Improved access on the south of the airport;
- Compliance with the Civil Aviation Authority regulations and International Civil Association Organisation (ICAO) standards;
- Reduced possibility for fatalities and worsening of the incident;
- Faster reaction time for emergency services to get to the runway;
- Avoidance of stopping operational activities whilst the emergency situation is being dealt with.

It must be noted that positive impacts related to the development of the site outweigh the negative impacts that may occur as it is critical that access is available anytime there may be an emergency on site.

4. NEED AND DESIRABILITY FOR THE PROPOSED DEVELOPMENT

Relating to the need of the road, accessibility to the airport currently is not properly established as it should be, the construction of the road will enable accessibility during emergencies and the easy movement and safety of vehicles commuting into and out of the airport will be achieved. Currently, the access available is not suitable as it is also not aligned with the existing emergency gate 3.

The road is desirable because of the demand that the King Shaka International Airport is experiencing, the airport recorded 5.22 million passengers between 2016–2017, with the majority (4.85 million) being domestic passengers, 356,234 being international and a small percentage of traffic being classified as "unscheduled". The statistics place KSIA as the third busiest airport in South Africa, behind both OR Tambo International Airport in Johannesburg and Cape Town International Airport.

From a compliance point of view, all airports must provide appropriate emergency access as specified in the 2011 Civil Aviation Regulations (Regulation 6,8, and 9 of section 139.2.7). the Regulations specifiy the following:

(6)"*Emergency access roads shall be provided on an aerodrome where the minimum response times as prescribed in Document SA-CATS 139 cannot be achieved and where the terrain conditions permit their construction*".

(8)*"Emergency access roads shall be capable of supporting the heaviest emergency vehicles and shall be accessible in all weather conditions".*
(9)*" the roads within 90m of a runway shall be surfaced to prevent surface erosion and transfer of debris to the runway*".

5. DETAILS OF THE PPP UNDERTAKEN IN TERMS OF REGULATION 41 OF THE EIA REGULATIONS

5.1 DISTRIBUTION OF THE BACKGROUND INFORMATION DOCUMENT (BID)

The Background Information Document (BID) was distributed to the authorities and surrounding landowners on the 05th May 2018. The BID offered an opportunity for interested parties to register their details so that they can be added onto the I&AP list and to comment on the proposed development.

The registration form could either be emailed or faxed for the attention of the appointed EAP; a copy of the BID has been attached in Appendix C.

5.2 PLACEMENT OF SITE NOTICES

Site notices compiled in English and IsiZulu were placed on site in order to notify the general public regarding the proposed development. The site notice contained details of the proposed development; applicable 2014 EIA Regulations listed activities as well as contact details of the EAP appointed to conduct the process. Photos showing the locations where site notices were placed can be seen in Appendix C.

5.3 PLACEMENT OF THE NEWSPAPER ADVERT

Advertisements were placed in the Isolezwe newspaper dated 25 May 2018 and in the North Coast Courier Newspaper dated 01 June 2018, copies of the adverts can be seen in Appendix C of this report.

5.4 COMPILATION OF THE I&AP LIST

As per Regulation 42 of the 2014 EIA Regulations, a register of Interested and Affected Parties must be compiled to contain contact details and addresses of all persons who have submitted written comments, requested registration and organs of state who have jurisdiction in respect of the activity to which the application relates.

A copy of the I&AP list can be seen in Appendix C.

5.5 COMPILATION OF ISSUES AND RESPONSES REPORT

Comments have been received based from the information given in the BID, a comments and responses report has therefore been compiled in order to detail each comment and offer the appropriate response.

Summary of the issues raised include the following:

- Request for the use of local labour as the proposal is in the Centre of ward 58;
- The requirements of the KSIA Appeal Decision (Reference No: 12/12/20/686) and its associated decision in respect of the KSIA Conservation Area must inform the planning of the proposed emergency access;
- The applicant needs to ensure that all construction activities onsite are in compliance with the environmental authorisation as contained in the Record Of Decision (RoD) dated 23 August 2007 and a revised RoD dated 29 October 2008;
- A geotechnical centreline investigation is recommended for the road alignment as past earthworks for the airport development have potentially resulted in variable conditions (cut/fill/imported materials). Of particular interest is the drainage line crossing in the east to ensure founding of culvert/causeway is adequate to avoid excessive settlement of the new structure under potentially heavy emergency vehicles;
- A comprehensive Environmental Management Programme is to be provided prior to the commencement of the project.

Concerns raised and comments to each have been captured into the comments table refer to Appendix C for the detailed responses.

6. DESCRIPTION OF THE STUDY AREA

6.1 CLIMATE

Durban, located in the KwaZulu-Natal Province of South Africa, boasts an average of 320 days of sunshine a year. Temperatures range from 16 - 25° C in winter (June to August) and 23 - 33° C during the summer months (October to March). There is high humidity during the summer months, with late January to early March being particularly humid, and air conditioning inside becomes virtually essential.

The climate of this area is warm and is strongly influenced by the Warm Agulhas Current that moves down the east coast of southern Africa. Average daytime temperatures range from 27°C in January, 23°C in June and 26°C in December (as can be seen on the graph below).

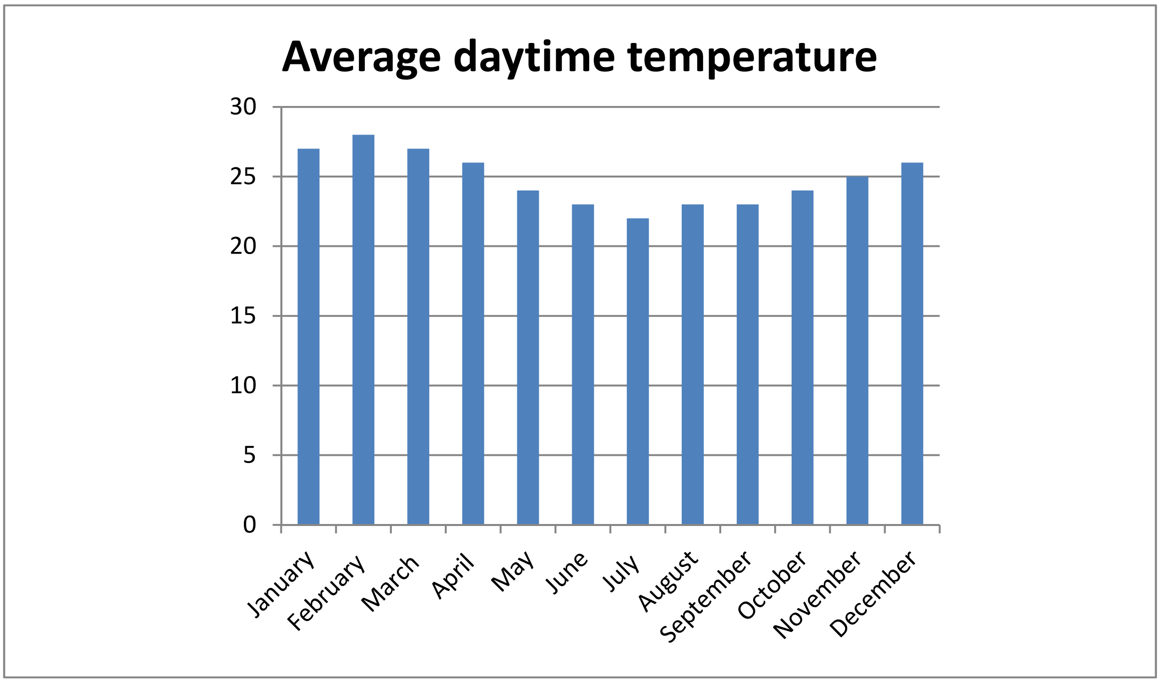

Figure 7 Average daytime temperature (1990 - 1999)
Station: Durban International Airport

Rainfall during the month of January is usually at the highest, estimated at 134mm with the month of June having the minimal rainfall of 27mm. The coldest period occurs during June and July, this is also the driest time of the year (refer to the graph below).

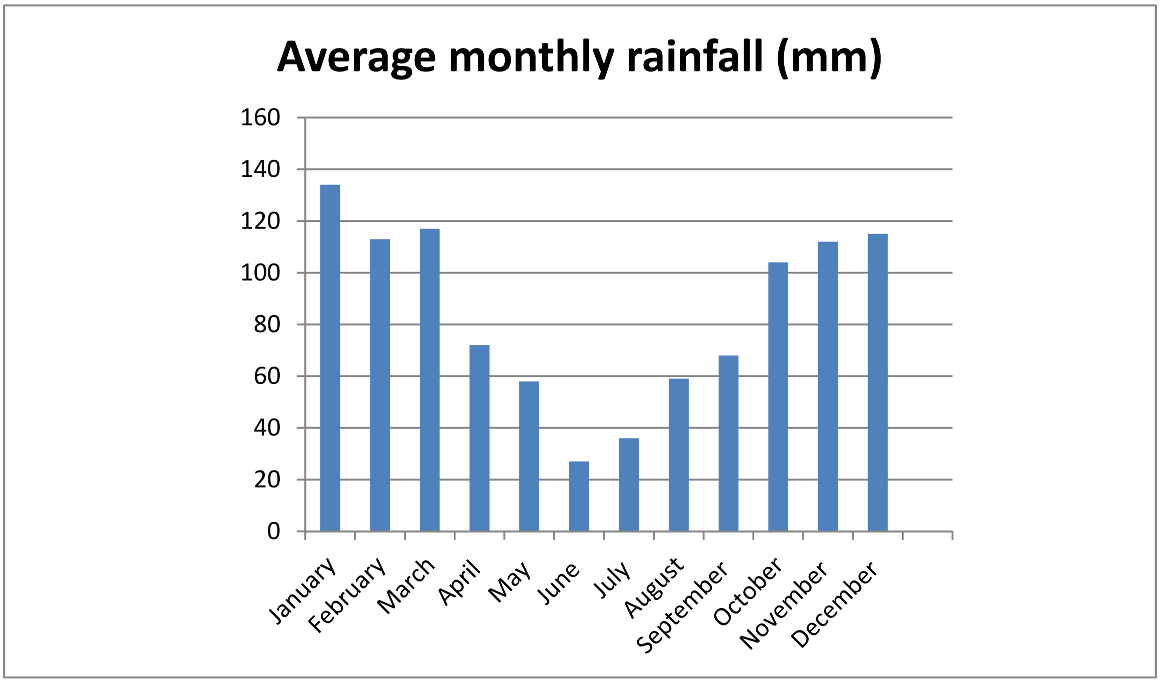

Figure 8 Average monthly rainfall (1990 - 1999)
Station: Durban International Airport

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

6.2 GEOLOGY

The 1:250 000 Geological Map of Durban, Geological Series 2930, indicates that the site investigated is underlain by soils of the Berea Formation as well as shale and siltstone of the Vryheid Formation. The regional geology has been shown in Appendix A (Figure 3) of the Geotechnical Report.

The Berea Formation sands comprise unconsolidated red sands, subordinate white, yellow, brown and purple sands as well as some basal conglomerate. The Vryheid Formation comprises medium to coarse grained sandstone with thin-grit beds and subordinate grey shale and siltstone with sporadic coal.

The Vryheid Formation units were subjected to faulting and fracturing during the breakup of the ancient Gondwana super-continent. These structures in the surrounding area are attributed to the extraction of the Falkland Plateau past the Natal Valley during the mid-Cretaceous breakup of Gondwana, when during coast-parallel shearing, right-lateral strike-slip movement occurred.

6.2.1 Geotechnical Investigation

Shriram Geotechnical Consulting (Pty) Ltd was appointed by iX Engineers (Pty) Ltd to carry out a geotechnical investigation for the emergency access roads proposed to be constructed at the King Shaka International Airport in La Mercy, KwaZulu-Natal. The aim of the geotechnical investigation was to assess the ground conditions in terms of usage and for subgrade treatment guidelines to be provided, (Full Report contained in Appendix D).

6.2.2 Fieldwork

The field work was carried out between 22 August and 11 September 2018 and comprised of the following:

- In Situ CBR Dynamic Cone Penetrometer tests- A total of 9 in Situ CBR (ICBR) Dynamic Cone Penetrometer (DCP) tests, designated DCP1 to DCP9 were carried. The ICBR DCP tests were generally advanced to a minimum depth of 1.00m or earlier refusal.

Table 3 Summary of ICBR DCP Tests

Location	DCP Number	Final Depth (mm)	Refusal
Northern Emergency Access Road - Landside	DCP1	940	No
	DCP2	80	No
Northern Emergency Access Road - Airside	DCP3	1011	No
	DCP4	1025	No
	DCP5	1073	No
Southern Emergency Access Road - Airside	DCP6	1038	No
	DCP7	979	No
Southern Emergency Access Road - Landside	DCP8	1019	No
	DCP9	335	Yes

- Test pits- A total of 9 test pits were excavated by hand through to a minimum depth of 1.00m or earlier refusal. The materials exposed in the test pits were profiled and sampled by an engineering geologist.

Table 4 Summary of test pits

Location	DCP Number	Final Depth (m)	Refusal
Northern Emergency Access Road - Landside	TP1	1.10	No
	TP2	1.05	No
Northern Emergency Access Road - Airside	TP3	1.00	No
	TP4	1.10	No
	TP5	1.00	No
Southern Emergency Access Road - Airside	TP6	1.00	No
	TP7	1.05	No
Southern Emergency Access Road - Landside	TP8	1.05	No
	TP9	1.00	No

6.2.3 Groundwater

Groundwater seepage was not encountered in any of the test pits. However, during periods of high rainfall, shallow groundwater seepage could be expected to proliferate particularly where highly permeable soils exist and at the interface between fill layers.

6.2.4 Laboratory Testing

In order to classify the materials on site and to assess their suitability for use, laboratory testing was conducted on selected materials encountered in the test pits and the following tests were undertaken:

- Road indicator tests (Particle size analysis and Atterberg limit determination);
- Modified AASHTO moisture-density (modified AASHTO) tests; and
- California Bearing Ratio, or CBR, strength tests.

The detailed test result sheets are contained in Appendix D of the Geotechnical Report.

6.2.5 Materials Classification and Usage

The materials making up the existing roadbed have been classified in terms of their suitability for use in road construction on the basis of field observations and laboratory testing. The classification and recommended usage is summarised in Table 6 below.

Due to the isolated work areas (northern access road – landside, northern access road – airside, southern access road – airside, southern access road – landside) and operational constraints the materials classification and usage has been provided based on the work areas, and not necessarily the similarity in materials encountered.

Table 5 Materials and classification usage

Material Type, Location & Test Pit Number	**Description**	**Classification Details**	**Recommended Use and Subgrade Treatment**
Fill (average thickness of 525mm, in range of 250mm to 750mm) Northern Emergency Access Road – Landside TP1 & TP2	Brown and orange variants of silty clayey SAND.	PI = NP to 6; Silt & clay = 12 to 35; GM = 0.68 to 0.96; CBR = 1 to 6 @ 90% MDD; CBR = 3 to 14 @ 93% MDD; CBR = 7 to 21 @ 95% MDD; CBR = 12 to 48 @ 98% MDD; CBR = 15 to 82 @ 100% MDD Classifies as A-2-4(0) in terms of USPRA. TRH14:1985 classification of G8 to G10 in quality	Excellent to good subgrade material in terms of USPRA. Generally suitable for use as subgrade material of quality G10.
Fill (average thickness of 563mm, in range of 400mm to 700mm) Northern Emergency Access Road – Airside TP3 , TP4 and TP5	Orange, orange brown and reddish brown clayey and silty SAND.	PI = NP to 3; Silt & clay = 8 to 25; GM = 0.78 to 1.01; CBR = 4 to 10 @ 90% MDD; CBR = 7 to 16 @ 93% MDD; CBR = 11 to 22 @ 95% MDD; CBR = 14 to 36 @ 98% MDD; CBR = 16 to 49 @ 100% MDD Classifies as A3(0) to A-2-4(0) in terms of USPRA. TRH14:1985 classification of G7 to G9 in quality.	Excellent to good subgrade material in terms of USPRA. Generally suitable for use as subgrade material of quality G9.

Fill (average thickness of 550mm, in range of 250mm to 850mm) Southern Emergency Access Road – Airside TP6 & TP7	Red and brownish yellow silty and clayey SAND and sandy GRAVEL.	PI = 6 to 11; Silt & clay = 14 to 34; GM = 0.91 to 2.36; CBR = 1 to 11 @ 90% MDD; CBR = 1 to 13 @ 93% MDD; CBR = 2 to 15 @ 95% MDD; CBR = 2 to 18 @ 98% MDD; CBR = 3 to 20 @ 100% MDD Classifies as A-2-4(0) to A-2-6(0) in terms of USPRA. TRH14:1985 classification of G8 to <G10 in quality.	Generally fair to poor subgrade material in terms of USPRA. TP6: Generally suitable for use as subgrade material of quality G8. TP7: Not suitable for use as subgrade.
Fill (average thickness of 475mm, in range of 450mm to 500mm) Southern Emergency Access Road – Landside TP8 & TP9	Yellowish orange brown clayey sandy GRAVEL.	PI = 7; Silt & clay = 22 to 24; GM = 1.56 to 1.89; CBR = 5 @ 90% MDD; CBR = 5 to 9 @ 93% MDD; CBR = 6 to 13 @ 95% MDD; CBR = 7 to 22 @ 98% MDD; CBR = 8 to 31 @ 100% MDD Classifies as A-2-4(0) in terms of USPRA. TRH14:1985 classification of G9 to G10 in quality.	Excellent to good subgrade material in terms of USPRA Generally suitable for use as subgrade material of quality G10.

6.2.6 Materials Assessment

The existing gravel road appears not to have been maintained and as a result, the gravel wearing course has been thinned or completely eroded in places. Where encountered, the gravel wearing course was found to be 50mm thick.

The materials underlying the gravel wearing course, and those present from ground level where the gravel wearing course has been completely eroded away, appears to have been compacted in order to serve as a base layer. These materials generally comprise silty clayey sands but behaved as clays when inspected on site. They generally classify in the range of G8 to G10 in terms of TRH 14 and are of excellent to good subgrade material.

All other areas investigated were found to be underlain by fill of varying composition (silty and clayey sands and gravels with clay rich layers occurring in areas). These soils vary from G7 to less than G10 quality and are not suitable for use in structural pavement layers but may be used as subgrade materials (in certain areas) as suggested in the table above.

6.2.7 Subgrade Treatment

It is understood that the 440mm deep excavations will be created along the path of the emergency access roads, from which depth the structural pavement layers will be constructed.

The ICBR values recorded on site are variable (Appendix B) and were found to be relatively higher in some areas. These areas generally correspond to those underlain by gravelly soils. The possibility of the higher ICBR values being attributed to the individual gravels acting as obstructions or “barriers” during DCP testing must therefore not be ruled out.

It will suffice to treat the subgrade as follows:

- Excavate to top of in situ subgrade level.

- Rip the fill to a minimum 200mm depth (or as determined by the Engineer), obtain a moisture content within ±2% of the Mod AASHTO Optimum Moisture Content (OMC) by wetting or drying and recompact to minimum 93% MDD. Provided this is adhered to the following minimum CBRs may be adopted (based on the laboratory test results) for the subgrade for the design of respective lengths of road:

    - ✓ Northern Access Road – Landside: 3
    - ✓ Northern Access Road – Airside: 7
    - ✓ Southern Access Road – Airside: 1
    - ✓ Southern Access Road – Landside: 5

- Where materials of clayey consistency and/or of less than G10 quality in terms of TRH 14 are encountered, they should be removed and replaced with more gravelly material in the range of G8/G9 quality. One such area exists in the vicinity of TP7. Clayey soils will usually be able to be practically identified during construction by its instability (heaving) under compaction and it not being able to be compacted to the recommended 93% MDD. Definitive identification will require laboratory testing. The depth of undercut should be determined by the Engineer but in general a 300mm undercut is likely to be acceptable for lightly trafficked roads. In instances where heavier wheel loads are anticipated, then a much deeper undercut to provide a stable base may be necessary, subject to the pavement type and depth selected by the designer.

- The subsequent road layers should then be constructed according to appropriate road design, which will take the type and volume of traffic and design life into account. The majority of the materials required for the pavement formation layers will need to be imported to the site.

6.3 SOILS AND DRAINAGE

The insitu materials indicated on the Geological Map of Durban and/or their weathered products were not encountered during the field investigation. Fill resembling soils belonging to the Berea Formation were however encountered in TP1. The site was generally found to be underlain by colluvium, or topsoil, and fill which was likely placed when shaping the site during the construction of the airport. The existing gravel road situated on the landside north of the airport was found to be underlain by apparently compacted soils.

The study area is located within DWS Quaternary Catchment U30B which is drained primarily by the perennial Mdloti River situated in the Pongola - Mtamvuna Water Management Area (WMA). The study area is located in the headlands of a small stream and drains into a stormwater drain network which drains in a south-easterly direction, entering a first order stream downstream. The series of small tributary streams feed into the Mdloti River and Mdloti Estuary some 2km downstream to the south-east of the King Shaka International Airport (KSIA) site.

6.4 AQUATIC ENVIRONMENT

Eco-Pulse Environmental Consulting Services (Eco-Pulse) was appointed by Geomeasure Group to undertake a freshwater habitat assessment to inform all relevant environmental legislative applications. The scope of work undertaken as part of the Freshwater Habitat Assessment was as follows:

- Delineation of all watercourses (e.g. wetlands, rivers, streams, dams) likely to be measurably impacted / negatively affected by the proposed activities.
- Classification of all delineated watercourses according to the national wetland and aquatic ecosystem classification system (Ollis et al., 2013).
- Assessment of the Present Ecological State (PES) of the delineated watercourse units.
- Assessment of the Ecological Importance and Sensitivity (EIS) of the delineated watercourse units.
- Assessment of the supply, demand and importance of the direct and indirect ecosystem services provided by the delineated watercourse units.
- Identification and assessment of the significance of the likely negative impacts of the proposed activities on the onsite delineated and downstream watercourses.
- Provision of impact management and mitigation measures to avoid and/or reduce the potential impacts identified and assessed.
- Compilation of a freshwater habitat impact assessment report documenting the findings and recommendations of the assessment.

6.4.1 General Approach

The general approach to the freshwater ecosystem assessment was based on the proposed framework for wetland assessment proposed in the Water Research Commission’s (WRC) report titled: ‘*Development of a decision-support framework for wetland assessment in South Africa and a Decision-Support Protocol for the rapid assessment of wetland ecological condition*’ (Ollis et al., 2014).

Table 6 Proposed decision-support framework for wetland assessment in SA (after Ollis et al. 2014)

STEP 1: Contextualisation of assessment	- scale of assessment - type of assessment - level of assessment
STEP 2: Wetland ID, mapping and typing	- delineation and mapping classify wetland HGM types - natural vs artificial systems - regional grouping
STEP 3: Wetland assessment	- Perceived reference state - Determine PES - Assess functioning - Determine EIS - Risk assessment and anticipated trends (trajectory of change)
STEP 4: Setting of management objectives	- Set desired state (REC) - RQO's - Targets for ecosystem services/functions - Conservation targets
STEP 5: Formulation of wetland management measures	- ecosystem protection measures - rehabilitation measures - monitoring programme

The wetland/aquatic assessment report was developed in line with the National Environmental Management Act No. 107 of 1998 and the requirements of the Department of Water & Sanitation (DWS) for Water Use Licensing, as outlined in the 'Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals' contained in the Government Gazette No. 40713 of 24 March 2017.

6.4.2 Data sources consulted for the Desktop Assessment

The following data sources and GIS spatial information provided listed in Table 8 (below) were consulted to inform the specialist assessment. The data type, relevance to the project and source of the information has been provided.

Table 7 Data sources and GIS information consulted to inform the aquatic assessment

DATA/COVERAGE TYPE	RELEVANCE	SOURCE
Biophysical Context		
Colour aerial photography	Desktop mapping of drainage network, wetlands, etc.	NGI Online
Latest Google Earth ™ imagery	To supplement available aerial photography where needed	Google Earth™ On-line
DWA Eco-regions (GIS Coverage)	Classification of local Ecoregions	DWA (2005)
Geomorphological Provinces of South Africa	Understand regional geomorphology controlling the physical environment	Partridge *et al.* (2010)
South African Vegetation Map (GIS Coverage)	Classify vegetation types and determination of reference primary vegetation	Mucina & Rutherford (2006)
KwaZulu-Natal Vegetation Map (GIS Coverage)	Classify vegetation types and determination of reference primary vegetation	EKZNW (2011)
NFEPA: river and wetland inventories (GIS Coverage)	Highlight potential onsite and local rivers and wetlands	CSIR (2011)
KZN Rivers (GIS Coverage)	Highlight potential onsite and local rivers and wetlands and map local drainage network	SA Rivers Dataset
Conservation Context		
NFEPA: River, wetland and estuarine FEPAs (GIS Coverage	Shows location of national aquatic ecosystem conservation priorities	CSIR (2011)

KwaZulu-Natal Vegetation Map(GIS Coverage)	Determination of provincial threat status of local vegetation types	EKZNW (2011)
Freshwater Systematic Conservation Plan for KZN (GIS Coverage)	Location and extent of conservation planning units	EKZNW (2007)
Strategic Water Source Areas (GIS Coverage)	Location and extent of strategic water source areas	(Nel *et al.*, 2013)
Durban Metropolitan Open Space System (D'MOSS) (GIS Coverage)	Location and extent of open space systems and ecological corridors	EThekwini Municipality (2011)
Durban Systematic Conservation Plan (GIS Coverage)	Municipal conservation planning importance.	Maclean *et al.* (2015)

6.4.3 Desktop Mapping

The desktop delineation of all watercourses within 500m of the proposed development / activities was undertaken by analysing available 2m elevation contours and colour aerial photography supplemented by Google Earth^TM imagery where more up to date imagery was needed. Digitization and mapping was undertaken using QGIS 2.16.3 GIS software. All of the mapped watercourses were then broadly subdivided into distinct resource units (i.e. level 4 hydro-geomorphic types of Ollis et al., 2013. This was undertaken based on aerial photographic analysis and professional experience in working in the region. Please note that the desktop map was updated as part of the finalisation of the assessment to include the detailed delineation of the units occurring within the study area.

6.4.4 Impact Potential' Screening Assessment

Following the desktop identification and mapping exercise, watercourses were assigned preliminary 'likelihood of impact' ratings based on the likelihood that activities associated with the proposed development will result in measurable direct or indirect changes to the mapped watercourse units within 500m of the proposed development. The 'impact potential' ratings were refined following the completion of the field work. Each watercourse unit was ascribed a qualitative 'impact potential' rating according to the ratings and descriptions provided in Table 8 below:

Table 8 Qualitative ratings and descriptions

Likelihood of Impact Rating	Description of Rating Guidelines
High	These resources are likely to require impact assessment and a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons: • resources located **within the footprint** of the proposed development activity and will definitely be impacted by the project; and/or • resources located **within 15m upstream and/or upslope** of the proposed development activity and trigger requirements for Environmental Authorisation according to the NEMA: EIA regulations; and/or • resources located **within 15m or downslope** of the development and trigger requirements for Environmental Authorisation according to the NEMA: EIA regulations; and/or • resources located downstream within the following parameters: o **within 15m downstream** of a low risk development; o **within 50m downstream** of a moderate risk development; and/or o **within 100m downstream** of a high-risk development e.g. mining large industrial land uses.
Moderate	These resources may require impact assessment and a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons:

	• resources located **within 32m but greater than 15m upstream, upslope or downslope** of the proposed development; and/or • resources located within a range at which they are likely to incur indirect impacts associated with the development (such as water pollution, sedimentation and erosion) based on development land use intensity and development area. This is generally resources located downstream within the following parameters: o **within 32m downstream** of a low risk development; o **within 100m downstream** of a moderate risk development; and/or o **within 500m downstream** of a high risk development (note that the extent of the affected area downstream could be greater than 500m for high risk developments or developments that have extensive water quality and flow impacts e.g. dams / abstraction and treatment plants);
Low	These resources are unlikely to require impact assessment or Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons: • resources located a distance upstream, upslope or downslope (>32m) of the proposed development and which are unlikely to be impacted by the development project; and/or • resources located downstream but well beyond the range at which they are likely to incur impacts associated with the development (such as water pollution, sedimentation and erosion). This is generally resources located downstream within the following parameters: o **greater than 32m downstream** of a low risk development; o **greater than 100m downstream** of a moderate risk development; and/or o **greater than 500m downstream** of a high-risk development (note that the extent of the affected area downstream could be greater than 500m for high risk developments or developments that have extensive water quality and flow impacts e.g. dams / abstraction and treatment plants);
Very Low / None	These resources will not require impact assessment or a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons: • resources located within another adjacent sub-catchment and which will not be impacted by the development in any way, shape or form.

6.4.5 Baseline Assessment

6.4.5.1 Desktop Mapping & Screening Results

The watercourses mapped within 500m of the proposed emergency road is shown in Figure 8 below, with the majority of watercourses within this area being identified as wetlands. The impact potential screening assessment indicates that only one wetland stands to be measurably negatively impacted (possibly directly and indirectly) by the proposed development and was rated as having a high impact potential. This was due to its close proximity to the proposed activities (within 15m). This unit was thus taken forward for detailed infield assessment only.

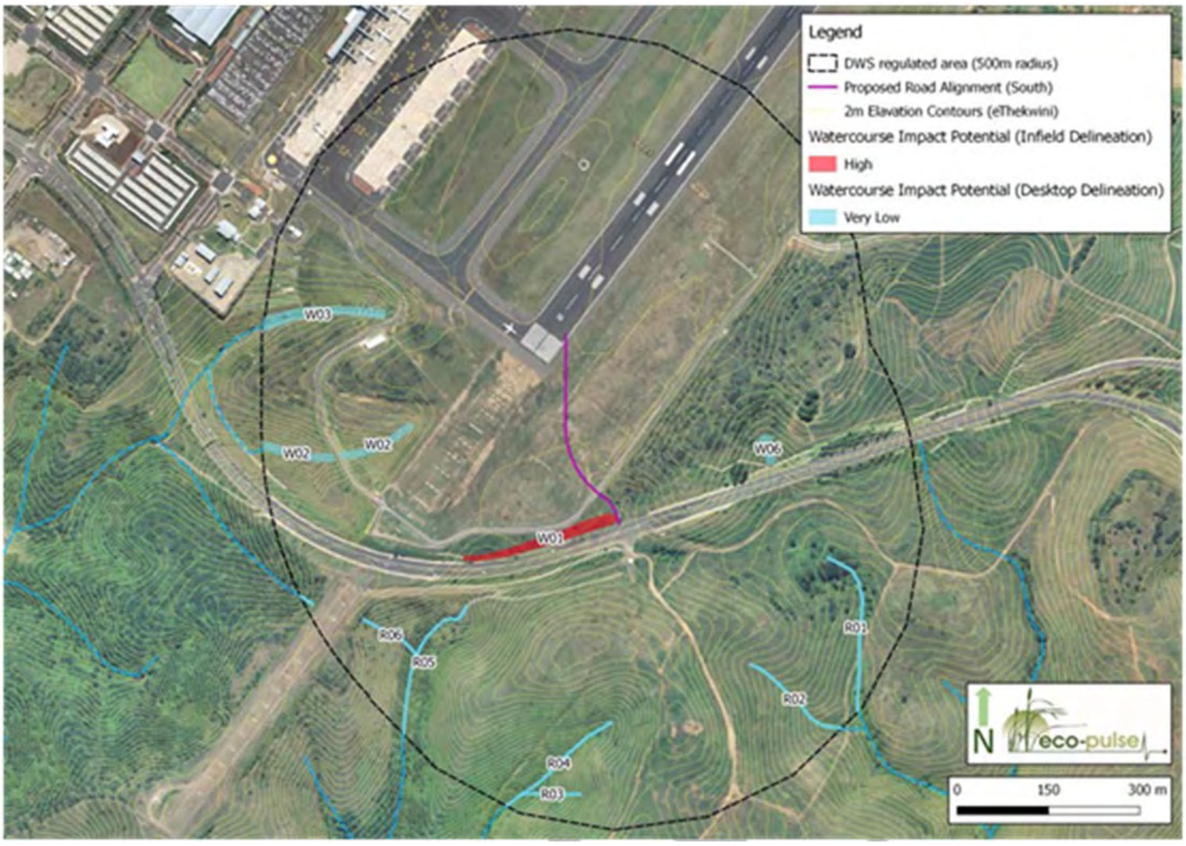

Figure 9 Map showing the desktop screening outputs for the proposed southern emergency access road

6.4.5.2 Delineation

Soil and vegetation sampling along the in close proximity to the proposed emergency road and servitude confirmed that no natural wetlands stand to be impacted by the proposed road. The wetland unit flagged as part of the desktop mapping and impact potential screening assessment was confirmed to be an artificial wetland formed within a stormwater drain, hereafter referred to as a ‘stormwater wetland’. The location and extent of the artificial wetland is shown in Figure 5 below. Flow within the drain is conveyed under the Mdloti Street / M65 via a culvert and discharged into the headwaters of a small stream via a large stormwater headwall within the KSIA conservation area. The headwall is located approximately 300m downstream of the study area. This stream was not assessed as it was assumed that it would not be measurably negatively affected by the proposed development. Furthermore, the stormwater wetland provides added protection and buffering top this stream.

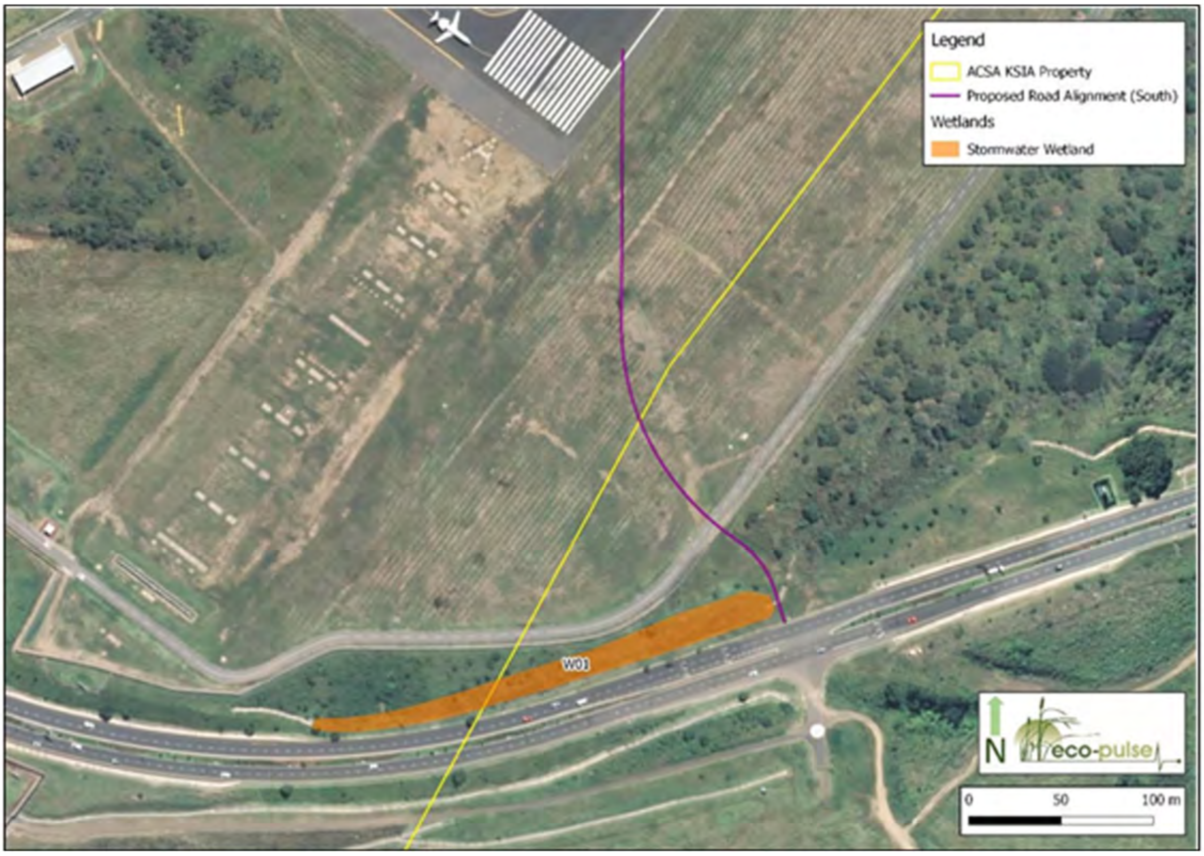

Figure 10 Map showing the location extent of delineated watercourses

6.4.5.3 Soils and Terrain

All soils sampled within the study area were dryland soils that showed no signs of wetness / hydric soil indicators. The soil texture[6] was found to range between moderately textured soils (sandy loam) and fine textured soils (clay loam) with a brown soil matrix[7] (hue[8] 10yr; chroma[9] 4/3; value[10] 2/3). No redoximorphic features like a gleyed matrix of the presence of mottles were found. Strategic sampling points were taken along the moderate to steep terrain. At a number of the sampling locations, signs of soil mixing and infilling from alterations to the landscape (construction of the King Shaka International Airport) made soil sampling and the interpretation of soil colour and morphology extremely difficult. The artificial stormwater wetland is characterised by seasonal to permanent saturated soils, however parts of the stormwater drain is lined with concrete.

6.4.5.4 Vegetation Characteristics

Due to the historic transformation of the study area, the vegetation communities encountered were all secondary and dominated by common weeds and opportunistic species with very low species diversity. Three broad but distinct vegetation communities were identified within and in close proximity to the study area, namely:

1. Dense *Typha capensis* (Bulrush) community within the stormwater drain, referred to as the

'stormwater wetland'. *T. capensis* is a robust emergent wetland plant that occurs in permanently saturated soils. This species often proliferates under disturbed wetland conditions and is an aggressive invader of disturbed wetlands. The presence of T*. capensis* indicates that there is likely flow impoundment within the stomrwater drain. Whether this is designed for or a consequence of blockage is not known. The banks of the drain have been planted with *Stenotaphrum secundatum* (Buffalo Grass), a locally occurring stoloniferous lawn grass.

2. Mowed *Cynodon dactylon* (Couch Grass) grassland occurring on levelled platform between the M65 and the KSIA boundary fence. *C. dactylon* is a creeping lawn grass that is used locally in revegetation applications. This species is also a weed of cultivation.
3. Mixed woody Panicum maximum grassland and shrubland within an undulating valley-head like landform.

6.4.5.5 Classification

The only watercourse identified within the study area was an artificial wetland located within a stormwater drain. Thus, this watercourse could not be formally classified, and was classified as an 'artificial wetland' for the purposes of this assessment.

6.4.5.6 Present Ecological State (PES)

As the wetland delineated is an artificial wetland that has formed in a man-made stormwater drain, PES could not be assessed. PES assessment is only applicable to natural features / ecosystems where deviation from a natural or reference state can be assessed.

6.4.5.7 Ecological, Functional & Socio-cultural Importance

Although the wetland is artificial, dense wetland vegetation is present, which could provide habitat for important flora and fauna as well as provide regulating ecosystem services like water quality enhancement. For this reason, the artificial wetland was formally assessed.

A summary of the importance scores and ratings for the artificial wetland is provided in Table 10 below.

The artificial wetland was assessed as being of moderate importance in terms of the provision of regulating services. This moderate importance score was driven by the score for erosion control services. Erosion control factors are important due to the high stormflows passing through the wetland and the stabilizing effect of the wetland vegetation. It is also important to mention that the wetland was also assessed as being of moderate importance in terms of the provision of water quality enhancement services, specifically toxicant removal services. The wetland is reasonably well situated to trap sediment contaminants due to factors such as the high surface roughness provided by wetland vegetation. Furthermore, stormwater runoff from the adjacent road and portion of the runway is likely to contain a level of toxicants, which wash into the wetland, increasing the demand of this service. The remaining regulating and supporting services were assessed as being of moderately-low importance. This is due to the low demand of these services.

In terms of biodiversity maintenance (ecological importance), the stormwater wetland was assessed as being of very-low importance due to the wetland being artificial with limited vegetation diversity and probably does not provide habitat for threated wetland flora and fauna.

The provisioning and cultural services provided by the wetland were assessed as being of very-low importance due to the wetland being located in a restricted area (no community access) and the limited occurrence of natural resources of direct and indirect use value for communities.

Table 9 Summary of the importance scores and ratings for Wetland Unit W1

Assessment Aspect / Component	**Unit W1**
Ecological Importance (Biodiversity Maintenance)	0,50
Ecological Sensitivity	0,00
EIS	**0,50**
EIS Rating	**Very Low**
Flow regime regulation	0,86
Water quality enhancement	1,79
Sediment trapping & erosion control	1,94
Carbon storage	1,44
Functional Importance	**1,94**
Functional Importance Rating	**Moderate**
Provisioning services	
Cultural services	0,44
Socio-cultural Importance	0,33
Socio-cultural Importance Rating	**0,44** **Very Low**

6.4.5.8 Risk and Impact Assessment Results

A summary of the potential risk and impacts ratings for the proposed development activities is provided in Table 11 below, the results of which are discussed as follows.

6.4.5.9 Preliminary Risk Assessment (DWS Risk Matrix)

It is our understanding that the purpose of the risk matrix tool developed by the DWS is to give a preliminary indication of the likely impact (consequence) of activities (water uses) to the resource quality of local and regional freshwater ecosystems.

Under a realistic good mitigation scenario, the risks were all assessed as being low. This is due largely to the severity of impacts to resource quality being predicted to be low, the small spatial scale of the impacts that are unlikely to extend beyond the stormwater wetland, the short duration of the construction impacts and the infrequent use of the road during operation (low stressor frequency). It’s also important to note that the stormwater wetland will likely buffer the downstream aquatic ecosystems from the stressors and impacts and reduce the probability of impacts.

6.4.5.10 Impact Significance

All of the potential impacts identified were assessed as being of low significance under the poor and good mitigation scenarios. This is because the change in the condition and level of ecosystem services provided by the local freshwater ecosystems will be negligible under a good mitigation scenario to small under a poor mitigation scenario. Nevertheless, it is important that all potential impacts are adequately mitigated to ensure duty of care.

Table 10 List of key impact-causing activities with associated risks, impacts and impact pathways

Risk / Impact Groups	**Risk / Significance Rating**	
	Poor Mitigation	**Good Mitigation**
Risks		
C1_R1: Physical disturbance	-	Low
C1_R2: Eroded sediment	-	Low
C1_R3: Erosive water	-	Low
C1_R4: Alien invasive plants	-	Low
C2_R1: Pollutants	-	Low
O1_R1: Physical disturbance	-	Low
O2_R1: Erosive water	-	Low
O3_R1: Pollutants	-	Low
Impacts		
C1_I1: Physical loss / modification of watercourse	Low	Low
C1_I2: Erosion and/or sedimentation of watercourses	Low	Low
C1_I3: Invasion of alien invasive plants	Low	Low
C2_I1: Water quality deterioration	Low	Low
O1_I1: Physical loss / modification of watercourse	Low	Low
O2_I1: Erosion and/or sedimentation of watercourses	Low	Low
O3_I1: Water quality deterioration	Low	Low

Please refer to Appendix D of this report for the full copy of the Freshwater Habitat Impact Assessment prepared by EcoPulse Environmental Consulting Services.

6. 5 TERRESTRIAL ENVIRONMENT

Eco-Pulse Environmental Consulting Services (Eco-Pulse) was appointed by Geomeasure Group to undertake a terrestrial vegetation assessment to inform all relevant environmental legislative applications. The scope of work undertaken as part of the Terrestrial Vegetation Assessment was as follows:

- Contextualization of the study area in terms of important biophysical characteristics and conservation planning using available spatial datasets and conservation plans.

- Undertake an infield vegetation survey to delineate and classify the distinct terrestrial vegetation communities occurring within a 15m radius of the proposed road centre line (referred to as the 'study area').
- Brief description of the delineated vegetation communities within the study area based on species composition and structural types in line with available provincial and national vegetation classifications, and the compilation of vegetation maps. A floral species list was prepared.
- Identification and recording of the location of all floral species of conservation concern and/or legally protected species encountered during field work using a hand-held GPS.
- Assessment of the condition of the vegetation communities based on key variables like species composition and the presence of ruderal1, pioneer2, weedy3 and invasive4 species.
- Assessment of the conservation / biodiversity importance of the delineated vegetation communities / habitats.
- Provision of best-practice planning and design recommendations for inclusion in layout and designs.
- The identification, prediction and description of the potential impacts on the delineated plant communities and local floral biodiversity.
- Provision of planning, construction phase and operational phase mitigation measures to avoid, minimise and remediate ecological impacts of the proposed activities.
- Discussion of any permit/licensing requirements that may be relevant to the proposed activities, where relevant.

6.5.1 DESKTOP ASSESSMENT

6.5.1.1 Contextual Review: Data Sources Consulted

The following data sources and GIS spatial information provided listed in Table 12 (below) was consulted to inform the specialist assessment. The data type, relevance to the project and source of the information has been provided.

Table 11 Data sources and GIS information consulted to inform the terrestrial assessment

DATA/COVERAGE TYPE	RELEVANCE	SOURCE
Latest Google Earth ™ imagery	To supplement available aerial photography in mapping vegetation communities	Google Earth ™ Online
eThekwini Geology (GIS Coverage)	Assessment of underlying geology controlling soil formation and consequently vegetation types	eThekwini Municipality
South African Vegetation Map (GIS Coverage)	Classification of vegetation types and determination of reference primary vegetation	Mucina & Rutherford (2006)
KwaZulu-Natal Vegetation Map (GIS Coverage)	Classification of vegetation types and determination of reference primary vegetation	Scott-Shaw & Escott (2011)

National Biodiversity Assessment – Threatened Ecosystems (GIS Coverage)	Identification of conservation important ecosystems	SANBI 2011
KZN Terrestrial Conservation Plan (GIS Coverage)	Identification of fauna, flora and ecosystems of conservation importance	EKZNW (2010)
KZN Systematic Conservation Assessments (SCAs) (GIS Coverage)	Identification of fauna, flora and ecosystems of conservation importance	EKZNW (2016)
SANBI On-line threatened species database	Assessment of threatened plant species potentially occurring on site	SANBI on-line database
SANBI's PRECIS (National Herbarium Pretoria Computerized Information System) (electronic database)	Determination of conservation important plant species	http://posa.sanbi.org
National Red List of South African Plants	Determination of treat status of plants of conservation concern	SANBI, 2009

6.5.2 BASELINE ASSESSMENT

6.5.2.1 Field Work

The field survey was undertaken on the 12th June 2018 (winter season). This entailed undertaking site walkovers within the study areas at key locations. The following data was collected in the field:

- **Broad vegetation and structural type** – The vegetation communities encountered were classified into broad vegetation structural types e.g. grassland, forest, bushland, scrubland etc. where applicable. Overall morphology and architecture of the plant community were also recorded where applicable.
- **Qualitative plant species composition** – Species composition refers to the relative proportions (%) of various plant species in relation to the total on a given area. The relative abundance of each species encountered was rated qualitatively on a 3-point scale of low, moderate and high based on visual observations.
- **Species of conservation concern*** – Species of conservation concern are species that have a high conservation importance in terms of preserving South Africa's biodiversity and include rare and threatened species. This category also includes those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient - Insufficient Information (DDD).
- **Observable onsite impacts** – Evidence of the physical disturbance to vegetation and soils and indirect impacts like erosion, sedimentation, contamination etc. were recorded.
- **Distinct vegetation boundaries** – Clear boundaries between distinct vegetation communities were recorded onsite. Between sampling points boundaries were extrapolated using the latest colour aerial photography for the area.

All sampling points were recorded using a handheld GPS device.

6.5.2.2 Vegetation Mapping and Classification

Distinct vegetation communities were broadly mapped based on observed changes in species composition that were recorded using a hand-geld GPS. These GPS waypoints were imported into GIS for mapping purposes.

6.5.2.3 Condition Assessment

Vegetation communities / habitat units defined for the study area were assessed qualitatively in terms of their ecological condition. Ecological condition is defined as a measure of modification relative to a reference state in terms of species structure and composition. For the purposes of this study, vegetation was assessed qualitatively based on qualitative species composition.

6.5.2.4 Results & Discussion- Vegetation Description and Classification

Within the area fenced around the runways, the vegetation comprises secondary grassland. Regular mowing (multiple times a year), has prevented accumulation of scrubby or woody species and has otherwise had an important impact on species composition. It contains only grasses that are tolerant of disturbance, or which originate from plantings. Although 10 indigenous herbs were recorded, with the exception of *Zornia capensis*, these are all species that are not typical of open, primary grassland, but are instead either ruderal or weedy species, or associated with coarse or disturbed grassland i.e. opportunistic or tolerant species.

Vegetation within the footprint of the access road can be separated into two broad communities based on differential management regimes, namely a *Chloris gayana* (Rhode’s Grass) secondary grassland on the runway platform and a *Cynodon dactylon* (Couch / Bermuda Grass) grassland community on a platform cut along the M65. The study area, which is more extensive than the road footprint, also includes a dense, moribund *Panicum maximum* grassland community on sloping land above / upslope of the platforms.

The *C. gayana* community assemblage also comprises moderate abundances of *Aristea ecklonii, Cyperus esculentus* (Yellow Nut-sedge), *Sporobolus africanus* (Rat’s Tail Dropseed) and *Melinis repens* (Red Top). All of these species are considered tolerant and opportunistic and typically increase in abidance with human disturbance and poor management practices.

Aristea ecklonii is the most abundant indigenous herb. The KwaZulu-Natal provincial conservation ordinance provides special protection not only to particular species, but whole genera and families. All members of the family Iridaceae are protected. However, this blanket protection means that both rare to very common members are specially protected. These specially protected species may not be damaged, destroyed or relocated without permit authorization from the provincial conservation authority, Ezemvelo KwaZulu-Natal Wildlife.

It is important to note that *Aristea ecklonii* is a common, widespread species which is not threatened. Moreover, it is a semi-ruderal, with a preference for disturbed or scrubby grassland, particularly where slightly damp. Within this polygon, it is possible that there are many hundreds of *Aristea ecklonii* plants. Given these numbers, and because it is a common species that is not threatened, and also abundant elsewhere within the airport precinct, it is not recommended that relocation occur. It will, however, be necessary to obtain a permit from EKZNW for disturbance or destruction of any plants.

Outside of the runway fence, the vegetation is different. Some on an informal road leading to an access gate appears even more frequently mown and contains less plant diversity (i.e. *C. dactylon* secondary grassland). This grassland appears to have largely been actively planted and resembles a garden lawn. Low to moderate abundances of *Paspalum urvillei* is present within this community. Away from the mown area grass is only seldom mown or burned and is tall and moribund, mainly comprised of *Panicum maximum* (i.e. *P. maximum* secondary grassland). While difficult to discern herbaceous diversity amongst the moribund grass, it is also well infiltrated by common or pioneer indigenous trees, most emergent or of smaller stature. The community is dense and is characterised by moderate to high abundances of *Commelina benghalensis* and *Stenotraphrumn secundatum* (Buffalo Grass) in places. Like the *C. gayana* grassland, the species recorded are all tolerant opportunistic species that are not representative of natural grassland species composition. No species occur that are noteworthy or threatened. There is a smaller presence of *Aristea ecklonii* than in the grassland fenced around the runway

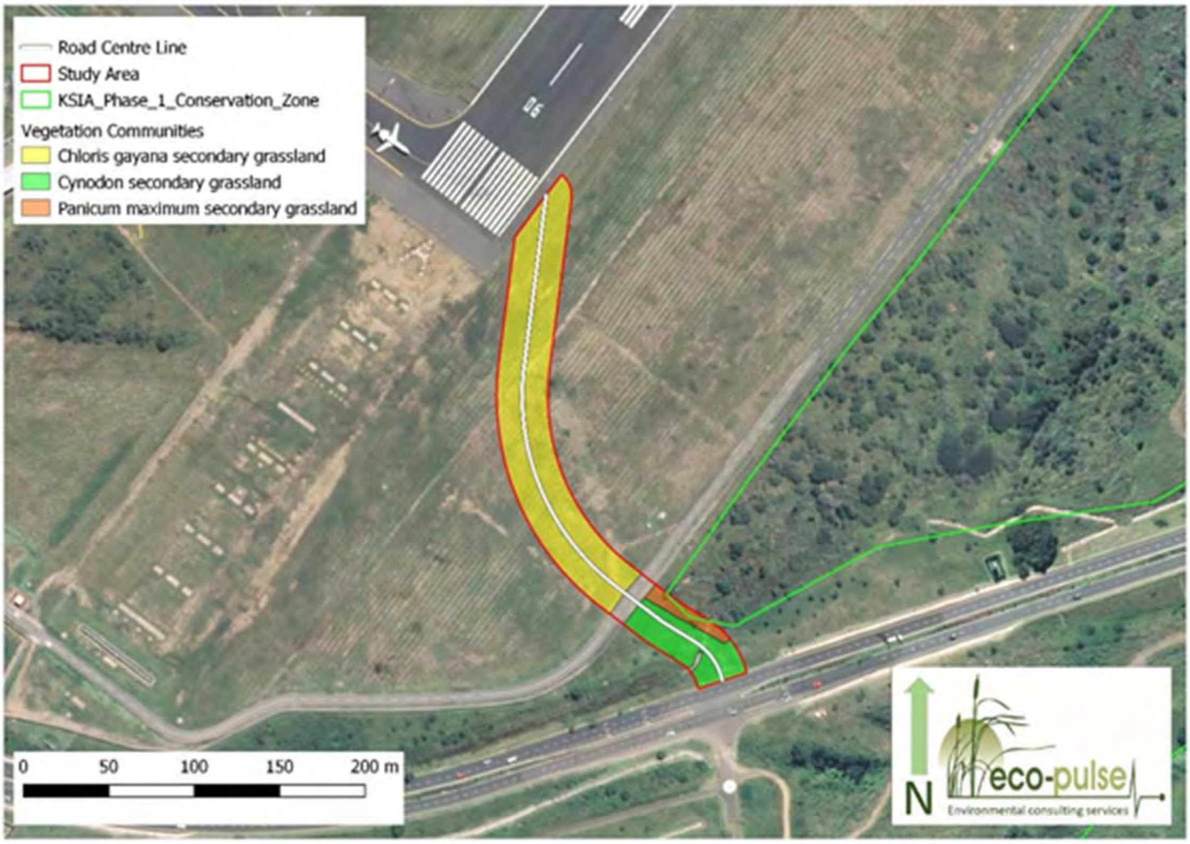

Figure 11 Broadly mapped secondary vegetation communities within the study area in relation to the KSIA conservation zone

Species List

Grasses and sedges	**Indigenous herbs**	**Alien species**
Chloris gayana	*Abrus precatorius*	*Bidens pilosa*
Cyperus sphaerospermus	*Aristea ecklonii*	*Commelina benghalensis*
Cyperus esculentus	*Centella asiatica*	*Leucaena leucocephala*
Cynodon dactylon	*Gomphocarpus physocarpus*	
Digitaria eriantha	*Helichcrysum cymosum*	
Imperata cylindrical	*Hewittea malabarica*	
Melenisrepens	*Ipomoea cairica*	
Paspalum urveillii	*Senecio deltoidea*	
Pycreus polystachyos	*Triumfetta pilosa*	
Sporobolus africanus	*Zornia capensis*	

6.5.2.5 Comment on Ecological Condition

The grassland communities assessed were all in poor condition relative to the reference grassland type for the region (i.e. KZN Coastal Belt Grassland / KZN Sandy Grassland / North Coast Grassland). This is due to fact that the natural grassland that once would have existed in the study area has long been destroyed by clearing, cane cultivation and more recently by earthworks to create the KSIA platform. As a result all of the grasslands assessed were secondary in nature, characterised by particularly low forb diversity, and dominated by common, opportunistic and tolerant semi-perennial and perennial plant species.

6.5.2.6 Comment on Biodiversity / Ecological Importance

Interior North Coast Grasslands are a Critically Endangered ecosystem. Moreover, KwaZulu-Natal Coastal Belt Grassland, which in fact comprises a mosaic of different vegetation, is an 'Endangered' vegetation type. As a result, natural vegetation in these areas should be considered valuable. However, the grassland areas encountered within the study area and surrounds is secondary, contains little plant diversity and no species that are rare or threatened. The moribund *P. maximum* grassland east of the KSIA fence also contains relatively more common or pioneer woody species than the rest of the area assessed. Considering that these secondary grasslands are not representative of local primary grasslands and do not contain rare or threatened species, the grassland areas within the road footprint to be lost are of low conservation / biodiversity importance. The single issue noted is the large number of *Aristea ecklonii*. A permit will need to be obtained for their disturbance, destruction or relocation. However, as it is abundant within the airport precinct, and this is a common species in KwaZulu-Natal, relocation is not recommended.

It is important to note however that a small portion of the study area associated with the *P. maximum* grassland community encroaches into the KSIA Conservation Zone (see Figure 11). As this is a formally protected area and considered a municipal Ecological Support

Area and a provincial Critical Biodiversity Area, any vegetation communities occurring within this conservation area should be considered important and should be excluded from any development activities.

6.5.2.7 Comment on the Significance of the Potential Impacts

Considering the small area of grassland to be directly and indirectly impacted, the low intensity of the indirect impacts considering the gentle gradient of the grassland and the intense management regimes, and the fact that the grasslands encountered were of low value in terms of the maintenance of biodiversity, there is high confidence that the proposed development activities will have limited impacts on local floral biodiversity and that all of the above-listed impacts will be of low significance under poor and good mitigation scenarios. There are thus no fatal flaws associated with the proposed development activities. Nevertheless, the applicant is still legally obliged to ensure that all indirect impacts (and direct impacts outside of the road footprint) to the vegetation communities assessed are minimised as far as practically possible as per the ‘duty of care’ principle.

Please refer to Appendix D of this report for the full copy of the Terrestrial Vegetation Assessment prepared by EcoPulse Environmental Consulting Services.

6. 6 SOCIO-ECONOMICS

6.6.1 Social Statistics

According to the 2017-2018 eThekwini Municipality’s IDP, in 2001 the population of eThekwini was 3.09 million and has grown at an average annual percentage of 1.13% per annum to reach 3.44 million in 2011 (Statistics South Africa 2011). In terms of population spread, the greatest population concentrations occur in the central and north planning regions. The Outer West Region which represents the largest extent of the Municipality (approximately 78 438ha) actually comprises of just 11% (approximately 338 000 people) of the total population of the Municipality. The northern region which represents approximately 26% of the total extent of the Municipality has approximately 1.15 million people which represent 33% of eThekwini’s total population. The majority of the population of approximately 1.18 million people (34% of the total population) is located in the Central region which is the second largest in extent in the municipality. The South makes up 23% (760 000 people) of the total Municipal population. The figures below depict the total population and race profile and the population breakdown per region in the Municipality.

Table 12 Total population within the eThekwini Municipality

TOTAL POPULATION = 3, 442 358		
Race	**Number**	**(%)**
Black	2, 540 443	74
Coloured	85 906	2
Indian	573 332	17
White	228 405	7
Other	14 273	0

Table 13 Demographic breakdown per region

Demographic breakdown per region	
Region	**(%)**
South	23
Central	34
Outer west	11
North	33

Table 14 Gender profile for the population

Gender Profile		
Sex	**Number**	**(%)**
Females	1, 759 956	51
Males	1, 682 408	49

6.6.2 Education

29% of the eThekwini Municipal population has some secondary education, 19% of the population has some primary education, 4% has no schooling and 4% is unspecified meaning they are functionally illiterate in that they either do not have school-based education or have not received sufficient school-based education to acquire marketable skills and engage in serious business ventures. 26% of the population has secondary education (grade 12/standard 10) while only 8% of the population have tertiary level education.

Table 15 Educational level statistics

HIGHEST EDUCATION	
No Schooling	720 792
Some Primary Education	2, 540 146
Primary Education Completed	471 590
Some Secondary Education	2,723 785
Grade 12 Complete	1 934 764
Higher Education	551 452
Education NA	1 308 153
Education Unspecified	16 29

6.6.3 Economic Statistics

An extremely high percentage of the population is not economically active. This also means high dependency ratios on household heads with low income levels. Despite the diversified nature of the local economy, unemployment in the municipal area is of concern as only 992560 of the total labour force are employed. The unemployment rate is currently estimated at 430319 of the population while 873583 of the total labour force are not economically active

Table 16 Employment profile statistics

Description	Number
Employed	992560
Unemployed	430319
Discouraged	114229
Not Active	873583
Employment NA	1031671

Table 17 Income categories for households

Income Category	Number of Households
0-2400	897
2400-6000	7 932
6000-12000	39 663
12000-18000	54 957
18000-30000	98 927
30000-42000	101 557
42000-54000	87 528
54000-72000	90 856
72000-96000	81 960
96000-132000	82 279
132000- 192000	90 882
192000-360000	124 462
360000- 600000	78 529
600000- 1200000	52 494
1200000- 2400000	16 694
2400000+	2 658

6.7 HERITAGE

A short Public Participation (PP) process and Heritage Impact Assessment (HIA) was undertaken to ascertain whether there are any features of heritage or cultural importance on site. This was to inform the Biodiversity Offset Management Plan and Conceptual Rehabilitation and Restoration Plan for the airport.

Findings indicated that there is one site of social significance which is a memorial site belonging to the de Ricquebourg family, situated on Portion 10. Relatives of the de Ricquebourg family came to South Africa in the 1800's and the grandfather farmed the area and owned a house on Portion 10 until the farm was expropriated in 1965. Although the family house was demolished, the memorial site exists at a tree that was once at the bottom of the garden. The grandfather's, fathers, uncles, and aunts ashes are kept there and the remaining family members visit the site on special occasions.

The road layout will not be impacting the memorial site, it is however vital that the relevant heritage bodies are contacted should heritage resources be encountered during the road construction activities. The provincial heritage resources authority (AMAFA) established in terms of South Africa's National Heritage Resources Act must be contacted.

7. ASSESSMENT OF IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

7.1 IMPACT ASSESSMENT METHODOLOGY

The following section comprises a summary table of the implications and mitigation of each environmental aspect. The methodology used to rate the environmental impacts was qualitative. Each category was divided into a number of different levels. These levels were then assigned various criteria. This is detailed Table 20 below.

Table 18 Impact Assessment Rating Methodology

Sensitivity of Aspect Magnitude or intensity of impact	Low Medium High	The aspect has very little value in terms of its ecological importance e.g. a highly disturbed area is rated as low. The aspect has certain qualities which make it ecologically valuable. The aspect is near pristine and has numerous qualities which make it extremely ecologically valuable.
Duration (time scale)	Short-term Medium-term Long-term Permanent	Impact restricted to construction (0-1 years). Impact will exist during construction & operation (1-10 years). Impacts will exist in the long term (>30 years). Impacts will have permanent potential.
Significance rating pre / post-mitigation (positive / negative)	Low Medium High	The impact will have a minimal effect on the environment. The impact will result in a measurable deterioration in the environment. The impact will cause a significant deterioration in the environment
Probability		Definite (>90%) Probable (>70%) Possible (40%) Unlikely (<40%)
Mitigation	Full Partial None	No mitigation necessary. Full mitigation/reversal of the impact is possible. Only partial mitigation/reversal of the impact is possible. No mitigation or reversal of the impact is possible.

Table 19 Environmental impact assessment table

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
PLANNING PHASE						
Onsite Documentation	Site	Short term	Definite	High (+)	N/A	The Project Applicant must ensure that a copy of the EMPr and the Environmental Authorisation (EA) are available on site at all times.
Authority Notification	Site	Short term	Definite	High (+)	N/A	2 weeks written notice must be given to DEA prior to the commencement of any construction activities.
Appointment of Environmental Control Officer (ECO)	Site	Short term	Definite	High (+)	N/A	An Environmental Control Officer (ECO) must be appointed 4 weeks prior to the commencement of the construction activities. The name and details of the ECO must be provided to DEA.
Notification to landowners/neighbours	Site	Short term	Definite	High (+)	N/A	The Project Applicant must send out correspondence to landowners/neighbours located adjacent to the site notifying them of the commencement of construction activities. Contact numbers should be also included in the correspondence should landowners wish to make complaints during the construction phase.
Sensitive area/ working area demarcations	Site	Short term	Definite	High (+)	N/A	The extent of the construction working area / servitude should be minimised as far as practically possible to ensure that the

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						amount of grassland impacted outside of the road footprint is minimised. Once the construction working area has been agreed to by the Environmental Control Officer (ECO), the working area should be clearly demarcated using highly visible material (e.g. danger tape / orange plastic bonnox) prior to construction commencing. This applies to site camps and storage / laydown areas as well. Access to and from the development area should be either via existing roads or within the construction servitude
Setting up and management of Construction camp	Site	Short term	Possible	Medium (-)	Low (-)	The site manager and the ECO must decide on the appropriate location of the construction camp/site office prior to moving on to the site. The site manager must ensure free drainage of run-off from the office/ construction camp to avoid standing water and erosion. The area with the construction camp must occupy a small area as possible.
Ablution facilities	Site	Short term	Definite	Medium (-)	Low (-)	Temporary chemical toilets must be provided at the construction site and must be made available to all staff.

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						A maintenance plan must be created for the servicing of the toilets. Staff must be instructed not to use any other areas within the site for ablutions. No ablution facilities may be placed close to a water resource.
Stormwater management	Site	Short term	Definite	Medium (-)	Low (-)	Wherever possible, stormwater conveyance outside of the road surface should be via open, grass-lined channels/swales and/or stone-filled infiltration ditches rather than underground piped systems or concrete V-drains. Where stormwater is planned to be discharged into the existing concrete channel above the artificial stormwater wetland, energy dissipation measures should be installed along this channel wherever possible. Wherever possible, many stormwater outlets should be favoured over few large. Ideally, the stormwater outlets should be established at regular intervals to reduce the volumes and velocities of flow at outlets. In this regard, discharge via mitre drains should be considered where suitable.
Solid waste management	Site	Short term	Definite	Medium (-)	Low (-)	Appropriate waste disposal receptacles

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						must be placed within the construction camps/site offices. All contractors must be made aware that they will be required to remove all their waste from site and dispose of legally and that the site manager or the ECO may request to view the safe disposal certificates.
Pollution management	Site	Short term	Possible	Medium (-)	Low (-)	Any sources or potential sources of pollution must be identified by the Project Manager and appropriate measures must be taken to prevent any pollution of the environment.
Fauna protection	Site	Short term	Possible	Medium (-)	Low (-)	Habitat degradation as well as habitat fragmentation must be minimized through the avoidance of areas not planned for the development.
Hazardous substances	Site	Short term	Definite	High (-)	Low (-)	Potentially hazardous materials must be identified before being brought to the site. Safety Data Sheets must be available on site for all hazardous substances. Hazardous substance storage and refueling areas must be bunded and lined (impermeable).

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						Emergency procedures for the handling of such substances during incidents must be available on site. Staff working with such substances must be trained and be competent to deal with emergency situations.
Worker conduct	Site	Short term	Definite	Medium (-)	Low (-)	The site manager and any contractors must understand the contents of this EMPr and be proved competent in implementing its requirements. Construction workers must be made aware of their specific responsibilities in terms of environmental impacts i.e. controlling noise levels, reducing dust. Construction workers must be made aware that no alcohol or drugs will be allowed on site and no workers under the influence will be permitted on site. Construction workers must be made aware that firearms or traditional weapons will not be allowed on site. Construction workers must be made aware that no fires will be permitted on site.

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
Heritage resources	Site	Short term	Unlikely	Low (-)	Low (-)	Road alignments, quarries and borrow pits impacting on known heritage sites must be avoided. In the event of a heritage object being unearthed, construction work that could impact on it should be stopped and the input of specialists in the field should be obtained. Heritage objects must not be moved or destroyed without the necessary permits from the South African Heritage Resources Agency (SAHRA). Compliance with the National Heritage Resources Act must be ensured at all times.
CONSTRUCTION PHASE						
Surface water contamination /Strormwater management						
Construction activities	Site	Short term	Definite	Medium (-)	Low (-)	Construction activities should preferably take place during the dry summer months to prevent soil erosion caused by heavy thunderstorms.

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
Asphalt, bitumen and paving	site	Short term	Definite	High (-)	Low (-)	Overspray of bitumen products outside of the road surface and onto roadside vegetation must be prevented. Stone chip/gravel excess must not be left on road/paved area verges. This must be swept / raked into piles and removed to an area approved by the site manager. Drums / tanks must be safely and securely stored in the construction camp. Water quality from runoff from newly / fresh bitumen surfaces must be monitored by the site manager and remedial actions taken where necessary.

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
Stormwater management	Site	Short term	Possible	Medium (-)	Low (-)	Ensure that excavated and stockpiled soil material is stored covered on the higher lying areas of the site and not in any storm water run-off channels or any other areas where it is likely to cause erosion or where water would naturally accumulate. Arrange secondary containment for the storage areas of removed contaminated paving bricks and soils to prevent further contamination.(i.e plastic lined temporary mini-bunds). The contractor must ensure that the storage and mixing of chemicals on site on site is undertaken on a lined / bunded area. Storm water management plans must be approved by the local authority prior to commencement of construction activities.
Soil protection						
Soil management	Site	Short term	Definite	Medium (-)	Low (-)	Ensure that excavated and stockpiled soil material is stored covered on the higher lying areas of the site and not in any storm water run-off channels or any other areas where it is likely to cause erosion or where water would naturally accumulate. Stockpiled soils are to be kept free of weeds and are not to be compacted. The

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions. All soil excavated during construction must, where practical, be separated into Topsoil and subsoil. Subsoil must be used for backfilling and topsoil for landscaping and rehabilitation of disturbed areas.
Mixing of chemicals/construction material	Site	Short term	Possible	Medium (-)	Low (-)	The contractor must ensure that the storage and mixing of chemicals on site on site is undertaken on a lined / bunded area.
Litter control	Site	Short term	Definite	Low (-)	Low (-)	Litter generated by the construction crew must be collected in rubbish bins with lids and regularly disposed of at registered sites.
Soil erosion management	Site	Short term	Possible	Low (-)	Low (-)	Soil erosion on Site must be prevented during all phases of the development. In instances where erosion becomes a negative impact during the construction phase, diversion berms and drains must be constructed to divert run-off away from exposed areas. Erosion control measures to be implemented in areas sensitive to erosion such as water supply points, edges of slopes etc.

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.
Groundwater management						
Infiltration of chemical contaminated water	Local	Short term	Unlikely	Low (-)	Low (-)	Every effort should be made to ensure that any chemicals or hazardous substances do not contaminate the soil or groundwater on site. In the event of a spill, proper measures to contain the spill must be applied immediately and if necessary, notification to the relevant Department must be undertaken. Ground water monitoring wells must be installed (down and up gradient of the site)i.e. 1 up gradient and two down gradient, and baseline results must be provided prior to handing over the site to operation. These results must be used as benchmark during operation of the site.
Visuals						
Soil stockpiling	Site	Short term	Definite	Medium (-)	Low (-)	Topsoil must be removed from all areas where physical disturbance will occur and

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						must be placed and protected from weed generation. Soil stockpiles must not exceed 2m and must be covered at all times to avoid erosion as dust generation. Ensure that no refuse or builders' rubble generated on the premises be placed, dumped or deposited on adjacent/surrounding properties including road verges, roads or public places and open spaces during or after the construction period of the new development**.**
Waste management						
Storage of waste	Site	Short term	Definite	Low (-)	Low (-)	All the waste generated during the construction of the site must be stored in area that is able to prevent further possible contamination of the surrounding environment. Separation of waste must be encouraged on site, i.e. glass, paper and plastic must be separated. Regular clearing/maintenance of bins is required.
Labelling of bins	Site	Short term	Definite	Low (-)	Low (-)	Supply sufficient clearly labelled garbage bins on site and empty them regularly.
Waste disposal	Site	Short term	Definite	Low (-)	Low (-)	All waste generated onsite must be

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						disposed of at a registered landfill Site. Waybills proving disposal at each waste load shall be kept in the Green file on Site.
Fauna and flora						
Removal of fauna	Site	Short term	Unlikely	Low (-)	Low (-)	Removal of any flora on site shall be restricted to area required to execute the works and no vegetation will be cleared outside the construction area.
Protection of sensitive areas	Site	Long term	Definite	High (+)	N/A	Areas that have been identified to be sensitive and that will not be disturbed by the proposed development must be fenced and signposted as such.
Areas of Conservation significance	Site	Long term	Definite	High (+)	N/A	Before machinery moves on to site, it must be confirmed that the supervising engineer understands the extreme sensitivity of specially protected areas of Conservation significance along the access road route.
Rehabilitation	Site	Long term	Definite	High (+)	N/A	Rehabilitation should commence as soon as each section of the road has been completed. If re-vegetation of exposed surfaces cannot be established immediately due to phasing issues, temporary erosion and sediment control measures must be maintained until such a time that re-vegetation can commence.

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
Artificial Wetland management						
Protection of the artificial wetland						The Construction Site Manager's Site supervisor must oversee that construction activities are being undertaken as per requirements of the environmental authorization, EMPr and all applicable ACSA Environmental requirements.
Control of runoff	Site	Short term	Definite	Medium (-)	Low (-)	No contaminated runoff must be allowed to reach any wetland system within and around the construction Site. No storage of construction materials or chemicals must be allowed within the proximity of any wetland.
Protection of wetland plants	Site	Long term	Definite	High (+)	N/A	It is recommended that species identified during the construction phase are removed immediately within the wetlands with the assistance of a qualified specialist.
Control of alien plants	Site	Long term	Possible	High (+)	N/A	Where any disturbance of the soil takes place, these areas should be stabilized and any alien plants that establish should be cleared and regular follow up should be undertaken.
Hazardous substances						
Safety data sheets	Site	Short term	Definite	High (+)	N/A	Hazardous substances or materials must be transported in sealed containers or bags The MSDS for any hazardous substance on

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						site must be available at the site office/ construction camp at all times.
Storage and training on use	Site	Short term	Definite	Medium (+)	N/A	Hazardous substance storage and refuelling areas must be bunded and lined (impermeable). Staff working with such substances must be trained and be competent to deal with emergency situations
Health & Safety						
Potential injuries during construction	Site	Short term	Unlikely	Low (-)	Low (-)	All staff should be provided with Personal Protective Equipment (PPE). Emergency contact numbers must be placed in allocation known to all staff so that it is easily accessed during an emergency.
Management of fires	Site	Short term	Unlikely	Low (-)	Low (-)	fire extinguishers must be provided and “No smoking” and “No naked flames” signs must be installed to comply with the Local Fire Department’s regulations. Install fire extinguishers in such a way that they are easily accessible in the event of fire
Emergency preparedness	Site	Short term	Definite	High (+)	N/A	Develop Emergency Response Plans for possible scenarios during construction. Spills must be cleared up immediately and contaminated soils must be taken to the nearest registered landfill site. Proof of safe disposal must be kept on file for record

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						purposes. A register of all incidents shall be kept on file in order to ensure that all incidents that take place on site are recorded and dealt with appropriately.
Traffic impacts						
Vehicle access	Local	Short term	Possible	Medium (-)	Low (-)	Person and vehicle access should be restricted during construction so as to control access to potential dangerous excavations and materials on site.
Signage and speed limit	Site	Short term	Definite	Low (-)	Low (-)	Adequate signage and warnings must be erected to control traffic at the construction area. Ensure that construction vehicles adhere to the speed limits on all public roads. All temporary or permanent traffic calming measures, if required, must be erected according to the appropriate municipal specifications governing road works
Air Quality						
Generation of dust	Local	Short	Possible	Medium (-)	Low (-)	Stockpiles must be managed appropriately to reduce dust generation. Dust suppression should be undertaken in instances where dust poses a threat to the workers onsite and neighbouring properties.

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
Soil quality						
Soil erosion	Site	Short	Possible	Medium (-)	Low (-)	Proper erosion control measures i.e. sediment basins, sand barrier bags etc. must be adopted where necessary. Adequate drainage, such as sub-soil drains and stormwater channels will need to be installed around the site to maintain a stable moisture regime below the surface beds. All erosion control works should be regularly inspected, especially after a rainfall event. It will be imperative that the design engineers take cognisance of the potential influx of stormwater onto the site. It is suggested that measures are taken to ensure the new structure and roads are constructed proud of the maximum potential flood level and that small berms/levees are strategically placed to keep storm water at bay.
Noise						
Construction activities	Local	Short term	Definite	Medium (-)	Low (-)	Noisy activities must be restricted to the times given in the Project Specification of General Conditions of Contract i.e. weekdays 7h00 to 16h30, Saturdays 7h00 to 15h00. No work on Sundays Workers must be instructed to keep

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						shouting, whistling, etc. to a minimum
Machinery and equipment	Site	Short term	Possible	Medium (-)	Low (-)	Machinery and equipment must be inspected on a daily basis to ensure that it is always in good working order.
Rehabilitation						
Clearing of the site	Site	Short term	Definite	High (+)	N/A	All structures comprising the construction camp/site offices on site must be removed. The area that previously housed the site offices/ construction camp must be checked for spills of substances such as oil etc. All surfaces of the construction footprint areas must be checked for waste products i.e. oil or fuel spills must be cleared from the Site and disposed of at a licensed Landfill. The Site Manager must notify the ECO once the site close-out has taken place in order for the ECO to conduct a site close-out inspection. The construction sites must be cleared of all litter. All left over building materials must be removed from the Site.
Revegetation	Site	Short term	Possible	High (+)	N/A	After the removal of infrastructure and associated foundations, the site must be ploughed to break up and aerate compacted soils and nutrients such as compost must

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						be added to the soil to encourage vegetation re-growth.
OPERATION PHASE						
Site Rehabilitation and re-vegetation						
Restoration of site areas	Site	Long term	Definite	High (+)	N/A	Topsoil excavated as part of site preparation must be replaced after construction activities for re-vegetation purposes. It must be ensured that no further harm occurs to the fauna and flora on site. Where suitable, previous fauna habitats must be restored on areas not disturbed by the development.
Alien vegetation management	Site	Long term	Definite	High (+)	N/A	All alien invasive vegetation that colonise the construction site must be removed, preferably by uprooting. The contactor should consult the ECO regarding the method of removal. All bare surfaces across the construction site must be checked for IAPs every two weeks and IAPs removed by hand pulling/uprooting and adequately disposed. Herbicides should be utilised where hand pulling/uprooting is not possible. The ECO must be consulted in this regard.

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
Roads and stormwater infrastructure maintenance						
Regular monitoring	Site	Long term	Definite	High (+)	N/A	Regular monitoring along the roads must be conducted during the roads operational phase to ensure that rehabilitation measures have been successful and to observe whether unstable cut and fill areas need to be stabilized, especially after heavy rainfall events. ACSA is responsible for the maintenance of stormwater control measures in order to ensure that no damming or ponding of water takes place after a rainfall event. Stormwater management structures must be maintained and cleaned to minimize erosion that could result in the siltation of wetland systems. This requires regular inspection of the stormwater drainage system to confirm its functionality and instituting maintenance as and when required to remove any blockages.
Visuals						
Visual impacts and access	Site	Long term	Definite	High (+)	N/A	The site must be kept in a neat and orderly manner at all times. The site must be appropriately fenced and access be controlled at all times. Access must be only allowed for the

Impact	Extent	Duration	Probability	Significance Without Mitigation	Significance With Mitigation	Mitigation Measures
						relevant emergency personnel and only during the required circumstances.
Signage						
Signage	Site	Long term	Definite	High (+)	N/A	Appropriate signage is required to be placed at the emergency access gate specifying that the roads are only for use during emergency situations.
Access control	Site	Long term	Possible	Low (-)	Low (-)	Access must be only allowed for the relevant emergency personnel and only during the required circumstances.

8. PROPOSED MONITORING DURING OPERATION

- Regular monitoring along the emergency access road must be conducted by ECO during the operational phase (preferably first six months) to ensure that rehabilitation measures have been successful and to observe whether unstable cut and fill areas need to be stabilised, especially after heavy rains.
- Evidence of pollution damage below all stormwater outlets should be monitored annually as part of the repair and maintenance of the road stormwater infrastructure.
- The applicant must ensure that the appropriate speed limit signage is placed at the access gates as well as along the route in order to ensure safety.
- Maintenance of stormwater control measures and erosion control structures is the responsibility of the applicant, checks especially after a rainfall event must be undertaken by the relevant person and proof of such checks is kept on file.
- Access to the emergency gate must be clear at all times, the airport personnel must inspect the road on a two weekly basis in order to clear any overgrown vegetation which may pose as threat when access is required using the road.
- The visual quality of the water exiting the M65 culvert must be inspected at least once per year at the end of the year (summer season). This should be undertaken by a freshwater ecologist or hydrologist. A baseline assessment of the visual quality of water at this point should be established prior to construction commencing. Such qualitative monitoring should also inform the need for formal water sampling and laboratory analysis if problems are identified.

9. SUMMARY OF SPECIALIST FINDINGS

9.1 GEOTECHNICAL INVESTIGATION

The Geotechnical Report compiled by Shriram Geotechnical Consulting sets out the results of the geotechnical investigation for the emergency access roads (north as well as south) proposed to be constructed at the King Shaka International Airport and provided guidelines pertaining to materials usage and subgrade treatment as discussed in Section 6.2.1 of this report.

The field work was carried out between 22 August and 11 September 2018 and comprised of In Situ CBR Dynamic Cone Penetrometer tests and test pits. The in situ materials indicated on the Geological Map of Durban and/or their weathered products were not encountered during the field investigation. Fill resembling soils belonging to the Berea Formation were however encountered in TP1. The site was generally found to be underlain by colluvium, or topsoil, and fill which was likely placed when shaping the site during the construction of the airport. The existing gravel road situated on the landside north of the airport was found to be underlain by apparently compacted soils.

Test pits TP1 and TP2 were excavated through the existing gravel road. A degraded gravel wearing course comprised of sandy fine to course gravel occurred in the upper 5cm of TP2. The gravel wearing course was underlain by brownish orange and brownish red silty sands and clayey sands which were apparently compacted in the upper 0.40 (TP1) to 0.60m (TP2). These materials occurred from surface level in TP1, where the gravel wearing course was

absent. Elsewhere on the site, a colluvial or topsoil layer generally comprised of brown and dark brown of silty and clayey variants of sand with gravelly clays occurring in TP6.
The colluvial/topsoil layer was underlain by fill. The fill encountered was highly variable comprised silty and clayey sands and gravels with clay rich layers occurring in areas. These fill layers cannot be described as well-defined soil units due to the inconsistent physical characteristics and soil compositions encountered as shown on the test pit profiles (Appendix C of the Geotechnical Report).

The ground conditions described geotechnical report refer specifically to those encountered in the test pits and In Situ CBR Dynamic Cone Penetrometer tests put down on site. It is mentioned that it is quite possible that conditions at variance with those discussed in the report can be encountered elsewhere. Shriram Geotechnical (Pty) Ltd therefore recommends the carrying out periodic inspections of the open excavations, particularly of the exposed foundation inverts, before any construction is carried out. Any change from the anticipated ground conditions could then be taken into account to avoid unnecessary expense and damage to the finished structure, therefore the construction phase of the project should be treated as an augmentation of the geotechnical investigation.

9.2 FRESHWATER HABITAT IMPACT ASSESSMENT

The assessment indicated that the closest watercourse to the proposed emergency road development is an artificial wetland located within a stormwater drain located approximately 5m from the proposed activities at the closest point. The closest natural watercourse is a steam located approximately 350m downstream of the proposed activities. Although the artificial wetland was assessed as having limited biodiversity benefits, it was found to have some value in terms of toxicant removal and erosion control and thus provides some regulating functions in the landscape that can reduce impacts to downstream aquatic ecosystems.

A number of key risks and impacts associated with the proposed development activities were identified and assessed. All of the risks and impacts were assessed as being low in significance.

9.3 TERRESTRIAL VEGETATION ASSESSMENT

The terrestrial report compiled by EcoPulse Environmental Consulting indicates that site observations and recordings during site walkovers of the study area confirmed that the vegetation of the study area comprises secondary grassland with low grass and forb species diversity. These grasslands assessed are not representative of the primary grassland types of the area and region. All of the species encountered are common species that are considered local ruderals, weeds and/or opportunistic species that often proliferate under disturbed conditions. No species of conservation concern were encountered. A large number of the protected forb, Aristea ecklonii, was encountered. However, due to the large number of A. ecklonii within and outside of the study area within the KSIA, and the low biodiversity value of the species (it is a common, widespread species which is not threatened), relocation is not recommended in this case. As this species is protected in terms of the KwaZulu-Natal Provincial Conservation Ordinance, a permit to destroy the plants within the study area will be required.

The proposed road development stands to have a number of potential direct and indirect impacts to the grasslands assessed. However, considering the small area of grassland to be directly and indirectly impacted, the low intensity of the indirect impacts considering the gentle gradient of the grassland and the intense management regimes, and the fact that the grasslands encountered were of low value in terms of the maintenance of biodiversity, there is high confidence that the proposed development activities will have limited impacts on local floral biodiversity and that all of the anticipated impacts will be of low significance under poor and good mitigation scenarios. There are thus no fatal flaws associated with the proposed development activities. Nevertheless, the applicant is still legally obliged to ensure that all indirect impacts (and direct impacts outside of the road footprint) to the vegetation communities assessed are minimised as far as practically possible as per the 'duty of care' principle.

Furthermore, due to the low biodiversity value of the grassland, and the majority of the forb species being pioneer and/or opportunistic in nature, widespread in distribution and not threatened, plant rescue and relocation is not recommended for conservation purposes. However, some plant rescue (i.e. sod translocation) may assist in reducing the costs of post-development grassland rehabilitation.

10. IMPACT MANAGEMENT MEASURES FROM SPECIALIST REPORTS

10.1 FRESHWATER HABITAT ASSESSMENT

10.1.1 Sensitive area / working area demarcations

- The edges of the construction servitude within the vicinity of the artificial watercourse must be clearly staked-out by a surveyor and demarcated using highly visible material (e.g. danger tape) prior to construction commencing.
- The demarcation work must be signed off by the Environmental Control Officer (ECO) before any work commences.
- Demarcations are to remain until construction and rehabilitation is complete.
- All areas outside of this demarcated working servitude must be considered no-go areas for the entire construction phase.
- No equipment laydown or storage areas must be located within delineated wetland areas.
- Access to and from the development area should be either via existing roads or within the construction servitude.
- Any contractors found working inside the 'No-Go' wetland/river areas (areas outside the construction/ working servitude) should be fined as per a fining schedule/system setup for the project.

10.1.2 Rehabilitation measures (if accidental disturbance)

If the artificial wetland is disturbed during the construction phase, such disturbance (infilling, excavation, compaction etc.) must be rehabilitated immediately. All foreign material must be removed and disposed, the natural ground level reinstated (reshaping) and the disturbed areas re-vegetated to the satisfaction of the ECO as per the watercourse rehabilitation and management plan. In this case, existing and intact vegetation (*Typha capensis*) within the wetland should be translocated to the disturbed area by a suitably experienced planting contractor. For the disturbed stormwater drain banks, sods or plugs of *Stenotaphrum secundatum* must be planted by a suitably experienced planting contractor.

10.1.3 Runoff, erosion and sediment control

- Wherever possible, existing vegetation cover on the development site should be maintained during the construction phase. The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes which will not be developed.
- Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.
- All bare slopes and surfaces to be exposed to the elements during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals (e.g. every 2m) to break the energy of surface flows.
- Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately. Revegetation using plugs and/or sods of *Cynodon dactylon* is recommended.
- If re-vegetation of exposed surfaces cannot be established immediately due to phasing issues, temporary erosion and sediment control measures must be maintained until such a time that re-vegetation can commence.
- All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when damaged. All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas.
- After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gulley for additional protection until vegetation has re-colonised the rehabilitated area.

10.1.4 Soil management

- Soil stockpiles must be established on flat ground at least 15m away from the artificial wetland.
- Erosion/sediment control measures such as silt fences, low soil berms or wooden shutter boards must be placed around the stockpiles to limit sediment runoff from stockpiles.

- Subsoil and topsoil is to be stockpiled separately. Stockpiled soil must be replaced in the reverse order as to which it was removed (subsoil first followed by topsoil).
- Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils.
- The stockpiles may only be placed within demarcated stockpile areas, which must fall within the demarcated construction area. The contractor shall, where possible, avoid stockpiling materials in vegetated areas that will not be cleared.
- Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions.
- If soil stockpiles are to be kept for more than 3 months they must be hydroseeded.
- The slope and height of stockpiles must be limited to 1.5m and are not be sloped more than 1:2 to avoid collapse.

10.1.5 Invasive Alien Plant Control

- All alien invasive vegetation that colonise the construction site must be removed, preferably by uprooting. The contactor should consult the ECO regarding the method of removal.
- All bare surfaces across the construction site must be checked for IAPs every two weeks and IAPs removed by hand pulling/uprooting and adequately disposed.
- Herbicides should be utilised where hand pulling/uprooting is not possible. ONLY herbicides which have been certified safe for use in wetlands by independent testing authority are to be used. The ECO must be consulted in this regard.

10.1.6 Hazardous substances / materials management

- The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, etc.) needs to be administered.
- Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater.
- Drip trays should be utilised at all dispensing areas.
- No refuelling, servicing or chemical storage should occur within 15m of the artificial wetland.
- No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site.
- Vehicle maintenance should not take place on site unless a specific bunded area is constructed for such a purpose.
- Hazardous storage and refuelling areas must be bunded prior to their use on site during the construction period following the appropriate SANS codes. The bund wall should be high enough to contain at least 110% of any stored volume. The surface of the bunded surface should be graded to the centre so that spillage may be collected and satisfactorily disposed of.
- All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.

- Sanitation - portable toilets (1 toilet per 10 users) to be provided where construction is occurring. Workers need to be encouraged to use these facilities and not the natural environment. Toilets must not be located within the 1:100yr flood line of a watercourse or within the buffer of any natural watercourses. Waste from chemical toilets must be disposed of regularly (at least once a week) and in a responsible manner by a registered waste contractor. Toilet facilities must be serviced weekly and in a responsible manner by a registered waste contractor to prevent pollution and improper hygiene conditions.
- Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site.
- An emergency spill response procedure must be formulated and staff are to be trained in spill response. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.
- 44-gallon drums must be kept on site to collect contaminated soil. These should be disposed of at a registered hazardous waste site.
- Provide adequate rubbish bins and waste disposal facilities on-site and educate/encourage workers not to litter or dispose of solid waste in the natural environment but to use available facilities for waste disposal.
- Clear and completely remove from site all general waste, constructional plant, equipment, surplus rock and other foreign materials once construction has been completed.
- Litter generated by the construction crew must be collected in rubbish bins and disposed of at registered landfill sites.
- Litter bins must be equipped with a closing mechanism to prevent their contents from blowing out or wild animals from accessing the contents.

10.1.7 Solid waste management

- Eating areas must not be located within 30m of the wetland/aquatic habitats.
- Waste bins must be provided at the eating areas.
- Bins and/or skips need to be supplied at convenient intervals on site for disposal of waste within the construction camp. The bins should have liner bags for easy control and safe disposal of waste.
- Bins should be provided to all areas that generate waste e.g. worker eating and resting areas and the camp site. General refuse and construction material refuse should not be mixed.
- Regular clearing/maintenance of bins is required.

10.1.8 Monitoring measures

The ECO should inspect the visual quality of the water exiting the M65 culvert at least once every week during the construction phase, particularly after rainfall events. A baseline assessment of the visual quality of water at this point should be established prior to construction commencing.

10.1.9 Incorporation of sensitive areas into maintenance and repair plans

The location and extent of the artificial wetland, as well as the relevant mitigation measures within Section 6 of the Freshwater Impact Assessment report, must be incorporated into all formal maintenance and repair plants for the emergency road.

10.1.10 Planning and design measures: Stormwater management

It is assumed that stormwater generated by the proposed road will be discharged into the existing concrete stormwater channel that drains into the stormwater wetland. As this infrastructure already exists and the road is relatively small, this plan is considered acceptable. Nevertheless, limited details on stormwater management have been provided to the authors and as such the following road stormwater design measures are recommended:

- **Stormwater conveyance:**
    - Wherever possible, stormwater conveyance outside of the road surface should be via open, grass-lined channels/swales and/or stone-filled infiltration ditches rather than underground piped systems or concrete V-drains.
    - Wherever possible, velocity / energy reduction measures should be established within the open conveyance systems to reduce the velocity at planned outlets.
- **Stormwater discharge / outlets:**
    - Wherever possible, many stormwater outlets should be favoured over few large. Ideally, the stormwater outlets should be established at regular intervals to reduce the volumes and velocities of flow at outlets. In this regard, discharge via mitre drains should be considered where suitable.
    - All outlets must be designed to dissipate the energy of outgoing flows to reduce point source scouring and erosion risks. In this regard, adequately sized concrete stilling basins/sumps must be installed at all outlets and flow from these stilling basins must fall onto suitably designed gabion reno-mattresses with wing walls. The reno-mattresses must extend an appropriate distance downslope to ensure that erosion risks are minimised.
    - The outlet reno-mattresses must be established to reflect the natural slope of the surface it is constructed on and are to be located at the natural ground-level.
    - The outlets and associated outlet protection structures should be aligned parallel to contours wherever possible to reduce the gradient of outflows and remain outside of wetlands and their buffer zones where possible.
    - Where stormwater is planned to be discharged into the existing concrete channel above the artificial stormwater wetland, energy dissipation measures should be installed along this channel wherever possible.

Rehabilitation measures (if significant erosion / sedimentation) - It is considered impractical to rehabilitate erosion damage within the artificial wetland habitat within the stormwater drain. However, it is beneficial that significant sediment deposits causing smothering or burial are removed as soon as possible after being detected.

Monitoring measures- The state of the wetland vegetation within the stormwater drain should be investigated annually for the first three years of operation. A baseline assessment of the visual quality of the vegetation should be established prior to construction commencing. If no problems are picked up, such monitoring could cease.

10.1.11 Planning and design measures: Storm water wetland

The artificial stormwater wetland itself is considered mitigation for potential water quality impacts considering that the unit was assessed as having moderately important toxicant removal services. No specific water filtration measures for incorporation into the stormwater management systems are recommended.

Monitoring measures- The visual quality of the water exiting the M65 culvert must be inspected at least once per year at the end of the year (summer season). This should be undertaken by a freshwater ecologist or hydrologist. A baseline assessment of the visual quality of water at this point should be established prior to construction commencing. Such qualitative monitoring should also inform the need for formal water sampling and laboratory analysis if problems are identified.

10.2 TERRESTRIAL VEGETATION ASSESSMENT

10.2.1 Sensitive area / working area demarcations

- The extent of the construction working area / servitude should be minimised as far as practically possible to ensure that the amount of grassland impacted outside of the road footprint is minimised.
- The western edge of the KSIA conservation zone must be clearly demarcated using shade cloth prior to construction commencing and considered a no-go area.
- Once the construction working area has been agreed to by the Environmental Control Officer (ECO), the working area should be clearly demarcated using highly visible material (e.g. danger tape / orange plastic bonnox) prior to construction commencing. This applies to site camps and storage / laydown areas as well.
- The demarcation work must be signed off by the Environmental Control Officer (ECO) before any work commences.
  Demarcations are to remain until construction and rehabilitation is complete.

The above statements assume that there will be no impact to the KSIA conservation zone.

10.2.2 Plant rescue and relocation

Due to the low biodiversity value of the grassland, and the majority of the forb species being pioneer and/or opportunistic in nature, widespread in distribution and not threatened, plant rescue and relocation is not recommended for conservation purposes. However, some plant rescue (i.e. sod translocation) may assist in reducing the costs of post-development grassland rehabilitation. This will need to be informed by the planting contractor to be appointed by the applicant.

10.2.3 Rehabilitation measures

- All grassland areas that are directly disturbed (infilling, excavation, compaction etc.) or indirectly impacted (erosion or sedimentation) during the construction phase must be rehabilitated. Rehabilitation should involve the following actions:
    - All foreign material must be removed and disposed. This includes removing eroded sediment.
    - The natural ground level must be reinstated (reshaping). This includes reshaping erosion rills and gullies.
    - All compacted areas must be ripped to depths ranging from 150 – 250mm depending on the intensity of compaction.
    - The disturbed areas must be re-vegetated to the satisfaction of the ECO as per the construction phase grassland rehabilitation plan – to be prepared as part of the construction phase Environmental Management Programme (EMPr). Hydroseeding of the disturbed areas using an indigenous grass mix comprising of locally sourced grass seeds should be acceptable. Where faster cover is required (i.e. for soil stabilisation purposes), re-vegetation should be undertaken using plugs or sods of locally sourced *Cynodon dactylon*.

10.2.4 Runoff, erosion and sediment control

- Wherever possible, existing vegetation cover on the development site should be maintained during the construction phase. The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes which will not be developed.
- Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.
    - All bare slopes and surfaces to be exposed to the elements during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals (e.g. every 2m) to break the energy of surface flows.
    - Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately as per the construction phase re-vegetation plan (see Section 5.1.3 above)
    - If re-vegetation of exposed surfaces cannot be established immediately due to phasing issues, temporary erosion and sediment control measures must be maintained until such a time that re-vegetation can commence.
    - All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when damaged. All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas.

- After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gulley for additional protection until vegetation has re-colonised the rehabilitated area.

10.2.5 Soil Management

- Soil stockpiles must be established on flat ground.
- Erosion/sediment control measures such as silt fences, low soil berms or wooden shutter boards must be placed around the stockpiles to limit sediment runoff from stockpiles.
- Subsoil and topsoil is to be stockpiled separately. Stockpiled soil must be replaced in the reverse order as to which it was removed (subsoil first followed by topsoil).
- Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils
- The stockpiles may only be placed within demarcated stockpile areas, which must fall within the demarcated construction area. The contractor shall, where possible, avoid stockpiling materials in vegetated areas that will not be cleared.
- Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions.
- If soil stockpiles are to be kept for more than 3 months they must be hydroseeded.
- The slope and height of stockpiles must be limited to 1.5m and are not be sloped more than 1:2 to avoid collapse.

10.2.6 Invasive Alien Plant Control

- All alien invasive vegetation that colonise the construction site must be removed, preferably by uprooting. The contactor should consult the ECO regarding the method of removal.
- All bare surfaces across the construction site must be checked for IAPs every two weeks and IAPs removed by hand pulling/uprooting and adequately disposed.
- Herbicides should be utilised where hand pulling/uprooting is not possible. The ECO must be consulted in this regard.

10.2.7 Hazardous substances / materials management

- The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, etc.) needs to be administered.
- Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater.
- Drip trays should be utilised at all dispensing areas.
- No refuelling, servicing or chemical storage should occur within 15m of the artificial wetland.

- No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site.
- Vehicle maintenance should not take place on site unless a specific bunded area is constructed for such a purpose.
- Hazardous storage and refuelling areas must be bunded prior to their use on site during the construction period following the appropriate SANS codes. The bund wall should be high enough to contain at least 110% of any stored volume. The surface of the bunded surface should be graded to the centre so that spillage may be collected and satisfactorily disposed of.
- All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.
- Sanitation - portable toilets (1 toilet per 10 users) to be provided where construction is occurring. Workers need to be encouraged to use these facilities and not the natural environment. Toilets must not be located within the 1:100yr flood line of a watercourse or within the buffer of any natural watercourses. Waste from chemical toilets must be disposed of regularly (at least once a week) and in a responsible manner by a registered waste contractor. Toilet facilities must be serviced weekly and in a responsible manner by a registered waste contractor to prevent pollution and improper hygiene conditions.
- Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site.
- An emergency spill response procedure must be formulated and staff is to be trained in spill response. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.
- 44-gallon drums must be kept on site to collect contaminated soil. These should be disposed of at a registered hazardous waste site.
- Provide adequate rubbish bins and waste disposal facilities on-site and educate/encourage workers not to litter or dispose of solid waste in the natural environment but to use available facilities for waste disposal.
- Clear and completely remove from site all general waste, constructional plant, equipment, surplus rock and other foreign materials once construction has been completed.
- Litter generated by the construction crew must be collected in rubbish bins and disposed of at registered landfill sites.
- Litter bins must be equipped with a closing mechanism to prevent their contents from blowing out or wild animals from accessing the contents.

10.2.8 Solid waste management

- Eating areas must be clearly demarcated.
- Waste bins must be provided at the eating areas.
- Bins and/or skips need to be supplied at convenient intervals on site for disposal of waste within the construction camp. The bins should have liner bags for easy control and safe disposal of waste.

- Bins should be provided to all areas that generate waste e.g. worker eating and resting areas and the camp site. General refuse and construction material refuse should not be mixed.
- Regular clearing/maintenance of bins is required.

10.2.9 Planning and design measures: Storm water Management

It is assumed that stormwater generated by the proposed road will be discharged into the existing concrete stormwater channel that drains into the stormwater wetland. As this infrastructure already exists and the road is relatively small, this plan is considered acceptable. Nevertheless, limited details on stormwater management have been provided and as such the following road stormwater design measures are recommended:

- **Stormwater conveyance:**

o Wherever possible, stormwater conveyance outside of the road surface should be via open, grass-lined channels/swales and/or stone-filled infiltration ditches rather than underground piped systems or concrete V-drains.

o Wherever possible, velocity / energy reduction measures should be established within the open conveyance systems to reduce the velocity at planned outlets.

- **Stormwater discharge / outlets:**

o Wherever possible, many stormwater outlets should be favoured over few large. Ideally, the stormwater outlets should be established at regular intervals to reduce the volumes and velocities of flow at outlets. In this regard, discharge via mitre drains should be considered where suitable.

o All outlets must be designed to dissipate the energy of outgoing flows to reduce point source scouring and erosion risks. In this regard, adequately sized concrete stilling basins/sumps must be installed at all outlets and flow from these stilling basins must fall onto suitably designed gabion reno-mattresses with wing walls. The reno-mattresses must extend an appropriate distance downslope to ensure that erosion risks are minimised.

o The outlet reno-mattresses must be established to reflect the natural slope of the surface it is constructed on and are to be located at the natural ground-level.

o The outlets and associated outlet protection structures should be aligned parallel to contours wherever possible to reduce the gradient of outflows and remain outside of wetlands and their buffer zones where possible.

o Where stormwater is planned to be discharged into the existing concrete channel above the artificial stormwater wetland, energy dissipation measures should be installed along this channel wherever possible.

Plant Rescue and Relocation- All of the plant species encountered onsite within areas sampled were pioneer, ruderal or weedy / opportunistic (tolerant) species of low conservation value. A large number of *A. ecklonii* were encountered within the *C. gayana* grassland within the study area. This species is protected in terms of the KwaZulu-Natal

Provincial Conservation Ordinance. However, due to the very large numbers of *Aristea ecklonii* within and outside of the study area within the KSIA, and the low biodiversity value of the species (it is a common, widespread species which is not threatened), relocation is not recommended in this case.

11. ENVIRONMENTAL IMPACT STATEMENT

The Basic Assessment (BA) process for the proposed emergency access roads at the King Shaka International Airport (KSIA) has been undertaken in accordance with the 2014 Environmental Impact Assessment Regulations (amended) published in Government Notices R. 982 of 02 December 2014 read with Section 44, of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

This Basic Assessment Report provides an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed emergency access road. The findings conclude that the construction and operation of the proposed development is likely to have both negative and positive impacts with the negative impacts having greatest potential during the construction phase of the development. These potential negative impacts may be significantly reduced if the mitigation measures proposed are followed accordingly.

The emergency access road is required as part of the airport operations, the good state of the road directly means reduced reaction times for emergency personnel during emergencies at the airport. In addition, the access road is required in terms of the regulatory requirements as it is non-compliant for an airport not to have emergency access.

The findings of the specialist studies undertaken in support of the proposed development indicate that the site is suitable for the development and findings are summarised as follows:

Geotechnical Investigation- The materials underlying the gravel wearing course, and those present from ground level where the gravel wearing course has been completely eroded away, appears to have been compacted in order to serve as a base layer. These materials generally comprise silty clayey sands but behaved as clays when inspected on site. They generally classify in the range of G8 to G10 in terms of TRH 14 and are of excellent to good subgrade material.

All other areas investigated were found to be underlain by fill of varying composition (silty and clayey sands and gravels with clay rich layers occurring in areas). These soils vary from G7 to less than G10 quality and are not suitable for use in structural pavement layers but may be used as subgrade materials (in certain areas).

Freshwater Impact Assessment- The closest watercourse to the proposed emergency road development is an artificial wetland located within a stormwater drain located approximately 5m from the proposed activities at the closest point. The closest natural watercourse is a steam located approximately 350m downstream of the proposed activities. Although the artificial wetland was assessed as having limited biodiversity benefits, it was found to have some value in terms of toxicant removal and erosion control and thus provides some regulating functions in the landscape that can reduce impacts to downstream aquatic ecosystems.

A number of key risks and impacts associated with the proposed development activities were identified and assessed. All of the risks and impacts were assessed as being low in significance. This was due to the predicted change in downstream watercourse resource quality being low, as well as the probability of resource quality impacts. This was driven largely by the distance between the proposed activities and the closest natural watercourses, and the fact that the artificial stormwater wetland would act the reduce most of the potential impacts and risks to downstream aquatic ecosystems.

Terrestrial Vegetation Assessment- The proposed road development stands to have a number of potential direct and indirect impacts to the grasslands assessed. However, considering the small area of grassland to be directly and indirectly impacted, the low intensity of the indirect impacts considering the gentle gradient of the grassland and the intense management regimes, and the fact that the grasslands encountered were of low value in terms of the maintenance of biodiversity, there is high confidence that the proposed development activities will have limited impacts on local floral biodiversity and that all of the anticipated impacts will be of low significance under poor and good mitigation scenarios. There are thus no fatal flaws associated with the proposed development activities.

Furthermore, due to the low biodiversity value of the grassland, and the majority of the forb species being pioneer and/or opportunistic in nature, widespread in distribution and not threatened, plant rescue and relocation is not recommended for conservation purposes. However, some plant rescue (i.e. sod translocation) may assist in reducing the costs of post-development grassland rehabilitation.

12. REASONED OPINION ON WHETHER THE PROPOSED DEVELOPMENT SHOULD/SHOULD NOT BE AUTHORISED

The proposed development has undergone the Environmental Impact Assessment Process as per legislative requirements for the proposed construction of the emergency access road which will increase the airport's footprint. Through the process, relevant specialists were appointed in order to assess the proposed development and potential impacts that may occur as a result of its construction and operation. From the findings of the specialist investigations, the proposed development site is suitable for the proposed activity.

In addition, the assessment has identified the potential positive and negative impacts associated with the construction and operation phases of the development, thus giving rise to the compilation of the EMPr which offers specific management and mitigation measures required to minimise the identified negative impacts. As long as the measures specified in the EMPr are followed accordingly, the activity will not result in significant environmental impacts and compliance with the relevant legislation will be achieved.

From the socio-economic perspective, the development will result in temporary employment opportunities which are greatly needed due to the high levels of unemployment in the country. The presence of the emergency road will ensure that reaction time to any accidents that take place at the airport are attended to in a short period of time. This will ensure that the significance of impacts is reduced dramatically.

13. AN UNDERTAKING UNDER OATH BY THE EAP

The EAP confirms the following under oath:

- That the information provided is correct at the time of the finalisation of this report;
- That the comments received from the registered interested and affected parties has been incorporated in the report;

- That the specialist recommendations have been included in this report and that mitigation measures provided have been added onto the EMPr.

14. CONCLUSION AND RECOMMENDATIONS BY THE EAP

It is concluded at this stage of the assessment that the proposed development will result in positive social and economic impacts and thus the following is recommended:

- The proposed activity must be undertaken within the time period specified in the environmental authorisation;
- Limit the working hours during the construction phase between at least 07:00 and 18:00 during weekdays. No construction work should occur during weekends or public holidays;
- Activities taking place on site must comply with the requirements of the EMPr as well as ACSA's safety, health and environment policy;
- Works on site must be undertaken by the appointed service providers;
- The construction of the roads must be in line with the relevant construction regulations;
- An Environmental Control Officer must be appointed for the duration of the construction phase of the activity in order to check compliance with the requirements of relevant legislation and the authorisation;
- In the event of an emergency, the requirements specified in the ACSA's Emergency Plan must be followed;
- Workers on site must be made aware of the EMPr requirements and always wear their full personal protective equipment;
- Spill containment kits must always be available on site to deal with accidental spills, the safety officer must ensure that kits has all the required materials;

Prepared by:

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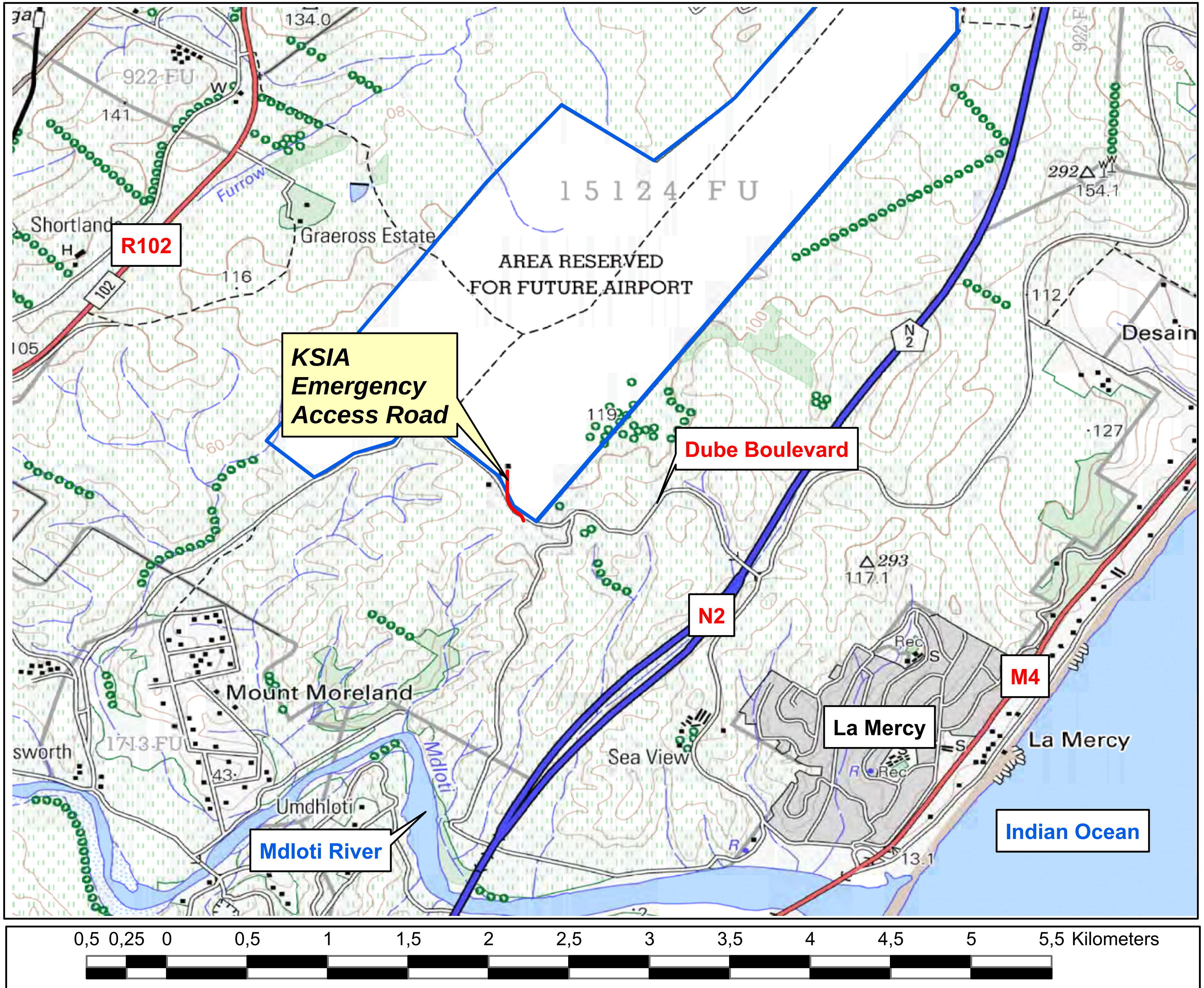
APPENDIX A

LOCALITY MAP



1 : 50 000 Digital Coverage from Chief Director: Surveys and Mapping

Legend:

▭ Approximate KSIA Boundary

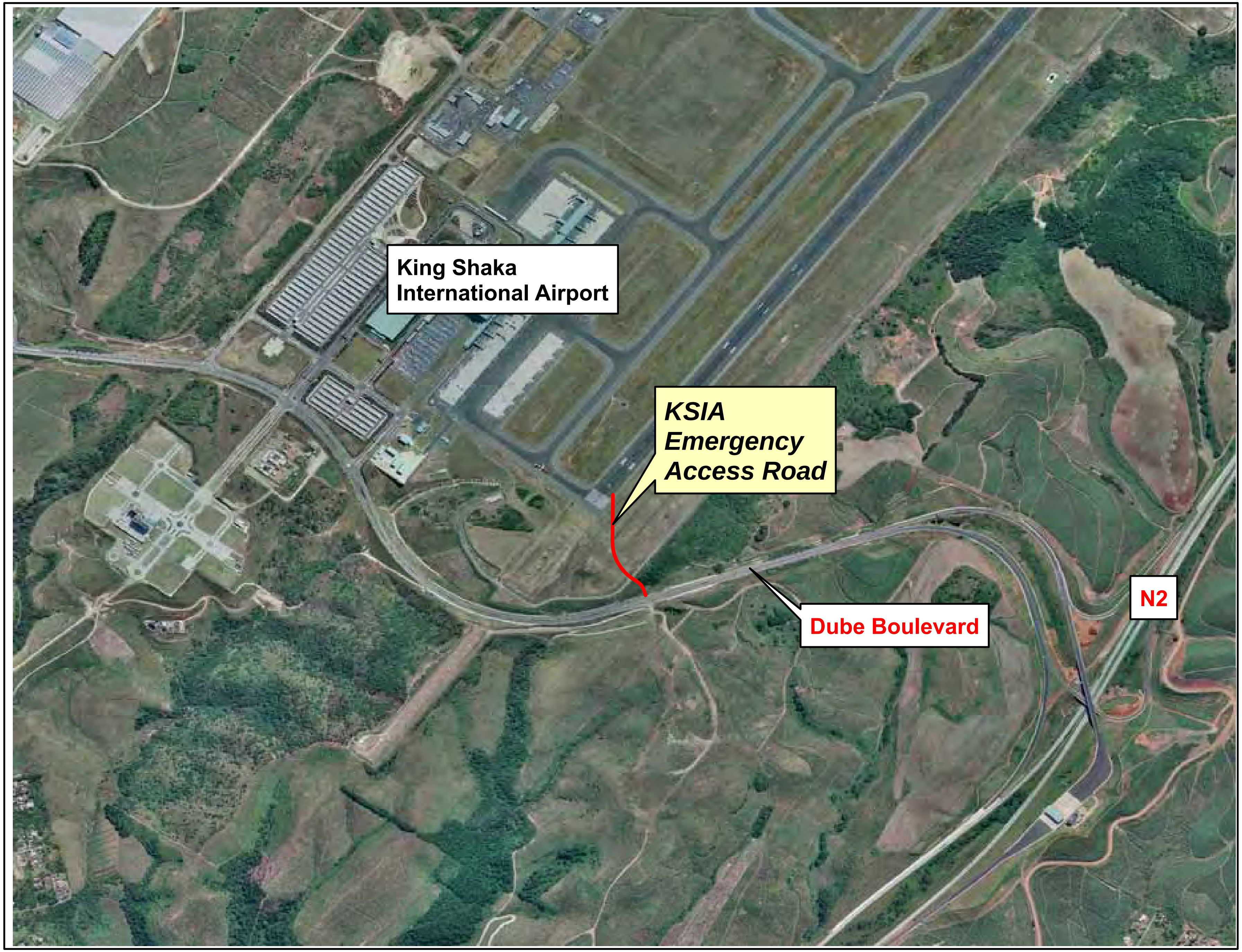
(KSIA Emergency Access Road

GEOMEASURE GROUP

KSIA
EMERGENCY
ACCESS ROAD

LOCALITY
PLAN

DWG NO. 2017/162
Appendix: A



Digital Coverage from eThekwini Metro

Legend:

KSIA Emergency Access Road

GEOMEASURE GROUP

KSIA EMERGENCY ACCESS ROAD

SITE PLAN

DWG NO. 2017/162
Appendix: B

APPENDIX B

DESIGN REPORT

AIRPORTS COMPANY SOUTH AFRICA

KING SHAKA INTERNATIONAL AIRPORT

CONTRACT NO: DIA23/2017

CONSTRUCTION OF EMERGENCY ACCESS ROADS AT KING SHAKA INTERNATIONAL AIRPORT – FAST TRACK PHASE

DESIGN REPORT

REVISION E (FINAL) – 7 NOVEMBER 2018

PREPARED FOR:
AIRPORTS COMPANY SOUTH AFRICA SOC LIMITED
KING SHAKA INTERNATIONAL AIRPORT

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AIRPORTS COMPANY SOUTH AFRICA
KING SHAKA INTERNATIONAL AIRPORT

CONTRACT NO: DIA23/2017
CONSTRUCTION OF EMERGENCY ACCESS ROADS AT KING SHAKA INTERNATIONAL AIRPORT – FAST TRACK PHASE

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Abbreviations used

AASHTO	American Association of State Highway and Transportation Officials
ACSA	Airports Company South Africa
APR	Airport Perimeter Road
BOQ	Bill of Quantities
CH	Chainage (Distance along the road)
DCP	Dutch Cone Penetrometer
DEA	Department of Environmental Affairs
EIA	Environmental Impact Assessments
FGL	Finished Ground Level
GMG	Geomeasure Group (Environmental Sub-consultant)
iX	iX engineers (Pty) Ltd
KSIA	King Shaka International Airport
LHS	Left Hand Side
MOD	Maximum Optimum Density
MOU	Memorandum of Understanding
NGL	Natural ground level
RESA	Runway End Safety Area
RHS	Right Hand Side
SANRAL	South African National Roads Agency Limited
THD	Tongaat Hulett Developments

AIRPORTS COMPANY SOUTH AFRICA
KING SHAKA INTERNATIONAL AIRPORT

CONTRACT NO: DIA23/2017
CONSTRUCTION OF EMERGENCY ACCESS ROADS AT KING SHAKA INTERNATIONAL AIRPORT – FAST TRACK PHASE

1. INTRODUCTION

1.1 Terms of Reference

The Airports Company South Africa (ACSA) required the construction of emergency vehicle access roads at King Shaka International Airport (KSIA) to link the ends of the runway to the local municipal roads to the north and south of the airport property.

In October 2017, iX engineers (Pty) Ltd (IX) were appointed to investigate and design the roads according to ACSA requirements. The environmental studies / approvals and land ownership agreements also formed part of this appointment.

1.2 Scope of The Report

During the process of negotiating with adjacent landowners, it became clear that the full extent of the requirements of the project could not be met in the short term. The project was divided into 2 portions, namely, portions of the roads that could be constructed now and portions that would need further negotiations regarding rights of way or transfer of land ownership. This was done to allow ACSA / KSIA to meet the majority of their obligations in terms of the civil aviation safety requirements.

This report covers the civil engineering design for the portion of the works to be constructed now, which we have termed Fast Track Phase.

1.3 Scope of The Design

The extent of the Fast Track Phase works is:

Southern Road

- Surfaced road from the southern end of Runway 06, crossing over the existing airport perimeter road, passing through existing Emergency Gate 3 and terminating at the existing Dube Boulevard.
- Associated stormwater drainage, signage and re-vegetation of disturbed areas

The southern road does not require any further negotiations and the design outlined in this report would be the final design for this portion of the project.

Northern Road

- Surfaced road from northern end of Runway 24, passing through a new gate on the restricted area fence, crossing over the existing airport perimeter road, passing through existing Emergency Gate 1 and terminating about 200m north of the fence line.
- Reconstruction of the gravel road from end of the asphalt surfaced section linking to existing gravel road on the north eastern edge of the airport property.
- Associated stormwater drainage, signage and re-vegetation of disturbed areas.

The northern road will, when constructed as described above, constitute a partial completion of ACSA's obligations for the overall project, and the gravel surfaced section is to be considered a temporary or interim solution. To contain costs and minimise abortive works, the asphalt surfacing will terminate at the point beyond which the future alignment of the permanent route is undecided. This section will be completed once the land ownership and Right of Ways to the north are negotiated and agreed.

1.4 Locality Sketch

The locality sketch below indicates the position of the two roads forming part of this project

2. ADDITIONAL STUDIES

2.1 Topographical Survey

A topographical survey was conducted by TWM Surveys (Pty) Ltd during March and April 2018. The survey forms the background to all the layout drawings.

2.2 Geotechnical Investigation

Shriram Geotechnical Consulting (Pty) Ltd was been commissioned to conduct the geotechnical investigation. The field work and the laboratory testing have been completed. The results are summarised in this report and the full Geotechnical report is Appended in Appendix A. .

2.3 Environmental Investigation

Geomeasure Group (Pty) Ltd (GMG) are subcontracted to IX to conduct the necessary environmental investigations. Their brief includes assistance in obtaining the necessary environmental approvals. This is currently ongoing.

2.4 Land Ownership

Geomeasure Group (Pty) Ltd are subcontracted to IX to assist with determining ownership of the affected properties and the process of obtaining the necessary permissions and rights-of-way for the roads. This is currently on-going.

3. DESIGN CRITERIA AND STANDARDS

3.1 Design Criteria

The following criteria were used in the design process.

Roads	
Required surfaced width	6 m
Design speed	80 km/h
Design Vehicle	
Heaviest design vehicle	52 t (Panther 8x8)
Minimum vehicle turn radius	20 m
Stormwater	
Storm return period	100 years
Storm intensity	250 mm/hour
Storm duration	15 min

Additional requirements:

- Alignments should avoid the RESA as far as possible
- Road surface levels should closely follow the graded strip ground level.

The following 2 vehicles in use at the airport were considered the most onerous in terms of weight and manoeuvrability:

- Rosenbauer Panther 8x8
- Forward Command Post SU

3.2 Design Standards and Guides

The following design standards and guides were used or are applicable here:

- COLTO Standard Specifications for Road and Bridge Works for State Road Authorities (1998)
- Technical Recommendations for Highways
  - TRH4: Structural Design of Urban And Rural Roads (1996)
- Urban Transport Guidelines
  - UTG5 Geometric Design of Urban Collector Roads (1988)
  - UTG10 Guidelines for the Geometric Design of Commercial and Industrial Local Streets (1990)
- SANRAL Drainage Manual 5th Edition (2006)
- SA Road Traffic Signs Manual 3RD Edition (2012)
- ICAO Annexure 14 Aerodromes Vol 1 Aerodrome Design and Operations 5th Edition (2009)
- Kwa-Zulu Natal Department of Transport Standard Details

4. ROAD DESIGN

4.1 Design Criteria

Table 1: Road Design Criteria

Criteria		Value	Exceptions
Design Speed		80km/h	Approaches to gates and intersections with other roads
Road Category		B	
Road widths		6m (2 x 3m lanes)	
Longitudinal grade	Minimum	0.5%	Where road follows airfield graded strip
	Maximum	6%	Northern Road at tie in to existing road
Length of vertical curve	Minimum	20m	At intersections and stop / yield conditions
Cross fall	Nominal	2.0%	Where road follows airfield graded strip
Horizontal radius	Minimum	280m	Topographical constraints, intersections and stop / yield conditions

The following descriptions of the design alignments should be read in conjunction with the relevant layout drawings listed later in this report.

4.2 Southern Road

The southern road departs from Runway 06 just to the north of the threshold markings at an angle of 30 degrees to the runway edge. This angle allows the alignment to avoid crossing too far into the RESA. The road follows a gentle curve to the left to line up for the approach to Emergency Gate 3. Due to the short distance between the runway and the fence line and the change in direction required, a design speed of 80km/h is not achievable over the majority of this section.

The first 200m of the road follows the levels of the graded strip, before dropping down into a shallow cutting to tie into the airport perimeter road (APR). The cross fall on this section follows the fall of the graded strip (varying between 1 and 2 %) and stormwater is allowed to flow across the road unimpeded. This is designed to prevent the necessity for additional drainage structures or channels and thereby obstructions within the graded strip. The maximum depth of water crossing the road will vary from 20mm to 35mm for storm return periods of 5 to 100 years respectively. Regular maintenance of the vegetation adjacent to the surfacing will be required to prevent damming of surface run-off on the road edge. Beyond this 200m point, side drains will be employed to control stormwater.

To eliminate the existing slight drop-off between the APR and Emergency Gate 3, and create a smoother alignment through the gate, the gate will need to be raised by approximately 200mm. This is easily achieved within the modular nature of the existing fence and gate and the current vertical steps in the fence alignment.

The section between the gate and Dube Boulevard is short and given the stop conditions at each end, the design speed criteria was not applied. At the tie into Dube Boulevard, a conventional at-grade bell-mouth intersection will allow for easy entry / egress onto the existing road way.

4.3 Northern Road

The northern road departs from Runway 24 just to the south of the threshold markings at an angle of 20 degrees to the runway edge. While an angle of 30 degrees would have limited the encroachment into the RESA, it would have compromised the ability to achieve the 80km/h design speed and avoid the steep valley / drop-off on the RHS at ±CH 220.

The vertical alignment continues to follow the graded strip levels with a cross fall of between 1 and 2%, up to CH 660. To prevent additional stormwater drains and structures, the storm runoff will be allowed to cross the road surface between CH 0 and CH 420 to limit obstructions in the RESA. The maximum water depth crossing the road will be 10mm for storm return periods of 100 years. Regular maintenance of the vegetation adjacent to the surfacing will be required to prevent damming of surface run-off on the road edge. The existing water course crossing at CH 440 necessitated the installation of a pipe culvert with headwalls. Just beyond this, at CH 470 the road crosses the restricted zone fence line. A new gate will be installed in the existing fence.

Between CH 460 and the APR (CH 660), the alignment deviates from the graded strip levels to smooth out the slight undulations in the existing ground levels. A side drain will divert stormwater towards the water course at CH 440. The alignment crosses the APR and existing Emergency Gate 1 at grade and no adjustments are required to the gate.

The 200m section from the gate to the end of the asphalt surfacing achieves the 80km/h design speed and is designed in accordance to the final (future) alignment. However, the hindrance of the gate and the short surface length makes it unlikely that this speed will be achieved in practice.

The gravel section beyond the asphalt follows the existing gravel alignment to some extent. Realignment to a smoother alignment at this stage was considered and disregarded due to the environmental constraints of pioneering a new route through the water course just to the north of this section. The gravel road ties into the existing gravel road on the eastern side of the ACSA property. This existing gravel road links through to Watson Highway to the north and is in a good condition. The section of this road which crosses Tongaat Hulett's property will be part of a Memorandum of Understanding to secure the route for emergency vehicles until a permanent solution / route is achieved.

4.4 Typical Cross-Sections

The road alignments cover two distinct zones and the typical cross sections were developed to accommodate the limitations / requirements in each zone. With reference to the Construction Details drawing (300713-00-CI-DRD-0001-001):

TYPICAL ROAD CROSS SECTION: This is recommended where the road is allowed to deviate from the ground levels and a typical cut / fill scenario is shown. The 1.5m wide verge will allow vehicles to pull over / park without the risk of going down the embankment or obstructing the roadway.

AIRFIELD PLATFORM ROAD: This cross section is applied within the graded strip and the levels and cross fall follow the existing ground levels closely. A wide verge area adjacent to the surfacing will be trimmed to help 'blend' the road surface into the surrounding topography and eliminate any steps or sudden changes in grade. This will also assist with allowing stormwater to flow across the road without ponding or causing erosion.

5. MATERIALS INVESTIGATION

5.1 Available Data

No existing data was available.

5.2 Extent of investigation

As stated in section 2.2, Shriram Geotechnical Consulting (Pty) Ltd were commissioned to conduct the geotechnical investigation to assess the ground conditions in terms of usage and for subgrade treatment guidelines to be provided. The results are summarised below, and the full Geotechnical report is Appended in Appendix A.

The field work was carried out between 22 August 2018 and 11 September 2018 and comprised of the following:
- 9 x Dynamic Cone Penetrometer (DCP) tests; and
- 9 x Test pits.

The locations of the test positions are shown on Figure 1 and Figure 2. The site was generally found to be underlain by colluvium, or topsoil, and fill which was likely placed when shaping the site during the construction of the airport.

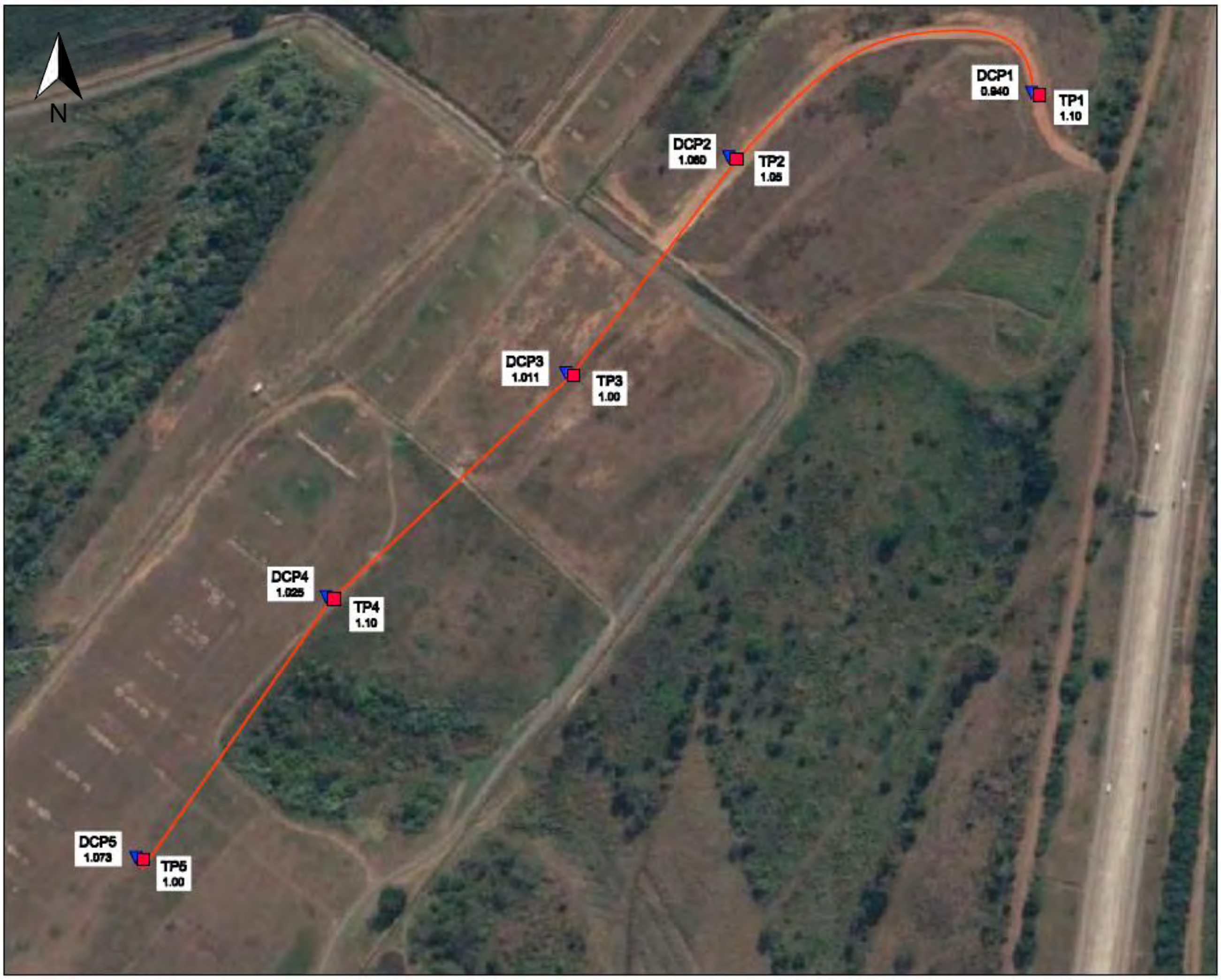


Figure 1: Test pit and DCP locations for the Northern Road

Figure 2: Test pit and DCP locations for the Southern Road

A summary of the test pit data is presented in below.

- **Top layer**

  Test pits TP1 and TP2 were excavated through the existing gravel road. This road was found to be poorly maintained. A degraded gravel wearing course comprised of sandy fine to course gravel occurred in the upper 5cm of TP2. The gravel wearing course was underlain by brownish orange and brownish red silty sands and clayey sands which were apparently compacted in the upper 0.40 (TP1) to 0.60m (TP2). These materials occurred from surface level in TP1, where the gravel wearing course was absent.

  Elsewhere on the site, a colluvial or topsoil layer generally comprised of brown and dark brown of silty and clayey variants of sand with gravelly clays occurring in TP6.

- **Fill**

  The colluvial/topsoil layer was underlain by fill. The fill encountered was highly variable comprised silty and clayey sands and gravels with clay rich layers occurring in areas. These fill layers cannot be described as well-defined soil units due to the inconsistent physical characteristics and soil compositions encountered as shown on the test pit profiles.

A summary of the tested material is provided in Table 1.

5.3 Groundwater

Groundwater seepage was not encountered in any of the test pits. However, during periods of high rainfall, shallow groundwater seepage could be expected to proliferate particularly where highly permeable soils exist and at the interface between fill layers.

5.4 Laboratory Testing

In order to classify the materials on site and to assess their suitability for use, laboratory testing was conducted on selected materials encountered in the test pits. The following tests were scheduled:
- Road indicator tests (Particle size analysis and Atterberg limit determination);
- Modified AASHTO moisture-density (modified AASHTO) tests; and
- California Bearing Ratio, or CBR, strength tests.

The test results are summarised in Figure 3 and Table 1 below, and the detailed result sheets are contained in Appendix A.

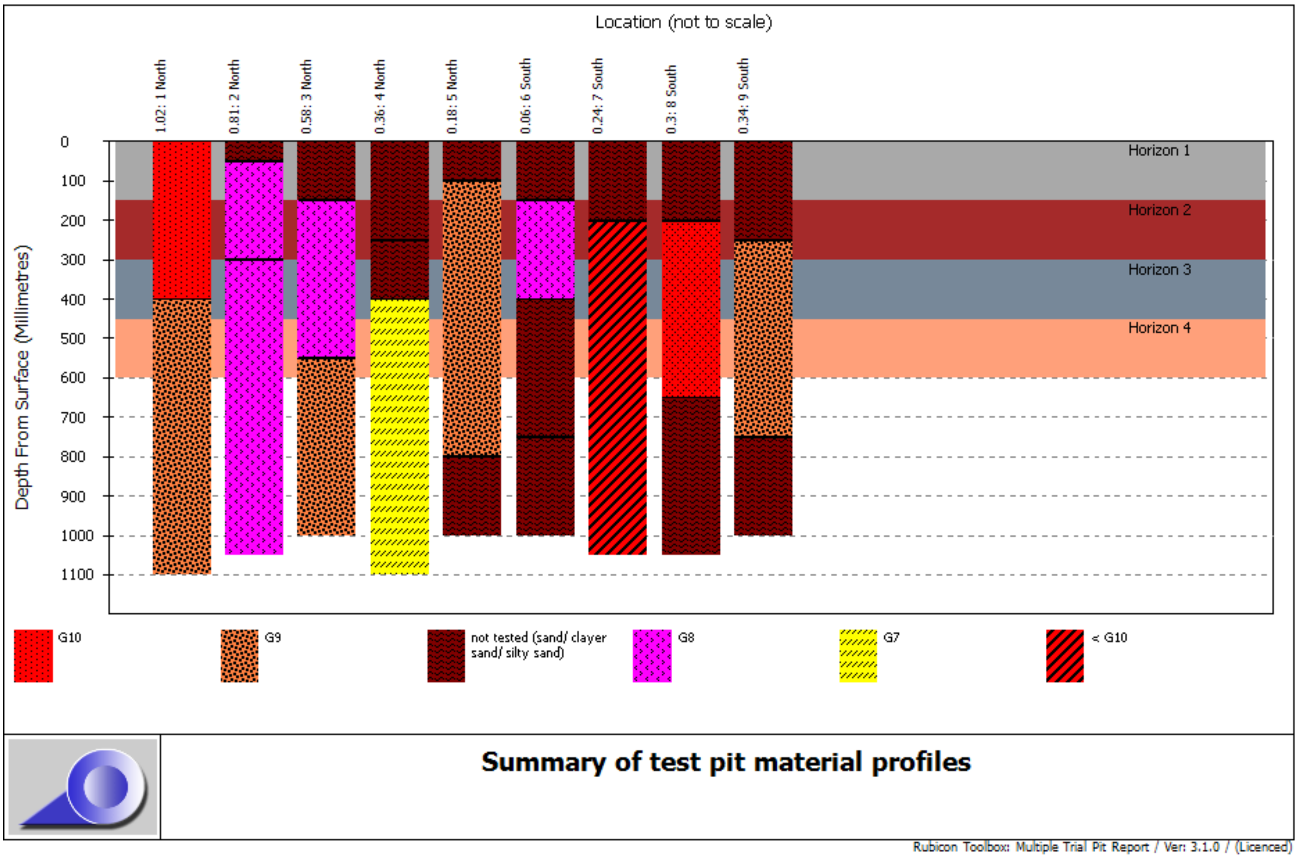


Figure 3: Summary of test pit profiles

Table 1: Summary of Results of Particle Size Distribution Analysis, Atterberg Limit Determinations and Moisture / Density and CBR Tests

TP No.	Depth (m)	Description	Particle Size %				Atterberg Limits			GM	Modified AASHTO		CBR Values (%) Compaction MDD (%)						Swell (%)	TRH 14 Classi-fication
			Clay	Silt	Sand	Gravel	LL	PI	LS %		MDD / Proctor (kg/m³)	OMC %	90	93	95	97	98	100	100	
TP1	0.00-0.40	Dry to slightly moist brownish orange dense intact silty clayey SAND with occasional gravels. Fill likely of Berea Formation origin.	35		65	0	21	6	3.0	0.68	2009	10.9	1	3	7	15	22	47	0.1	G10
TP1	0.40-1.10	Moist brownish red medium dense becoming loose at depth intact clayey SAND. Fill, likely of Berea Formation origin.	29		69	2	CBD	SP	1.5	0.80	2028	9.6	5	7	9	11	12	15	0.2	G9
TP2	0.05-0.30	Slightly moist medium brown occasionally mottled orange brown medium dense intact silty SAND. Fill.	12		84	2	CBD	NP	0.0	0.96	1845	9.9	8	14	21	30	36	52	0.0	G8
TP2	0.30-1.05	Slightly moist to moist orange brown medium dense becoming loose with depth intact silty SAND with zones of clayey SAND. Fill.	15		85	0	CBD	NP	0.0	0.87	1925	7.6	6	12	21	36	48	82	0.0	G8
TP3	0.15-0.55	Moist to very moist light orange mottled and streaked dark brown very loose intact slightly clayey and silty SAND with some sandy CLAY nodules. Fill.	8		91	1	CBD	NP	0.0	1.01	1831	6.3	8	10	11	13	14	16	0.0	G8
TP3	0.55-1.00	Moist reddish brown to orange brown soft intact clayey silty SAND. Fill.	22		78	0	19	3	2.0	0.81	1976	8.7	4	7	11	17	22	34	0.2	G9
TP4	0.40-1.10	Moist light orange brown mottled to blotched brownish red loose intact clayey silty SAND. Fill.	21		79	0	CBD	SP	1.0	0.82	2001	8.5	10	16	22	31	36	49	0.0	G7

TP No.	Depth (m)	Description	Particle Size %			Atterberg Limits			GM	Modified AASHTO		CBR Values (%) Compaction MDD (%)						Swell (%)	TRH 14 Classification
			Clay	Silt	Sand	Gravel	LL	PI		MDD / Proctor (kg/m^3)	OMC %	90	93	95	97	98	100	100	
TP5	0.10-0.80	Slightly moist to moist orange mottled ant blotched brownish yellow, light orange and brownish red loose to medium dense intact clayey SAND with minor gravels and cobbles of mixed origin. Fill.	25	75	0	CBD	SP	1.5	0.78	2011	9.4	5	9	15	23	30	47	0.1	G9
TP6	0.15-0.40	Slightly moist light brownish yellow medium dense intact clayey sandy GRAVEL with abundant cobbles. Apparently poorly compacted fill.	14	15	71	24	11	5.5	2.36	2145	8.6	11	13	15	17	18	20	0.0	G8
TP7	0.20-1.05	Moist red speckled and mottled deep yellow and dark grey soft becoming very soft with depth clayey and silty SAND with minor gravels of mixed origin. Fill.	34	58	8	22	6	3.0	0.91	1951	10.0	1	1	2	2	2	3	2.4	<G10
TP8	0.20-0.65	Slightly moist yellowish orange brown mottled blue grey dense intact clayey sandy GRAVEL with zones of sandy gravelly CLAY and occasional cobble up to 12cm across. Fill.	24	41	35	19	7	3.5	1.56	2139	7.9	5	5	6	7	7	8	0.1	G10
TP9	0.25-0.75	Slightly moist yellowish orange brown mottled blue grey dense intact clayey sandy GRAVEL with occasional cobble up to 12cm across. Fill.	22	27	51	21	7	4.5	1.89	2229	7.7	5	9	13	19	22	31	0.3	G9

5.5 DCP results

DCP soundings were conducted in the proximity of the test pits as indicated in Figure 1 and Figure 2. A summary of the DCP data of the material in the test pits is given in Table 2. The detailed DCP sheets are attached in Appendix A.

From Table 2 it can be concluded that the DCP-derived CBR values are comparable to the classification determined from the test pit material results.

Table 2: Summary of DCP results

DCP	Location	SV	DCP mm/blow			CBR Classification Range	Material Classification
			10th Percentile	Median	90th Percentile		
1	North	1.02	13.1	16.8	36.9	3 – 17	G7 – G10
2	North	0.81	2.6	3.4	6.9	24 - > 110	G4 – G7
3	North	0.58	5.2	6.2	10.1	6 - 55	G5 – G10
4	North	0.36	3.6	5.8	10.2	6 - 96	G4 – G10
5	North	0.18	4	6.2	16.5	9 - 96	G4 – G9
6	South	0.06	4.6	11.2	20.7	6 - 82	G4 – G9
7	South	0.24	14	27	33	4 - 31	G6 – G10
8	South	0.30	0.8	2.7	5.1	11 - > 110	G4 – G8
9	South	0.34	0.4	2.4	4.2	8 - > 110	G4 – G9

5.6 Conclusions from the materials investigation

The in-situ and fill material is variable (silty and clayey sands and gravels with clay rich layers occurring in areas). The quality of the material ranges from G7 to less than G10 quality material. Therefore, it is recommended that a 150mm G7 selected layer be constructed as a foundation for the pavement layers.

6. PAVEMENT DESIGN AND EARTHWORKS

6.1 Pavement Design

The criteria given in the brief regarding the loadings on this road is for an 80t vehicle. However, the most common heavy vehicle to utilise this road on a regular basis is the Panther 8x8 emergency response vehicle with a maximum operational weight of 52t, giving a wheel load of 6.5t. This vehicle and its wheel and axle loadings were used in the analysis of the pavement design. A picture of the Panther 8x8 is presented in Figure 4.

Figure 4: Picture of the design vehicle, the Panther 8x8

The axle configuration and spacing are important parameters for the determination of the traffic loading in pavement design. From Figure 4 it is observed that the Panther 8X8 has two tandem axles with single wheels. The length x width x height dimensions of the Panther 8x8 are 11,995 x 3,000 x 3,650mm. However, no information on the wheel and axle spacing was available. However, the axle spacing of the Panther 6x6 was available as shown in Figure 5 and it was assumed that the Panther 8x8 axles would be spaced similarly.

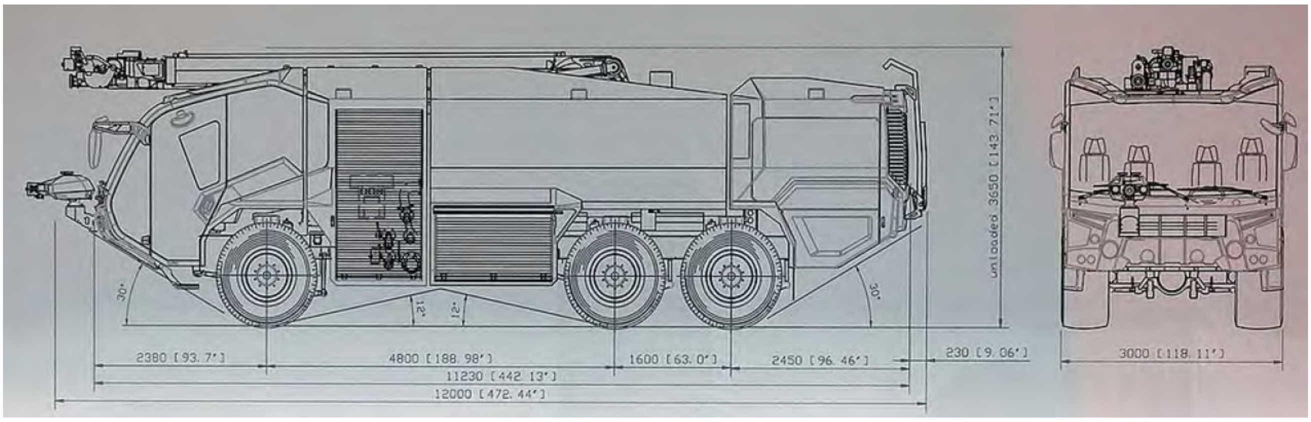


Figure 5: Figure showing axle spacing of the Panther 6x6

From Figure 5, the axle spacing between the axles of the tandem axle is 1,600mm and the axle width was assumed to be 3,000mm.

A tyre pressure of 1,000kPa was assumed.

The regular usage of the road will be for emergency drills and the criteria given was approximately one return trip for the Panther 8x8 every 2 days. Since the road is 6m wide, it was assumed that the Panther 8x8 would travel in the centre of the roadway and therefore no directional split was made. Therefore 365 trips were assumed per year.

The initial assessment was based on equivalent standard axle loads of 80kN (approximately 8t) (E80). The design loadings are shown in Table 3 below.

Table 3: Traffic details based on equivalent standard axle loads (E80's)

Vehicle type	**Panther 8x8**
Axle Type	2 tandem axles with single wheels
Vehicle Load	52 tons
Total load/axle (tons)	26 tons
Axle load (kN)	260 kN
Damage factor, n	4.2
LEF (Load equivalency factor) per axle	38 (as calculated below)
E80/HV	76
Total number of trips per annum	365
E80/annum	27,740
E80/design life (20 years) (0% growth)	554,800
MESA	0.55

The Load Equivalency Factor (LEF) was determined in accordance with the Manual M10 - Concrete Pavement Design and Construction: 1995. Figure 6 adapted from the M10 manual was used to convert the load on the tandem axle with single wheels to an equivalent load on a standard single axle with dual wheel configuration.

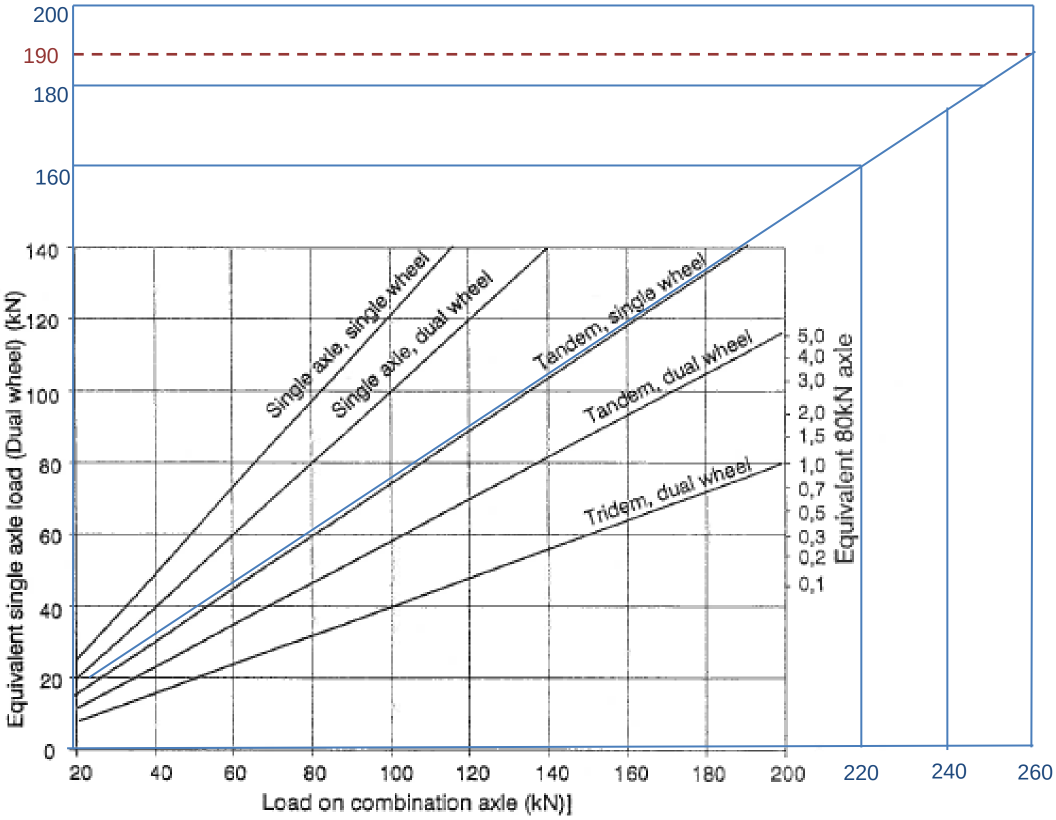


Figure 6: Curve for converting multi-axle loads to equivalent single axle loads (Manual M10, The Department of Transport, 1995)

The load determined using Figure 6 was then used to determine the equivalent number of E80's of the tandem axle using the following equation as defined in the M10 manual:

$$LEF = \left(\frac{Axle\ load\ from\ \text{Figure 6}}{80}\right)^{Damage\ Factor}$$

$$LEF = \left(\frac{190}{80}\right)^{4.2} = 38$$

The recommended pavement structure is presented in Figure 7 below. The in-situ and fill material is variable, therefore, it is recommended that a 150mm G7 selected layer be constructed as a foundation for the pavement layers. Due to the heavy axles and overloading on the pavement structure, the 2x150mm soil cement mixture layers are recommended. These layers would also allow for quicker construction which is crucial for work in the restricted zones. To further accelerate construction times, the 2x150mm soil cement mixture layers may be constructed as a single 300mm layer. However, the compaction should be checked and achieved in both the lower 150mm and upper 150mm of the layer.

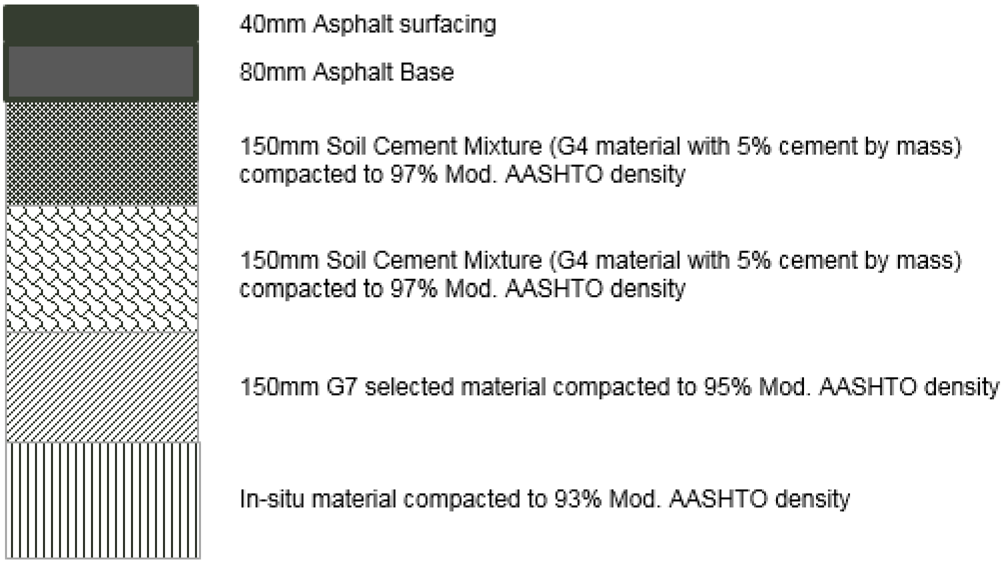


Figure 7: Recommended pavement design

The above pavement was analysed using Rubicon Toolbox Software and the design life was calculated at 1.6 MESA. Of the 1.6 MESA, 1.3 MESA is achieved during Phase 1. The Rubicon output is appended in Appendix B.

However, it should be noted that the transfer functions of this design method were not developed for overloaded axles. Therefore, in order to assess the effect of the heavy wheel and axle load, the stress and strain results extracted from Rubicon Toolbox were analysed after a single pass of the actual axle loading. These results are appended in Appendix C. According to published data, the strain at break for a C2 material is 120 microstrain and from the results of Phase 1 in Appendix C, the strain at the bottom of the 300mm C2 layer (critical point) is approximately 113 microstrain. Therefore, this design is adequate. The strain at the bottom of the first 150mm C2 layer during Phase 2 exceeds the strain at break which indicates that the layer will crack and not be able to withstand the load during this phase. Strain at break is not applicable to Phase 3 because the cement stabilised layers are deemed to be in their equivalent granular states.

The design traffic is 0.55 MESA for the 20-year design period and the pavement structure is able to carry 1.3 MESA during Phase 1 according to the analyses.

6.2 Restricted Zone Pavement Design

Areas close to the runway have restricted working conditions and times, and additional consideration was given to the design and construction methodology of the road layerworks in these areas. This restricted zone is defined as being within 75m of the runway edge and extending to 75m beyond the end of the RESA.

The available construction time according to ACSA is after the last flight lands at night (normally around 23H30) and before the first aircraft operation in the morning (normally around 05h30). However, a further flight that lands at approximately 03H30 has been added to the schedule. Accommodation of this additional flight will need to be discussed further because it breaks the ‘allowed’ time period into 2 short periods. Construction of the road would then be severely time constrained.

Within this restricted zone, to accommodate the safety and operational requirements during the remainder of the day, it is a requirement that no excavations are permitted to remain open outside of the construction times. This could entail temporary back filling or covering any excavation so that emergency or other vehicles could traverse the works area without the hindrance or risk associated with open excavations. This means that at the end of each work period, the excavation for the road layerworks would need to back-filled and then re-excavated at the start of the following work period. This has significant time and cost implications for the contract. These would be termed temporary works as the backfilling and execution would not form part of the final completed works

In order to limit the need to temporary backfilling, the sections completed in a ‘shift’ are likely to be short (in the order of 20 to 30m) with the subsequent reduction in quality from that normally achieved when longer sections of road (>200m) are constructed.

The process for construction would be:

1. Works completed in 1 shift – approximately 20 to 30m length
    - Excavation to the required depth and compaction to achieve 93% MOD AASHTO density
    - Construction of G7 selected material compacted to 95% MOD AASHTO density
    - Construction of 2x150mm (or 300mm) soil cement layers compacted to 97% MOD AASHTO density
    - Then alternatively
        - Temporary backfill to NGL with a G7, or
        - Trim the adjacent ground such that the maximum deviation from grade is 1:100 or less
2. The Asphalt base and surfacing would be constructed once a number of sections under 1 above have been completed – approximately 200m in length
    - If backfilled in 1 above, remove the backfill material to top of soil cement layer
    - Then alternatively
        - Trim the adjacent ground such that the maximum deviation from grade is 1:100 or less, or
        - If sufficient time remains in the shift, complete the 40mm asphalt surfacing layer
    - If necessary, complete the final asphalt layer on a subsequent or later shift.

While an experienced contractor may achieve the required result easily, it is proposed that trial sections be conducted outside of the restricted zone to allow the contractor to achieve the required work production rates and quality. This will also identify any shortcomings in their methodology prior to committing to working in the restricted zone. It is proposed that 2 trial sections be conducted:

1. The first to be conducted in daylight which will allow for the methodology to be worked through.
2. The second to be conducted at night to help identify particular issues related to working under artificial light conditions.

These trial sections are to be allowed for in the BOQ, but that payment will only be made for the 2 acceptable trial sections. Should the contractor require additional trial sections in order to achieve the required rates of progress and quality (to the satisfaction of the Employer’s Agent or ACSA), it will be at the contractor’s expense.

6.3 Earthworks

With the alignment criteria of having to follow the existing ground lines over the majority of the length of the road, the construction involves a predominantly cutting operations so that the final road level is approximately ground level.

There are limited areas where the final road levels are significantly above the ground level, and the volumes of material required for filling are very low. This results in a high volume of excess material being generated. With limited opportunity to deposit this within the airport precinct area, it will have to be spoiled off-site at a location to be determined.

According to the geotechnical investigation, the site is underlain by soils of the Berea Formation as well as shale and siltstone of the Vryheid Formation. These materials can perform well as road foundation materials if kept dry. Therefore, it is proposed that a subsoil drain be installed along the full length of the road to prevent the build-up of moisture in the lower layers which can significantly reduce the life span of the road.

7. STORMWATER

To limit the impact of additional structures and drainage channels on the graded strip, conventional stormwater infrastructure is only placed where necessary. This is limited to three locations on the project, two of which fall outside of the airport boundary fence.

The stormwater run-off and flow calculations have been conducted in accordance with the SANRAL Drainage Manual. Flows have been checked for up to 100 year return periods. The eThekwini Municipality database of expected rainfall for various return periods and storm durations has been used and the results are shown in the table below:

Table 4: Stormwater calculation results

No	Location	Area (Ha)	Run-off Coefficient	Storm intensity (mm/hr)	Storm flow for return periods	Pipe Data		
						Diameter	Capacity	Grade
					1:100	mm	m^3/s	%
1	Southern Road CH 325	Pipe to be replaced, capacity checked to match existing		252	1.13	2 x 450	1.13	3.0
2	Northern Road CH 448	1.5	0.4		0.42	1 x 600	0.96	2.0
3	Northern Road CH 740	0.1	0.4		0.03	1 x 600	0.96	2.0

The existing pipe at Pipe 1 is a 600mm dia concrete pipe that is too high and there is limited opportunity to ramp over it and still achieve a reasonable road alignment between Emergency Gate 3 and Dube Boulevard. This 600 mm pipe will be replaced by 2 x 450mm dia. pipes which provides the same capacity but reducing the height by 150mm. This will allow sufficient cover over the pipe to prevent damage from wheel loads.

An open grass lined drain will be excavated from the outlet of Pipe 3 to drain the storm run-off toward the existing water course to the north of the site.

All the stormwater pipes are to be Concrete spigot and socket, Class 100D on a Class A (concrete) bedding.

Where possible, a shallow side drain will be used to control the flow of surface water next to the road, and channel it to natural water course or existing drainage systems.

8. EXISTING SERVICES

There is limited accurate information available for the position and depth of the underground services. The available information received from ACSA have been added to the design drawings.

When construction commences, the contractor will be tasked with exposing the known services along the road alignment or within the project area before any other works commence. This will be done by careful hand excavation under the supervision of a responsible person or the airport service maintenance department. Once the locations and depths are confirmed, a protection strategy will be implemented, initially / immediately as temporary protection during construction and later a permanent solution will be constructed.

The necessity to introduce temporary protection will be assessed for each service location and can include the following:

- avoidance of working in the area until a permanent solution is constructed,
- construction of temporary earthworks / fill over the service to provide sufficient protection (normally to a level of 1.2m above the service, or
- installation of mechanical protection over the service to avoid vehicle loads directly on or near to the service (eg steel trench plates).

In most cases, this permanent solution, will consist of a concrete slab laid on a sand bedding over length of the service affected. This will spread the impact of imposed wheel loads to the areas adjacent to the service. Should the service need to be relocated or lowered, then this will be done in conjunction with a relevant specialist installer under the guidance of the Employer's Agent and the airport management.

Historically, most of the damage to buried services occurs during the construction phase of a project and the contractor will be made fully aware of the sensitive nature of the services and the consequences if damaged. A comprehensive methodology for working around these services will be agreed and implemented prior to the commencement of construction.

9. ENVIRONMENTAL

As noted above, GMG are subcontracted to fulfil the role of environmental specialist on the design portion of this project. The environmental status or requirements for a construction project are based on a staged approach with triggers being activated depending on the activities / scope being planned. The trigger for this project is the increase in the foot-print of the airport as the portion of the south road will extend out of ACSA's property boundary.

Wetland and ecological studies have been undertaken for the site and it has been concluded that the "wetland" initially identified to possibly trigger the EIA Regulations, is actually a "stormwater wetland". Therefore, no EIA triggers are applicable relating to this wetland.

A request for exemption was forwarded to DEA as the only trigger is for the increase in footprint (900m²), which is for the additional area out of ACSA property that the road will occupy. The DEA confirmed that they still require the Basic Assessment Process to be undertaken so that authorisation is received for the Southern Road.

The draft report compilation is underway and will be finalised upon receiving the geotechnical and preliminary design reports. This BA report will be circulated to the registered Interested and Affected Parties for a period of 30 days (on two separate rounds) prior to being submitted to DEA for decision making as per the requirements of the 2014 EIA Regulations (amended).

The report ref is 2017/162 "Basic Assessment Report for the Proposed Construction of the Emergency Access Road at the King Shaka International Airport, KwaZulu Natal"

10. LAND OWNERSHIP

As noted above, GMG have been tasked with assisting with resolving any land ownership issues or rights of ways for this project. The current status of this process is as follows:

10.1 Southern Road

The portion of road between Emergency Gate 3 and Dube Boulevard falls outside of the airport property. This land and Dube Avenue are owned and maintained by La Mercy JV, a joint venture between Dube Tradeport and ACSA. It has been proposed that a servitude be registered across this portion to accommodate the Emergency Road. It is not envisaged that any transfer of ownership of land will be required.

It should be noted that the development of Special Zone 2 of Dube Tradeport will commence soon. The access to this Zone is on the opposite side of Dube Boulevard and may significantly affect the layout of the current intersection. The Servitude will have to take this into account and ensure that the security / alignment of the southern road is not compromised by any future changes or transfer of ownership of any adjacent properties.

10.2 Northern Road

The portion of road between Emergency Gate 1 and the existing gravel road to the north fall within the airport property boundary and there are no land issues preventing the construction within the limits proposed in the attached drawings.

However, the issue of a right of way across the Tongaat Hulett Development (THD) land to the north has never been formalised and is essentially based on a verbal agreement / understanding. Attempts to formalise / finalise the route with THD have been rejected, mainly due to the proposed sale of the land (termed uSukela Development) to independent developers. THD will not compromise the value of the property by introducing a permanent right of way or access road into a sale agreement.

THD have agreed, pending the sale, to allow for a MoU to be put in place to allow for airport emergency vehicles to utilise the current gravel road. This will be temporary, and a final agreement or route will have to be determined once the requirements of the future developer or land owner are determined.

The MoU with THD to secure the route for the northern road is currently being drafted and negotiations for the terms of the agreement are to be conducted in due course. It is not envisaged that any transfer of ownership of land will be required now.

11. DRAWINGS

The following drawings form part of the project documentation:

DRAWING NUMBER	DESCRIPTION
300713-00-CI-DGA-0001-001	GENERAL ARRANGEMENT
300713-00-CI-DAL-0001-001	ROAD LAYOUT AND LONGITUDINAL SECTION SOUTH
300713-00-CI-DAL-0001-002	ROAD LAYOUT AND LONGITUDINAL SECTION NORTH SHEET 1 OF 3
300713-00-CI-DAL-0001-003	ROAD LAYOUT AND LONGITUDINAL SECTION NORTH SHEET 2 OF 3
300713-00-CI-DAL-0001-004	ROAD LAYOUT AND LONGITUDINAL SECTION NORTH SHEET 3 OF 3
300713-00-CI-DCR-0001-001	SOUTH ROAD CROSS SECTIONS AT 10m INTERVALS SHEET 1 OF 2
300713-00-CI-DCR-0001-002	SOUTH ROAD CROSS SECTIONS AT 10m INTERVALS SHEET 2 OF 2
300713-00-CI-DCR-0001-003	NORTH ROAD CROSS SECTIONS AT 10m INTERVALS SHEET 1 OF 5
300713-00-CI-DCR-0001-004	NORTH ROAD CROSS SECTIONS AT 10m INTERVALS SHEET 2 OF 5
300713-00-CI-DCR-0001-005	NORTH ROAD CROSS SECTIONS AT 10m INTERVALS SHEET 3 OF 5
300713-00-CI-DCR-0001-006	NORTH ROAD CROSS SECTIONS AT 10m INTERVALS SHEET 4 OF 5
300713-00-CI-DCR-0001-007	NORTH ROAD CROSS SECTIONS AT 10m INTERVALS SHEET 5 OF 5
300713-00-CI-DRD-0001-001	CONSTRUCTION DETAILS

12. CONSTRUCTION COSTS

The table below reflects the estimated construction costs:

Section	Description	Amount (Rand)
1300	CONTRACTOR'S ESTABLISHMENT ON SITE AND GENERAL OBLIGATIONS	4 310 000.00
1400	HOUSING, OFFICES AND LABORATORY FOR THE ENGINEER'S SITE PERSONNEL	81 400.00
1500	ACCOMMODATION OF TRAFFIC	200 000.00
1600	OVERHAUL	394 500.00
1700	CLEARING AND GRUBBING	474 000.00
2100	DRAINS	1 638 200.00
2200	PREFABRICATED CULVERTS	726 500.00
2300	CONCRETE KERBING, CONCRETE CHANNELLING, CHUTES AND DOWNPIPES, AND CONCRETE LININGS FOR OPEN DRAINS	116 200.00
3300	MASS EARTHWORKS	3 195 000.00
3400	PAVEMENT LAYERS OF GRAVEL MATERIAL	2 365 500.00
3500	STABILIZATION	315 000.00
3700	PLANT-MIXED PAVER-LAID PAVEMENT LAYERS	2 780 000.00
4100	PRIME COAT	144 600.00
4200	ASPHALT BASE AND SURFACING	5 122 000.00
5100	PITCHING, STONEWORK AND PROTECTION AGAINST EROSION	19 800.00
5200	GABIONS	714 500.00
5400	GUARDRAILS	72 150.00
5500	FENCING	71 000.00
5600	ROAD SIGNS	223 000.00
5700	ROAD MARKINGS	238 600.00
5800	LANDSCAPING AND PLANTING PLANTS	737 000.00
5900	FINISHING THE ROAD AND ROAD RESERVE AND TREATING OLD ROADS	16 000.00
2100	TESTING MATERIALS AND WORKMANSHIP	100 000.00
8400	PAINTING	25 000.00
	TOTAL (EXCLUDING VAT AND CONTINGENCIES	24 079 950.00

These costs exclude any contingency amounts and 15% VAT.

While the cost is high, the rates used are based on recent works with similar items. It must be noted that the nature and location of the works may well induce a further increase in the rates. The effect of how the tenderers will price the restricted work areas / times into account will only be known once formal tenders are received.

A further unknown is the expense that the contractor will be required to outlay to obtain the necessary inductions and permits required to work on the airside. While the base costs are known and will be included in the tender document, the number of employees and plant that permits will be required for is not. We have allowed approximately 20% of the works value for the contractor's establishment and general obligations.

A compete Bill of Quantities with estimated quantities and prices is in included in Appendix A.

13. SUMMARY

The project and scope proposed in the design are currently feasible from a civil engineering perspective. The items listed as issues within the report can be solved during construction or with some further investigation ahead of time. The items that will need to be further managed or considered are:

- The environmental issues related to the wetlands / increase in airport footprint and what further studies and approvals are required.
- MoU's for the portions outside the airport property.
- Existing underground services.

APPENDICES

A. Geotechnical Investigation
B. Rubicon Pavement Evaluation
C. Rubicon Stress and Strain Results
D. Schedule of Estimated Quantities and Prices

APPENDIX A – GEOTECHNICAL INVESTIGATION

APPENDIX B – RUBICON PAVEMENT EVALUATION

Pavement Situation At Start of Phase 1 of 3

Layered Elastic Evaluation for Standard Axle

Design Name: [Not Provided]

[No Description Provided]

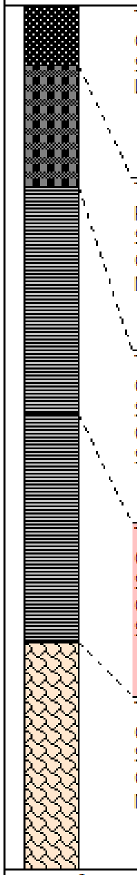
Axle Details: KSIA

Effective Structural Capacity for All Phases = 1.6 million Standard Axles

Time to Exceed Capacity for All Phases: 25 Years

Effective Structural Capacity for this Phase Only = 1.3 million Standard Axles

Time to Exceed Capacity for THIS Phase: 22.5 Years



Thickness = 40 Millimetres; Continuously Graded Asphalt Stiffness = 3000 MPa; Poisson = 0.4; Layer Was Not Evaluated	Design Parameter: N/A Position: N/A Basic Axle Capacity: N/A Effective Axle Capacity: N/A Damage not evaluated in this layer
Thickness = 80 Millimetres; RSA Thick Asphalt Base Layer Stiffness = 2300 MPa; Poisson = 0.44; Criterion: RSA Thick Asphalt Cat B No special material properties needed	Max. Horizontal Tensile Strain: 40.8 Microstrain Critical Position: Load Centreline/Bottom of Layer Basic Axle Capacity: >100 million Effective Axle Capacity: > 100 million Standard Axles Damage in this Phase from 0.00 to 0.00
Thickness = 150 Millimetres; C2 Cement Stabilized Material Stiffness = 3000 MPa; Poisson = 0.35; Criterion: RSA Cemented Fatigue, Cat B Strain-at-Break = 120 Microstrain;	Max. Horizontal Tensile Strain: 50.7 Microstrain Critical Position: Load Centreline/Bottom of Layer Basic Axle Capacity: 3.95 million Effective Axle Capacity: 3.95 million Standard Axles Damage in this Phase from 0.00 to 0.34
Thickness = 150 Millimetres; C2 Cement Stabilized Material Stiffness = 3000 MPa; Poisson = 0.35; Criterion: RSA Cemented Fatigue, Cat B Strain-at-Break = 120 Microstrain;	Max. Horizontal Tensile Strain: 114 Microstrain Critical Position: Load Centreline/Bottom of Layer Basic Axle Capacity: 1.34 million Effective Axle Capacity: 1.34 million Standard Axles Damage in this Phase from 0.00 to 1.00
Thickness = Semi-Infinite; G9 subgrade Criterion Stiffness = 50 MPa; Poisson = 0.35; Criterion: RSA Subgrade 10mm Rut, Cat B No special material properties needed	Vertical Compressive Strain: 377 Microstrain Critical Position: Load Centreline/Top of Layer Basic Axle Capacity: 40.88 million Effective Axle Capacity: 40.88 million Standard Axles Damage in this Phase from 0.00 to 0.03

Load Details:

Setup: KSIA; Daily Count = 100

Growth Rates: Yr 0 to 5 = 4% ; Yr 5 to 10 = 4% ; Yr 10 to End = 4% ;

Pavement Notes:

KSIA Access Road Pavement Design

Phase 1

Pavement Situation At Start of Phase 2 of 3

Layered Elastic Evaluation for Standard Axle

Design Name: [Not Provided]

[No Description Provided]

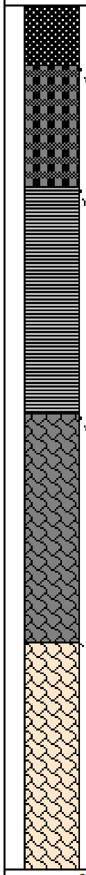
Axle Details: KSIA

Effective Structural Capacity for All Phases = 1.6 million Standard Axles

Time to Exceed Capacity for All Phases: 25 Years

Effective Structural Capacity for this Phase Only = 0.2 million Standard Axles

Time to Exceed Capacity for THIS Phase: 5.5 Years



Thickness = 40 Millimetres; Continuously Graded Asphalt Stiffness = 3000 MPa; Poisson = 0.4; Layer Was Not Evaluated	Design Parameter: N/A Position: N/A Basic Axle Capacity: N/A Effective Axle Capacity: N/A Damage not evaluated in this layer
Thickness = 80 Millimetres; RSA Thick Asphalt Base Layer Stiffness = 2300 MPa; Poisson = 0.44; Criterion: RSA Thick Asphalt Cat B No special material properties needed	Max. Horizontal Tensile Strain: 39.9 Microstrain Critical Position: Load Centreline/Bottom of Layer Basic Axle Capacity: >100 million Effective Axle Capacity: > 100 million Standard Axles Damage in this Phase from 0.00 to 0.00
Thickness = 150 Millimetres; C2 Cement Stabilized Material Stiffness = 3000 MPa; Poisson = 0.35; Criterion: RSA Cemented Fatigue, Cat B Strain-at-Break = 120 Microstrain;	Max. Horizontal Tensile Strain: 194 Microstrain Critical Position: Load Centreline/Bottom of Layer Basic Axle Capacity: 0.33 million Effective Axle Capacity: 0.22 million Standard Axles Damage in this Phase from 0.34 to 1.00
Thickness = 150 Millimetres; EG4 (equiv. granular) material in wet condition Stiffness = 300 MPa; Poisson = 0.35; Criterion: Granular Materials Cat B Cohesion = 24.6 kPa; Angle of Friction = 37.5	Shear Safety Factor: 0.959 Critical Position: Load Centreline/Middle of Layer Basic Axle Capacity: 1.61 million Effective Axle Capacity: 1.61 million Standard Axles Damage in this Phase from 0.00 to 0.19
Thickness = Semi-Infinite; G9 subgrade Criterion Stiffness = 50 MPa; Poisson = 0.35; Criterion: RSA Subgrade 10mm Rut, Cat B No special material properties needed	Vertical Compressive Strain: 617 Microstrain Critical Position: Load Centreline/Top of Layer Basic Axle Capacity: 0.3 million Effective Axle Capacity: 0.29 million Standard Axles Damage in this Phase from 0.03 to 1.00

Load Details:

Setup: KSIA; Daily Count = 100

Growth Rates: Yr 0 to 5 = 4% ; Yr 5 to 10 = 4% ; Yr 10 to End = 4% ;

Pavement Notes:

KSIA Access Road Pavement Design

Phase 2

Pavement Situation At Start of Phase 3 of 3

Layered Elastic Evaluation for Standard Axle

Design Name: [Not Provided]

[No Description Provided]

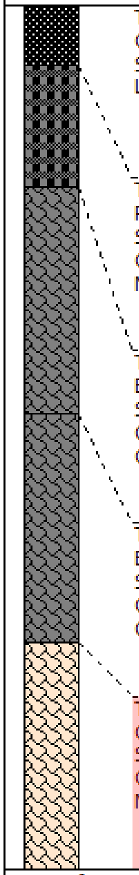
Axle Details: KSIA

Effective Structural Capacity for All Phases = 1.6 million Standard Axles

Time to Exceed Capacity for All Phases: 25 Years

Effective Structural Capacity for this Phase Only is < 1 thousand Standard Axles

Time to Exceed Capacity for THIS Phase: 0.25 Years



Thickness = 40 Millimetres; Continuously Graded Asphalt Stiffness = 3000 MPa; Poisson = 0.4; Layer Was Not Evaluated	Design Parameter: N/A Position: N/A Basic Axle Capacity: N/A Effective Axle Capacity: N/A Damage not evaluated in this layer
Thickness = 80 Millimetres; RSA Thick Asphalt Base Layer Stiffness = 2300 MPa; Poisson = 0.44; Criterion: RSA Thick Asphalt Cat B No special material properties needed	Max. Horizontal Tensile Strain: 422 Microstrain Critical Position: Load Centreline/Bottom of Layer Basic Axle Capacity: 26 thousand Effective Axle Capacity: 0.03 million Standard Axles Damage in this Phase from 0.00 to 0.07
Thickness = 150 Millimetres; EG4 (equiv. granular) material in wet condition Stiffness = 300 MPa; Poisson = 0.35; Criterion: Granular Materials Cat B Cohesion = 24.6 kPa; Angle of Friction = 37.5	Shear Safety Factor: 0.382 Critical Position: Load Centreline/Middle of Layer Basic Axle Capacity: 51 thousand Effective Axle Capacity: 0.05 million Standard Axles Damage in this Phase from 0.00 to 0.04
Thickness = 150 Millimetres; EG4 (equiv. granular) material in wet condition Stiffness = 300 MPa; Poisson = 0.35; Criterion: Granular Materials Cat B Cohesion = 24.6 kPa; Angle of Friction = 37.5	Shear Safety Factor: 0.58 Critical Position: Load Centreline/Middle of Layer Basic Axle Capacity: 0.17 million Effective Axle Capacity: 0.13 million Standard Axles Damage in this Phase from 0.19 to 0.20
Thickness = Semi-Infinite; G9 subgrade Criterion Stiffness = 50 MPa; Poisson = 0.35; Criterion: RSA Subgrade 10mm Rut, Cat B No special material properties needed	Vertical Compressive Strain: 1024 Microstrain Critical Position: Load Centreline/Top of Layer Basic Axle Capacity: 2 thousand Effective Axle Capacity: < 1 thousand Standard Axles Damage in this Phase from 1.00 to 1.00

Load Details:

Setup: KSIA; Daily Count = 100

Growth Rates: Yr 0 to 5 = 4% ; Yr 5 to 10 = 4% ; Yr 10 to End = 4% ;

Pavement Notes:

KSIA Access Road Pavement Design

Phase 3

APPENDIX C – RUBICON STRESS AND STRAIN RESULTS

Stress and Strain Results for Setup :

Thicknesses and Coordinates are in Millimetres
Stresses and Pressures are in kPa
Strains are in Microstrain
Applied Loads are in kN
Displacement is in Microns

Pavement Details

Layer No.	Thickness	Stiffness	Poisson		
1	40	3000	0.4	Default	Continuously Graded Asphalt
2	80	2300	0.44	Default	RSA Thick Asphalt Base Layer
3	150	3000	0.35	Default	C2 Cement Stabilized Material
4	150	3000	0.35	Default	C2 Cement Stabilized Material
5	150	50	0.35	Default	G9 subgrade Criterion

Load Setup Used : KSIA

Load No	Force	Pressure	X-Coord	Y-Coord
1	65	1000	0	0
2	65	1000	0	3000
3	65	1000	1600	0
4	65	1000	1600	3000

Stress and Strain Results (Eps denote strain and Sig denotes Stress. P1, P2 and P3 are the Principal Values. Negative denotes tension)

Pos.No.	Layer	X-Coord	Y-Coord	Z-Coord	SigXX	SigYY	SigZZ	SigP1	SigP2	SigP3	EpsXX	EpsYY	EpsZZ	EpsP1	EpsP2	EpsP3	DisplZ
1	1	0	0	0	1175	1199	1000	1201	1173	1000	98.4	110	16.7	111	97.5	16.7	1004
2	1	0	0	10	1051	1074	1001	1076	1049	1001	73.6	84.3	50.5	85.2	72.7	50.5	1004
3	1	0	0	20	926	948	1002	1002	950	924	48.7	58.8	84.3	84.3	59.6	47.8	1003
4	1	0	0	30	805	825	1001	1001	827	803	24.9	34.4	116	116	35.2	24	1002
5	1	0	0	39.9	692	711	994	994	713	690	3.31	12.2	144	144	13	2.53	1001
6	2	0	0	40	805	819	994	994	821	804	3.06	11.9	122	122	12.7	2.27	1001
7	2	0	0	60	651	664	962	962	665	650	-27.8	-20.1	167	167	-19.4	-28.5	998
8	2	0	0	80	537	547	905	905	548	536	-44.6	-38	186	186	-37.3	-45.2	995
9	2	0	0	100	461	469	830	830	470	460	-48.3	-42.7	183	183	-42.2	-48.8	991
10	2	0	0	120	420	427	741	741	428	419	-40.9	-36.4	160	160	-36	-41.4	987
11	3	0	0	120	216	225	740	740	226	214	-40.8	-36.4	195	195	-35.9	-41.3	987
12	3	0	0	158	105	110	571	571	111	104	-44.4	-42.1	165	165	-41.7	-44.8	981
13	3	0	0	195	24.8	25.4	424	424	26	24.1	-44.2	-43.9	136	136	-43.6	-44.5	975
14	3	0	0	232	-42.9	-46.8	305	305	-43	-46.8	-44.4	-46.2	112	112	-44.5	-46.2	970
15	3	0	0	270	-108	-116	210	210	-108	-117	-46.8	-50.6	96	96.1	-46.8	-50.8	966
16	4	0	0	270	-108	-116	209	210	-108	-117	-46.8	-50.7	96	96.1	-46.8	-50.8	966
17	4	0	0	308	-177	-190	134	134	-176	-191	-52.4	-58.3	87.4	87.5	-52.2	-58.6	963
18	4	0	0	345	-255	-273	76.1	76.2	-255	-274	-62.1	-70.2	87.1	87.1	-61.8	-70.6	960
19	4	0	0	382	-350	-373	37	37	-349	-374	-77.4	-87.7	96.6	96.6	-76.9	-88.3	956
20	4	0	0	420	-469	-497	21	21	-467	-498	-101	-113	120	120	-100	-114	952
21	5	0	0	420	3.31	2.84	21	21	2.84	3.31	-101	-114	377	377	-114	-101	952

Stress and Strain Results for Setup :

Thicknesses and Coordinates are in Millimetres
Stresses and Pressures are in kPa
Strains are in Microstrain
Applied Loads are in kN
Displacement is in Microns

Pavement Details

Layer No.	Thickness	Stiffness	Poisson		
1	40	3000	0.4	Default	Continuously Graded Asphalt
2	80	2300	0.44	Default	RSA Thick Asphalt Base Layer
3	150	3000	0.35	Default	C2 Cement Stabilized Material
4	150	300	0.35	Default	EG4 (equiv. granular) material in wet condition
5	150	50	0.35	Default	G9 subgrade Criterion

Load Setup Used : KSIA

Load No	Force	Pressure	X-Coord	Y-Coord
1	65	1000	0	0
2	65	1000	0	3000
3	65	1000	1600	0
4	65	1000	1600	3000

Stress and Strain Results (Eps denote strain and Sig denotes Stress. P1, P2 and P3 are the Principal Values. Negative denotes tension)

Pos.No.	Layer	X-Coord	Y-Coord	Z-Coord	SigXX	SigYY	SigZZ	SigP1	SigP2	SigP3	EpsXX	EpsYY	EpsZZ	EpsP1	EpsP2	EpsP3	DisplZ
1	1	0	0	0	1475	1520	1000	1520	1474	1000	156	177	-66	177	155	-66	1155
2	1	0	0	10	1312	1353	1000	1354	1311	1000	124	143	-22	143	123	-22	1155
3	1	0	0	20	1151	1189	999	1190	1150	999	91.9	110	21	110	91.6	21	1155
4	1	0	0	30	995	1030	993	1030	995	993	61.9	78.2	61.1	78.5	61.9	60.9	1155
5	1	0	0	39.9	849	881	981	981	881	848	34.7	49.5	96.6	96.6	49.7	34.4	1154
6	2	0	0	40	931	955	982	982	955	931	34.4	49.2	66.1	66.1	49.4	34.1	1154
7	2	0	0	60	729	748	936	936	749	729	-5.1	6.78	124	124	6.97	-5.3	1152
8	2	0	0	80	569	583	864	864	584	569	-29.5	-20.5	155	155	-20.4	-29.7	1149
9	2	0	0	100	448	458	771	771	458	448	-40.3	-34.2	162	162	-34	-40.4	1146
10	2	0	0	120	362	368	665	665	368	362	-39.9	-36.6	149	149	-36.5	-40	1143
11	3	0	0	120	177	185	664	664	185	177	-39.9	-36.6	179	179	-36.5	-40	1143
12	3	0	0	158	-47.7	-52.7	458	458	-47.7	-52.7	-63.2	-65.5	165	165	-63.2	-65.5	1137
13	3	0	0	195	-258	-275	281	281	-258	-275	-86.7	-94.4	156	156	-86.7	-94.4	1131
14	3	0	0	232	-492	-521	148	148	-492	-522	-120	-134	168	168	-120	-134	1125
15	3	0	0	270	-788	-830	81.1	81.1	-788	-830	-175	-194	216	216	-175	-194	1118
16	4	0	0	270	-39.6	-43.8	81.1	81.1	-39.6	-43.8	-176	-194	367	368	-176	-194	1118
17	4	0	0	308	-44	-49.1	61.2	61.2	-44	-49.1	-161	-184	312	313	-161	-184	1105
18	4	0	0	345	-51.5	-57.5	46.5	46.6	-51.5	-57.6	-159	-186	282	283	-159	-186	1094
19	4	0	0	382	-62.6	-69.5	36.4	36.5	-62.6	-69.6	-170	-201	276	276	-170	-201	1083
20	4	0	0	420	-78.1	-86	31	31	-78.1	-86.1	-196	-232	295	295	-196	-232	1073
21	5	0	0	420	0.88	-0.435	31	31	-0.435	0.88	-196	-232	617	617	-232	-196	1073

Stress and Strain Results for Setup :

Thicknesses and Coordinates are in Millimetres
Stresses and Pressures are in kPa
Strains are in Microstrain
Applied Loads are in kN
Displacement is in Microns

Pavement Details

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4	150	300	0.35	Default	EG4 (equiv. granular) material in wet condition
5	150	50	0.35	Default	G9 subgrade Criterion

Load Setup Used : KSIA

Load No	Force	Pressure	X-Coord	Y-Coord
1	65	1000	0	0
2	65	1000	0	3000
3	65	1000	1600	0
4	65	1000	1600	3000

Stress and Strain Results (Eps denote strain and Sig denotes Stress. P1, P2 and P3 are the Principal Values. Negative denotes tension)

Pos.No.	Layer	X-Coord	Y-Coord	Z-Coord	SigXX	SigYY	SigZZ	SigP1	SigP2	SigP3	EpsXX	EpsYY	EpsZZ	EpsP1	EpsP2	EpsP3	DisplZ
1	1	0	0	0	2661	2698	1000	2698	2661	1000	394	411	-381	411	394	-381	1443
2	1	0	0	10	2201	2233	991	2233	2200	991	304	319	-261	319	304	-261	1446
3	1	0	0	20	1760	1788	965	1789	1760	965	220	233	-152	233	220	-152	1448
4	1	0	0	30	1338	1362	923	1362	1338	923	141	153	-52.3	153	141	-52.3	1449
5	1	0	0	39.9	936	956	869	956	935	869	68.6	77.9	37.5	78.1	68.5	37.5	1449
6	2	0	0	40	973	988	869	988	973	869	67.9	77.1	2.63	77.3	67.7	2.63	1449
7	2	0	0	60	384	393	734	734	393	384	-48.5	-43.2	170	171	-43	-48.7	1447
8	2	0	0	80	-189	-187	588	588	-186	-190	-159	-157	327	327	-157	-159	1442
9	2	0	0	100	-778	-782	459	459	-778	-782	-277	-279	498	498	-277	-279	1434
10	2	0	0	120	-1415	-1425	379	379	-1415	-1425	-415	-421	708	708	-415	-421	1422
11	3	0	0	120	11.3	9.91	379	379	11.3	9.91	-416	-422	1238	1238	-416	-422	1422
12	3	0	0	158	-9.57	-12.1	299	299	-9.58	-12.1	-366	-378	1021	1021	-366	-378	1380
13	3	0	0	195	-24.4	-28.1	233	233	-24.4	-28.1	-321	-337	838	838	-321	-337	1345
14	3	0	0	232	-37.3	-42.2	181	181	-37.3	-42.2	-286	-308	694	695	-286	-308	1317
15	3	0	0	270	-50.7	-56.6	138	139	-50.7	-56.7	-264	-291	587	587	-264	-291	1293
16	4	0	0	270	-50.7	-56.7	138	138	-50.7	-56.7	-264	-291	587	587	-264	-291	1293
17	4	0	0	308	-66.1	-73.3	105	105	-66.1	-73.3	-257	-289	512	512	-257	-290	1272
18	4	0	0	345	-85.1	-93.5	78.7	78.7	-85.1	-93.5	-267	-304	471	471	-267	-304	1254
19	4	0	0	382	-110	-119	60	60	-110	-119	-296	-339	467	467	-296	-340	1236
20	4	0	0	420	-142	-153	49.6	49.6	-142	-153	-353	-401	509	509	-352	-402	1218
21	5	0	0	420	-1.43	-3.23	49.6	49.6	-3.23	-1.43	-353	-402	1024	1024	-402	-353	1218

APPENDIX D – SCHEDULE OF ESTIMATED QUANTITIES AND PRICES

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
13.00	CONTRACTOR'S ESTABLISHMENT ON SITE AND GENERAL OBLIGATIONS					
PS B13.01	Contractor's general obligations					
	(a) Fixed obligations	L/sum	1.0	1 000 000.00	1 000 000	00
	(b) Value-related obligations	L/sum	1.0	1 000 000.00	1 000 000	00
	(c) Time-related obligations	month	12.0	100 000.00	1 200 000	00
PS B13.02	Occupational Health and Safety Act and Construction Obligations					
	(a) Contractor's initial obligations in respect of the Occupational Health and Safety Act and Construction Regulations	L/sum	1.0	500 000.00	500 000	00
	(b) Submission of the Health & Safety File to the Employer complete, and to the satisfaction of the Employer	L/sum	1.0	10 000.00	10 000	00
	(c) Time-related obligations for the updating and mending the risk assessments, the safe work procedures, the project H&S file and the H&S plan, and for full compliance with all H&S matters during construction of the works under the contract.	month	12.0	50 000.00	600 000	00
Total Carried Forward To Summary					4 310 000	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
14.00	HOUSING, OFFICES AND LABORATORY FOR THE ENGINEER'S SITE PERSONNEL					
PS B14.01	Office and laboratory accommodation					
	(a) Offices (interior floor space only)	m²	18.0	1 500.00	27 000	00
14.02	Office and laboratory furniture					
	(a) Chairs	No	4.0	500.00	2 000	00
	(d) Desks, complete with drawers and locks	No	2.0	2 000.00	4 000	00
14.03	Office and laboratory fittings Installations and equipment					
	(a) Items measured by number					
	(11) Air conditioning units with 2,2 kW minimum capacity, mounted and with own power connection	No	2.0	5 000.00	10 000	00
	(14) General-purpose steel cupboards with shelves	No	1.0	500.00	500	00
	(15) Steel filing cabinets with drawers	No	1.0	500.00	500	00
	(17) Bookcases	No	2.0	500.00	1 000	00
	(c) Items measured by area					
	(8) Notice boards as specified	m²	2.0	200.00	400	00
14.04	Car ports					
	(a) Car ports, as specified, at offices and laboratory buildings	No	2.0	10 000.00	20 000	00
14.08	Services					
	(a) Services at office and laboratories					
	(1) Fixed costs	L/sum	1.0	10 000.00	10 000	00
	(2) Running costs	month	6.0	1 000.00	6 000	00
Total Carried Forward To Summary					81 400	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
15.00	ACCOMMODATION OF TRAFFIC					
PS B15.01	Accommodating traffic and maintaining temporary deviations	L/sum	1.0	200 000.00	200 000	00
Total Carried Forward To Summary					200 000	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
16.00	OVERHAUL					
16.01	Overhaul on material hauled in excess of a free-haul distance of 0,5 km for haul up to or through 1,0 km (restricted overhaul)	m^3	13 200.0	5.00	66 000	00
16.02	Overhaul on material hauled in excess of 1,0 km (ordinary overhaul)	m^3-km	65 700.0	5.00	328 500	00
Total Carried Forward To Summary					394 500	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
17.00	CLEARING AND GRUBBING					
17.01	Clearing and grubbing	ha	3.0	150 000.00	450 000	00
17.02	Removal and grubbing of large trees and tree stumps					
	(a) Girth exceeding 1m up to and including 2m	No	0.0	3 000.00	0	00
17.05	Cleaning out of hydraulic structures					
	(a) Pipes with an internal diameter up to and including 750 mm	m³	4.0	500.00	2 000	00
17.06	Removal and storage of selected vegetation:					
	(a) Cost of removal, storing, protection and replanting in a protected and fenced- off area of selected vegetation	Prov sum	1.0	20 000.00	20 000	00
	(b) Charge on provisional sum	%	20 000.00	10.00	2 000	00
Total Carried Forward To Summary					474 000	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
21.00	DRAINS					
21.01	Excavation for open drains:					
	(a) Excavating soft material situated within the following depth ranges below the surface level:					
	(1) 0 m up to 1,5 m	m³	340.0	200.00	68 000	00
	(2) Exceeding 1,5 m and up to 3,0 m	m³	1 630.0	300.00	489 000	00
	(b) Extra over subitem 21.01(a) for excavation in hard material, irrespective of depth	m³	220.0	1 000.00	220 000	00
21.02	Clearing and shaping existing open drains	m³	100.0	300.00	30 000	00
21.03	Excavation for subsoil drainage systems:					
	(a) Excavating soft material situated within the following depth ranges below the surface level:					
	(1) 0 m up to 1,5 m	m³	670.0	200.00	134 000	00
	(b) Extra over subitem 21.03(a) for excavation in hard material irrespective of depth	m³	80.0	300.00	24 000	00
21.04	Impermeable backfilling to subsoil drainage systems	m³	90.0	200.00	18 000	00
21.05	Banks and dykes	m³	1 000.0	200.00	200 000	00
21.06	Natural permeable material in subsoil drainage systems (crushed stone):					
	(b) Crushed stone obtained from commercial sources					
	(2) Coarse-Grade 19mm	m³	240.0	600.00	144 000	00
21.07	Natural permeable material in subsoil drainage systems (sand):					
	(b) Sand from commercial sources					
	(1) Coarse Grade 4.75mm	m³	60.0	500.00	30 000	00
21.08	Pipes in subsoil drainage systems:					
	(b) Unplasticised PVC pipes and fittings, normal duty complete with couplings					
	(1) 100 mm internal dia. perforated or slotted	m	1 330.0	120.00	159 600	00
	(2) 100 mm internal dia. unperforated	m	300.0	120.00	36 000	00
21.10	Synthetic-fibre filter fabric					
	(a) Type non-woven needle punched Grade A2 (Bidim or similar)	m²	2 780.0	20.00	55 600	00
Total Carried Forward					1 608 200	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
Brought Forward					1 608 200	00
21.12	Concrete outlet structures, manhole boxes, junction boxes and cleaning eyes for subsoil drainage systems:					
	(a) Outlet structures	No	5.0	2 000.00	10 000	00
21.17	Test flushing of pipe subsoil drains	No	5.0	1 000.00	5 000	00
Total Carried Forward To Summary					1 623 200	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
22.00	PREFABRICATED CULVERTS					
22.01	Excavation					
	(a) Excavating soft material situated within the following depth ranges below the surface level:					
	(1) 0 m up to 1.5 m	m³	180.0	200.00	36 000	00
	(b) Extra over subitem 22.01(a) for excavation in hard material, irrespective of depth	m³	20.0	300.00	6 000	00
22.02	Backfilling:					
	(a) Using the excavated material	m³	100.0	100.00	10 000	00
	(b) Using imported selected material	m³	70.0	300.00	21 000	00
	(c) Using coarse sand from commercial sources	m³	40.0	500.00	20 000	00
22.03	Concrete pipe culverts:					
	(a) On class A bedding					
	(2) 450mm dia. Type Spigot and Socket 100D	m	30.0	550.00	16 500	00
	(3) 600mm dia. Type Spigot and Socket 100D	m	30.0	700.00	21 000	00
22.07	Cast in situ concrete and formwork					
	(a) In class A bedding, screeds and the encasing for pipes, including formwork					
	(2) Class 30/19	m³	30.0	2 300.00	69 000	00
	(c) In inlet and outlet structures, skewed ends, catchpits, manholes, thrust and anchor blocks, excluding formwork but including class U2 surface finish					
	(1) Class 30/19	m³	20.0	2 500.00	50 000	00
	(d) Formwork of concrete under subitem 22.07(c) above					
	(2) Vertical formwork for F2 surface finish	m²	20.0	350.00	7 000	00
22.14	Removing and stacking existing prefabricated culverts (type and size indicated)					
	(a) Concrete, 600mm dia	m	20.0	200.00	4 000	00
22.18	Brickwork					
	(b) 230 mm thick	m²	200.0	1 000.00	200 000	00
	(c) 345 mm thick	m²	30.0	1 300.00	39 000	00
22.23	Service ducts:					
	(a) Ordinary pipes					
Total Carried Forward					499 500	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
Brought Forward					499 500	00
	(3) Unplasticised PVC pipes					
	(i) 110 mm dia.	m	220.0	150.00	33 000	00
	(iii) 160 mm dia.	m	220.0	200.00	44 000	00
22.24	Duct marker blocks					
	(a) Concrete as per drawing	No	20.0	500.00	10 000	00
PS B22.26	Hand excavation to determine the positions of existing services	m³	300.0	400.00	120 000	00
PS B22.29	Adjustments to existing stormwater infrastructure					
	(a) Convert exisitng stormwater catchpit to grid inlet with HD Cast-iron grid (Flat, 450 x 760 or similar) complete	No	1.0	10 000.00	10 000	00
	(b) Lower existing MH cover complete with new HD cast iron lid (Type 2A or similar)	No	1.0	10 000.00	10 000	00
Total Carried Forward To Summary					726 500	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
23.00	CONCRETE KERBING, CONCRETE CHANNELLING, CHUTES AND DOWNPIPES, AND CONCRETE LININGS FOR OPEN DRAINS					
23.02	Concrete kerbing-channelling combination					
	(c) Precast kerb to SABS 927 and cast in situ channel (concrete class 20/19)					
	(6) Figure 6 kerb	m	50.0	400.00	20 000	00
23.07	Trimming of excavations for concrete-lined open drains					
	(a) In soft material	m²	60.0	20.00	1 200	00
	(b) In hard material	m²	20.0	100.00	2 000	00
23.08	Concrete lining for open drains					
	(a) Cast in situ concrete lining class 25/19 for					
	(3) Trapezoidal					
	(i) 100mm thick to sides and base	m³	10.0	2 500.00	25 000	00
	(b) Class U2 surface finish to cast in situ concrete for					
	(3) Trapezoidal	m²	60.0	30.00	1 800	00
23.09	Formwork to cast in situ concrete lining for open drains (Class F2 surface finish)					
	(c) To ends of slabs	m²	10.0	300.00	3 000	00
23.10	Sealed joints in concrete linings of open drains					
	(a) Polysulphide sealants	m	30.0	100.00	3 000	00
23.12	Steel reinforcement					
	(a) Mild steel bars	t	0.1	15 000.00	1 500	00
	(b) High-tensile steel bars	t	0.1	15 000.00	1 500	00
	(c) Welded steel fabric	kg	280.0	200.00	56 000	00
23.13	Polyethylene sheeting (0,15 mm thick) for concrete-lined open drains	m²	60.0	20.00	1 200	00
Total Carried Forward To Summary					116 200	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
33.00	MASS EARTHWORKS					
33.01	Cut and borrow to fill, including free-haul up to 0.5km					
	(a) Soil or gravel material in compacted layer thickness of 200 mm and less:					
	(2) Compacted to 93% of modified AASHTO density (minimum G9)	m³	450.0	150.00	67 500	00
33.03	Extra over item 33.01 for excavating and breaking down material in:					
	(a) Intermediate excavation	m³	50.0	50.00	2 500	00
	(b) Hard excavation	m³	50.0	300.00	15 000	00
33.04	Cut to spoil, including free-haul up to 0,5 km. Material obtained from:					
	(a) Soft excavation	m³	9 100.0	150.00	1 365 000	00
	(b) Intermediate excavation	m³	1 670.0	200.00	334 000	00
	(c) Hard excavation	m³	840.0	700.00	588 000	00
33.07	Removal of unsuitable material (including free-haul of 0.5 km):					
	(a) In layer thicknesses of 200 mm and less:					
	(1) Stable material	m³	200.0	250.00	50 000	00
	(2) Unstable material	m³	200.0	300.00	60 000	00
	(b) In layer thicknesses exceeding 200mm					
	(1) Stable material	m³	400.0	250.00	100 000	00
	(2) Unstable material	m³	400.0	300.00	120 000	00
33.10	Roadbed preparation and the compaction of material					
	(a) Compaction to 93% of modified AASHTO density	m³	1 850.0	100.00	185 000	00
33.12	In situ treatment of roadbed:					
	(a) In situ treatment by ripping	m³	190.0	100.00	19 000	00
33.13	Finishing-off cut and fill slopes, medians and interchange areas:					
	(a) Cut slopes	m²	6 000.0	20.00	120 000	00
	(b) Fill slopes	m²	6 000.0	20.00	120 000	00
	(c) Medians and interchange areas	m²	2 000.0	20.00	40 000	00
Total Carried Forward					3 186 000	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
Brought Forward					3 186 000	00
33.14	Extra over item 33.01 for excavating material from the pavements and fills of existing roads:					
	(a) Non-cemented material	m³	60.0	50.00	3 000	00
	(b) Cemented material	m³	60.0	100.00	6 000	00
PS B33.20	Temporary backfilling and re-excavation of works areas within restricted airside areas	m³	500.0	500.00	250 000	00
PS B33.21	Trimming of areas to create a temporary 1:100 deviation from grade batter within restricted airside areas	m²	15 000.0	20.00	300 000	00
Total Carried Forward To Summary					3 745 000	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
34.00	PAVEMENT LAYERS OF GRAVEL MATERIAL					
34.01	Pavement layers constructed from gravel taken from cut or borrow, including free haul up to 1,0 km					
	(a) Gravel selected layer compacted to:					
	(1) 95% of modified AASHTO density, 150mm thick G7	m³	1 700.0	400.00	680 000	00
	(2) 95% of modified AASHTO density, G7 infill below shoulders / verges in 150mm thick layers	m³	450.0	600.00	270 000	00
	(f) Gravel base (chemically stabilized material) compacted to:					
	(2) 97% of modified AASHTO density, 150mm using G4	m³	2 700.0	800.00	2 160 000	00
	(g) Gravel shoulder compacted to:					
	(2) 95% of modified AASHTO density, 150mm G5	m³	250.0	600.00	150 000	00
	(h) Gravel wearing course coompacted to:					
	(2) 95% of modified AASHTO density, 200mm G6	m³	350.0	600.00	210 000	00
34.11	Watering the pavement excavation floor	kℓ	70.0	500.00	35 000	00
B34.14	Extra over item 33.10 for make up of deficiency or levelling of roadbed by addition of G5 material	m³	900.0	500.00	450 000	00
Total Carried Forward To Summary					3 955 000	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
35.00	STABILIZATION					
35.01	Chemical stabilization extra over unstabilized compacted layers					
	(b) Sub-base					
	(2) 150mm thickness (stabilsed G4, with 5% cement by mass)	m³	2 680.0	100.00	268 000	00
35.02	Chemical stabilizing agent:					
	(a) Ordinary portland cement	t	70.0	1 500.00	105 000	00
35.04	Provision and application of water for curing	kℓ	450.0	500.00	225 000	00
35.05	Curing by covering with the subsequent layer	m²	13 000.0	20.00	260 000	00
PS B35.14	Extra over 35.05 for curing by covering with the temporary layer	m²	4 000.0	20.00	80 000	00
PS B35.15	Trial sections for working in resticted zones	m	60.0	1 000.00	60 000	00
PS B35.16	Working in the restricted zone	m	600.0	400.00	240 000	00
Total Carried Forward To Summary					1 238 000	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
41.00	PRIME COAT					
41.01	Prime coat:					
	(b) MSP-1	litre	10 000.0	15.00	150 000	00
Total Carried Forward To Summary					150 000	00

KSIA EMERGENCY ACCESS ROADS - FAST TRACK PHASE

SCHEDULE A

SECTION 4200

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
42.00	ASPHALT BASE AND SURFACING					
42.01	Asphalt base					
	(a) Using 80/100 pen. bitumen					
	(1) Continuously graded (maximum size 26,5 mm)					
	(i) 80 mm thick	m²	8 000.0	400.00	3 200 000	00
42.02	Asphalt surfacing (state specified thickness and type of bitumen)					
	(a) Continuously graded					
	(2) Medium graded					
	(iv) 40 mm thick	m²	7 700.0	250.00	1 925 000	00
42.04	Tack coat of 30% stable-grade emulsion	litre	8 300.0	20.00	166 000	00
42.05	Binder variations					
	(a) Penetration grade bitumens	t	1.0	100.00	100	00
42.08	100 mm cores in asphalt paving	No	50.0	500.00	25 000	00
Total Carried Forward To Summary					5 316 100	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
51.00	PITCHING, STONEWORK AND PROTECTION AGAINST EROSION					
51.01	Stone pitching:					
	(b) Grouted stone pitching	m²	50.0	300.00	15 000	00
51.05	Concrete edge beams					
	(a) Class 20/38	m³	4.0	1 000.00	4 000	00
51.07	Foundation trenches	m³	4.0	200.00	800	00
Total Carried Forward To Summary					19 800	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
52.00	GABIONS					
52.01	Foundation trench excavation and backfilling:					
	(b) In all other classes of materials	m³	280.0	200.00	56 000	00
52.02	Surface preparation for bedding the gabions	m²	780.0	20.00	15 600	00
52.03	Gabions:					
	(b) PVC-coated gabion boxes					
	(3) 1,0 m wide by 1,0 m high					
	(ii) by 2,0 m long mesh 80mm 2.7mm galavanised wire	m³	60.0	2 000.00	120 000	00
	(d) PVC-coated gabion mattresses					
	(2) 0,6 m diaphragm spacing, 6,0 m long by 2,0 m wide					
	(i) by 0,23 m deep mesh 80mm 2.7mm galavanised wire	m³	110.0	2 300.00	253 000	00
52.05	Filter fabric					
	(b) Synthetic-fibre, non-woven needle punched Grade A4 (Bidim or similar)	m²	930.0	30.00	27 900	00
Total Carried Forward To Summary					472 500	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
54.00	GUARDRAILS					
54.01	Guardrails on timber posts:					
	(a) Galvanised	m	100.0	500.00	50 000	00
54.03	Extra over items 54.01, 54.02 and 54.11 for horizontally curved guardrails factory bent to a radius less than 45m	m	30.0	100.00	3 000	00
54.04	End treatments:					
	(a) End wings	No	6.0	700.00	4 200	00
54.05	Additional guardrail posts:					
	(a) Timber	No	20.0	350.00	7 000	00
54.06	Reflective plates	No	25.0	50.00	1 250	00
54.07	Removing existing guardrails	m	25.0	100.00	2 500	00
54.09	Re-erection of guardrails with recovered and/or new material:					
	(a) Single guardrail	m	25.0	100.00	2 500	00
54.10	Re-erection of end treatments with recovered material:					
	(a) End wings	No	1.0	50.00	50	00
54.11	New material required for the re-erection of guardrails with recovered materials:					
	(b) Timber posts	No	10.0	100.00	1 000	00
	(d) Reflective plates	No	5.0	50.00	250	00
	(e) Spacer blocks	No	10.0	20.00	200	00
	(f) Splice bolt complete with nut and washer	No	5.0	10.00	50	00
	(g) Post bolt complete with nut and washer	No	10.0	10.00	100	00
	(h) Reinforcing plates	No	5.0	10.00	50	00
Total Carried Forward To Summary					72 150	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
55.00	FENCING					
55.01	Clearing the fence line, 2m wide strip	km	0.1	10 000.00	1 000	00
PS B55.10	Fencing and gates by specialist fencing contractor					
	(a) Emergency Gate 1: Raise existing gate and adjacent fence panels by up to 200mm to match new road levels	Prov sum	1.0	20 000.00	20 000	00
	(b) Realign existing security fencing and add new double leaf gate crossing the Northern Road	Prov sum	1.0	50 000.00	50 000	00
	(c) Contractor's mark-up on (a) and (b)	%	70 000.0	0.00	0	00
Total Carried Forward To Summary					71 000	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
56.00	ROAD SIGNS					
56.01	Road sign boards with painted or coloured semi-matt background. Symbols, lettering and borders in semi-matt black or in Class 1 retro-reflective material, where the sign board is constructed from:					
	(e) Aluminium sheet regulatory warning and information signs					
	(1) Octagonal					
	(i) 610 mm	No	10.0	4 000.00	40 000	00
	(2) Triangular					
	(i) 900 mm side	No	9.0	3 000.00	27 000	00
	(3) Round					
	(i) 600 mm	No	4.0	2 500.00	10 000	00
	(4) Rectangular					
	(i) 200 mm wide x 800 mm high (Type W401/ W402)	No	10.0	1 000.00	10 000	00
	(ii) 2700 mm wide x 450mm high (Type W410 - split into 2 x 1350mm lengths and mounted on gates)	No	6.0	5 000.00	30 000	00
	(iii) 2700 mm wide x 450mm high (Type W409)	No	1.0	5 000.00	5 000	00
	(iv) 450 mm wide x 450mm high (Type W405 / W406)	No	20.0	1 000.00	20 000	00
56.03	Road sign supports (overhead road sign structures excluded):					
	(c) Timber					
	(1) 100 mm dia.	m	50.0	100.00	5 000	00
	(2) 150 mm dia.	m	150.0	150.00	22 500	00
56.05	Excavation and backfilling for road sign supports (not applicable to kilometre posts)	m^3	20.0	200.00	4 000	00
56.08	Dismantling, storing and re-erecting road signs with a surface area of:					
	(a) Up to 2 m^2	No	4.0	500.00	2 000	00
Total Carried Forward To Summary					175 500	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
57.00	ROAD MARKINGS					
57.02	Retro-reflective road marking paint:					
	(a) White lines (broken or unbroken)					
	(1) 100 mm wide	km	1.5	10 000.00	15 000	00
	(2) 150 mm wide	km	0.2	15 000.00	3 000	00
	(4) 300 mm wide	km	0.2	30 000.00	6 000	00
	(b) Yellow lines (broken or unbroken)					
	(1) 100 mm wide	km	0.2	10 000.00	2 000	00
	(2) 150 mm wide	km	0.2	15 000.00	3 000	00
	(c) Red lines (broken or unbroken) (width of line indicated)					
	(2) 150 mm wide	km	0.2	15 000.00	3 000	00
	(d) White lettering and symbols	m²	23.0	500.00	11 500	00
	(e) Yellow lettering and symbols	m²	5.0	500.00	2 500	00
	(f) Transverse lines, painted island and arrestor bed markings (any colour)	m²	20.0	500.00	10 000	00
57.04	Variations in rate of application:					
	(a) White paint	litre	100.0	100.00	10 000	00
	(b) Yellow paint	litre	10.0	100.00	1 000	00
	(c) Red paint	litre	10.0	100.00	1 000	00
	(d) Retro-reflective beads	kg	10.0	50.00	500	00
57.05	Road studs					
	(b) Bi-directional					
	(1) Stimsonite or similar	No	100.0	500.00	50 000	00
57.06	Setting out and premarking the lines (Excluding traffic-island markings, lettering and symbols)	km	2.5	1 000.00	2 500	00
57.07	Re-establishing the painting unit at the end of the maintenance period	L/sum	1.0	5 000.00	5 000	00
57.08	Removal of existing, temporary or permanent road markings by:					
	(a) Sandblasting	m²	10.0	500.00	5 000	00
57.09	Removal of existing roadstuds	No	5.0	100.00	500	00
Total Carried Forward To Summary					131 500	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
58.00	LANDSCAPING AND PLANTING PLANTS					
58.01	Trimming					
	(a) Machine trimming	m²	10 000.0	10.00	100 000	00
	(b) Hand trimming	m²	5 000.0	20.00	100 000	00
58.03	Preparing the areas for grassing:					
	(b) Scarifying for loosening topsoil	ha	15 000.0	5.00	75 000	00
	(c) Topsoiling within the road reserve, where the following materials are used:					
	(1) Topsoil obtained from within the road reserve or borrow areas (free haul 1,0 km)	m³	1 200.0	50.00	60 000	00
	(f) Stockpiling of topsoil (free-haul 1,0 km)	m³	1 200.0	50.00	60 000	00
58.04	Grassing:					
	(a) The planting of grass cuttings					
	(1) Kweek grass (Cynodon Dactolyn)	ha	1.0	2 000.00	2 000	00
	(b) Sodding by using the following types of sods:					
	(3) Kweek grass (Cynodon Dactolyn) sods	m²	1 000.0	20.00	20 000	00
	(c) Hydroseeding:					
	(3) Hydroseeding (Cynodon Dactolyn)	ha	2.0	10 000.00	20 000	00
58.05	Watering the grass when established by topsoiling only	kℓ	100.0	500.00	50 000	00
PS	Installation of shade netting over newly planted areas	m²	50.0	1 000.00	50 000	00
Total Carried Forward To Summary					537 000	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
59.00	FINISHING THE ROAD AND ROAD RESERVE AND TREATING OLD ROADS					
59.01	Finishing the road and road reserve:					
	(b) Single carriageway road	km	1.5	10 000.00	15 000	00
59.02	Treatment of old roads and temporary deviations	km	0.2	5 000.00	1 000	00
Total Carried Forward To Summary					16 000	00

KSIA EMERGENCY ACCESS ROADS - FAST TRACK PHASE

SCHEDULE A

SECTIN 2100

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
81.00	TESTING MATERIALS AND WORKMANSHIP					
81.02	Other special tests requested by the engineer	Prov sum	1.0	100 000.00	100 000	00
Total Carried Forward To Summary					100 000	00

Number	Item Description	Unit	Quantity	Rate	Amount	
					R	c
84.00	PAINTING					
PS 84.01	Painting:					
	(a) Marking of obstacles in accordance with ICAO requirements	m²	250.0	100.00	25 000	00
Total Carried Forward To Summary					25 000	00

KSIA EMERGENCY ACCESS ROADS - FAST TRACK PHASE
SCHEDULE A

SUMMARY OF SECTIONS

Section	Description	Amount (Rand)
1300	CONTRACTOR'S ESTABLISHMENT ON SITE AND GENERAL OBLIGATIONS	4 310 000.00
1400	HOUSING, OFFICES AND LABORATORY FOR THE ENGINEER'S SITE PERSONNEL	81 400.00
1500	ACCOMMODATION OF TRAFFIC	200 000.00
1600	OVERHAUL	394 500.00
1700	CLEARING AND GRUBBING	474 000.00
2100	DRAINS	1 623 200.00
2200	PREFABRICATED CULVERTS	726 500.00
2300	CONCRETE KERBING, CONCRETE CHANNELLING, CHUTES AND DOWNPIPES, AND CONCRETE LININGS FOR OPEN DRAINS	116 200.00
3300	MASS EARTHWORKS	3 745 000.00
3400	PAVEMENT LAYERS OF GRAVEL MATERIAL	3 955 000.00
3500	STABILIZATION	1 238 000.00
4100	PRIME COAT	150 000.00
4200	ASPHALT BASE AND SURFACING	5 316 100.00
5100	PITCHING, STONEWORK AND PROTECTION AGAINST EROSION	19 800.00
5200	GABIONS	472 500.00
5400	GUARDRAILS	72 150.00
5500	FENCING	71 000.00
5600	ROAD SIGNS	175 500.00
5700	ROAD MARKINGS	131 500.00
5800	LANDSCAPING AND PLANTING PLANTS	537 000.00
5900	FINISHING THE ROAD AND ROAD RESERVE AND TREATING OLD ROADS	16 000.00
2100	TESTING MATERIALS AND WORKMANSHIP	100 000.00
8400	PAINTING	25 000.00
Total Carried Forward To Summary Of Schedules		23 950 350.00

APPENDIX C

PUBLIC PARTICIPATION DOCUMENTATION

ADVERT AND PLACEMENT OF SITE NOTICES

Legals

701 Court Orders

INKANTOLO ENKULU YASENINGIZIMU AFRIKA ESIFUNDAZWENI SASE MGUNGUNDLOVU

Case No. 2305/18

Ziyishumi nambili kuMbasa [12/04/2018], Onyakeni ka 2018. Ngaphansi komhlonishwa uMnumzane Justice Seegobin.

Nofake isicelo **uNkosikazi Ntimbilezi Mbanjwa.**

Phezu kokufundwa kwesaziso kanye neminye imibhalo ewubufakazi obugcinilwe, nanga phezu kweminyakazo yomele unkosikazi Ntimilezi Mbanjwa kuye kwanqunywa ukuthi:

1.Kuye kwakhishwa umthetho obiza bonke abahlobene nomnumzane Mbanjwa ukuba bavele phambi kwenkantolo mhla zingamashumi amabili nesishiyaga lombili [28/06/2018] enyangeni kanhlangulana, isikhathi ligamenexe elesishiyaga lolunye [09:30]. Noma-ke maduze emveni kwalokho ummeli kuyomele achaze ukuthi yingani kungafanele sivunyelwe lesisinqumo.

1.1.Ngoku kholelwa ukuthi ukufa kukwa-Mhlalwa Mbanjwa, izinombolo eikamazisi wakhe 400904 5423 081 washona ngonyaka ka 1997.

2.Izimfanekiso (Amakhophi) zalomyalelo kumele zimenyezelwe

2.1.Ngezi - noma ngemuva mhla zingamashumi amathathu nanye kunhlaba [31/05/2018]

2.2.Kanye kwi-Government Gazette

2.3.Kabili kwi-Daily News ekhishwa ethekwini nejikeleza endaweni yasethekwini ngolimi lwesizulu

3.Esikhangisweni esisiveze ephephandabeni i-Daily News esigabeni sesibili kuya kwesesithaththu kwalesisinqumo ngizongenelela ezinsukwini ezingengaphansi kweziyisikhombisa ngaphambi kosuku olubekiwe.

Ngesinqumo esigunyazwe yinkantolo.

R J JOOSTE
UMBHALISI

MOONEY FORD ATTORNEYS, 7TH Floor, Permanent Building, 343 Anton Lembede Street, Durban 4001. Tel 031 3049881 Ref: K Padayachee/SM/M8617

702 Creditors/ Debtors

In the Estate of the Late Mnikizeni Paulos Butelezi, Id. No. 321011 0148 089, Date of death 22/7/2014, Last Address 5171 Manqele Road, Lamontville and Surviving spouse Thembekile Ellen Butelezi, Id. No. 251126 5099 089, Estate No. 011969/2017

Creditors and Debtors in the above Estate are hereby required to file their claims with and pay debts to the undersigned within 30 days from the the date of publication hereof. Dated at Durban this 16th day of March 2018

MDLEDLE INCORPORATED
501 The Marine, 22 Dorothy Nyembe Stree, Durban1

In the Estate of the late: THOKOZILE IVY MKHUMANE. Identity number: 481224 0546 089. Date of birth: 1948/12/24 Date of death: 2003/04/07. Address: P. O. BOX 7036, ULUNDI, 3838 Surviving spouse: N/A Identity number: N/A. ESTATE NO: 014952/2017

CREDITORS and DEBTORS in the above Estate are hereby required to file their claims with and pay debts to the undersigned within 30 Days from the date of publication hereof.

Dated at ULUNDI this 11TH Day of MAY 2018.

Attorneys/ Agents.
N.T SIBIYA ATTORNEYS
FAIRBREEZE OFFICE PARK,
SECTION 1 B
PO BOX 7036
ULUNDI, 3838
TEL:035 870 3320

In the Estate of the late ELIZABETH NOMAGUGU ZIKALI. Id No: 540916 0262 08 3. Date of death: 2014/07/01. Address: NYATHINI RESERVE, MACAMBINI, NYONI, 3802. Surviving spouse: BHEKUYISE ISAAC ZIKALI. Id No: 5104145275082. Estate No:005473/2018 DBN

CREDITORS and DEBTORS in the above Estate are hereby required to file their claims with and pay debts to the undersigned within Thirty (30) Days from the date of publication hereof.

Dated at DURBAN this 18TH Day of MAY 2018

Attorneys/ Agents .
DM GOVENDER
ATTORNEYS
P O BOX 5528
DURBAN
4000
TEL: 031 307 7911

702 Creditors/ Debtors

In the Estate of the late ZANDILE PATIENCE ZUNGU. Id No: 730629 0379 08 4. Date of death: 2014/10/01. Address H72, 43 IPHOTHWE STREET, ESIKHAWINI, 3887. Surviving spouse: N/A. Id No: N/A. Estate No: 005471/2018 DBN

CREDITORS and DEBTORS in the above Estate are hereby required to file their claims with and pay debts to the undersigned within Thirty (30) Days from the date of publication hereof.

Dated at DURBAN this 18TH Day of MAY 2018

Attorneys/ Agents.
DM GOVENDER
ATTORNEYS
P O BOX 5528
DURBAN
4000
TEL: 031 307 7911

703 First/Final Notices

In the Estate of the Late THULANI CHRISTOPHER DUBE, Id No: 681225 6483 084, Date of death: 22 OCTOBER 2017 Address: 8 HYSLOP STREET, PIETERMARITZBURG, KZN Surviving Spouse: NOKUBONGA PARMMELA DUBE. Id No: 811029 0576 080. Estate No. 8972/2017/PMB

The Liquidation and Distribution Account in the above Estate will lie for inspection at the office of the Master of the High Court Pietermaritzburg (and at the office of the Magistrate at Pietermaritzburg) for a period of three weeks from the date of publication hereof.

Dated at Pietermaritzburg on this 16th day of MAY 2018

SIVA CHETTY & COMPANY
378 Longmarket Street, Pietermaritzburg, 3201.
Ref: ESTD72

In the Estate of the Late ELSIE NTOMBININGI KUBHEKA, Id No: 640327 0712 086, Date of death: 10 JANUARY 2018 Address: 38 VAALBANK, VRYHEID, KZN Surviving Spouse: JEFFREY BHEKINKOSI KUBHEKA. Id No: 580917 5550 085 Estate No. 1212/2018/PMB

The Liquidation and Distribution Account in the above Estate will lie for inspection at the office of the Master of the High Court Pietermaritzburg (and at the office of the Magistrate at Pietermaritzburg) for a period of three weeks from the date of publication hereof.

Dated at Pietermaritzburg on this 11th day of MAY 2018

SIVA CHETTY & COMPANY
378 Longmarket Street, Pietermaritzburg, 3201.
Ref: ESTK64

In the Estate of the late: MTUSENI MVUSELELO THOKOZANI MGEYANE, Id. No. 640618 5510 081, Date of death 06 DECEMBER 2013, Address: HOUSE NO. 1426, ILFRACOMBE AREA 3, UMKOMAAS, 4200 Surviving Spouse: N/A, Id No: N/A Estate No: 15211/2015 DBN

The AMENDED First and Final Liquidation and Distribution Account in the above Estate will lie for inspection at the office of the Master of the High Court DURBAN (and at the office of the Magistrate at SCOTTBURGH MAGISTRATE'S COURT) for a period of three weeks from the date of publication hereof. Dated at DURBAN this 21st Day of MAY 2018

SIZA KHUMALO ATTORNEYS
Suite 307, Doone House, 3rd Floor, 379 Anton Lembede (Smith) Street,
Durban 4001
P.O. BOX 3060,
DURBAN 4000
Tel: (031) 305 3262/7488
Fax: 0313057741
Email: nelim@sizakhumalo attorneys.co.za

In the Estate of the Late INDERPAUL RAMANANEN, Id No: 640913 5150 081, Date of death: 9TH SEPTEMBER 2017 Address: FLAT 10 STRAWBERRY FIELDS, 36 COLLEGE ROAD, PIETERMARITZBURG Surviving Spouse: MAYADEVI RAMANANEN. Id No: 680221 0215 086. Estate No. 7354/2017/PMB

The Liquidation and Distribution Account in the above Estate will lie for inspection at the office of the Master of the High Court Pietermaritzburg (and at the office of the Magistrate at Pietermaritzburg) for a period of three weeks from the date of publication hereof.

Dated at Pietermaritzburg on this 17th day of MAY 2018

SIVA CHETTY & COMPANY
378 Longmarket Street, Pietermaritzburg, 3201.
Ref: ESTR86

703 First/Final Notices

In the Estate of the late: CHERYL PRECIOUS HLENGIWE ZWANE. Id No: 610610 052 2084. Date of death: 05/26/2001. Address: 92 COURTTOWN, CRESCENT, AVOCA. HILLS, DURBAN. Surviving spouse: THULASIZWE EARNEST ZWANE. Id No: 591103 5668 089. ESTATE NO:2018/2012

The Account in the above Estate will lie for inspection at the office of the Master of the High Court and at the office of the Magistrate at UMLAZI for a period of three weeks from the date of publication hereof.

Dated at Durban on this 18th day of May 2018

M MBATHA ATTORNEYS
SUITE 903
SANGRO HOUSE
417 ANTON LEMBEDE STREET
DURBAN
031 301 1287 (T)
mduduzi@ mmbathaattorneys.co.za
086 643 5012(F)

711 Public Notices

RE: S.C. MKIZE
CURATORSHIP REF: CR000049/2015DBN

Notice is hereby given that THULANI BHEKINKOSI NKOSI of c/o NKOSI AND ASSOCIATES, 607 Perm Building, 343 Anton Lembede Street, Durban has been appointed as Curator to administer the property of Sipo Clement Mkize, whose date of birth is 05 June 1936. Further take notice that he was appointed as such as per Letters of Curatorship issued on the 08 March 2018.

MASTER OF THE
HIGH COURT, DURBAN

711 Public Notices

RE: S.W. NXUMALO
CURATORSHIP REF: CR000056/2017DBN

Notice is hereby given that THULANI BHEKINKOSI NKOSI of c/o NKOSI AND ASSOCIATES,607 Perm Building, 343 Anton Lembede Street, Durban, has been appointed as Curator to administer the property of Sanele Webster Nxumalo in terms of Mental Health Care Act 17 of 200, whose date of birth is 21 February 1998. Further take notice that he was appointed as such as per Letter of Curatorship issued on the 26 July 2017.

MASTER OF THE
HIGH COURT DURBAN

711 Public Notices

711 Public Notices

ANNEXURE D

NOTICE TO DISPLAY INTENTION TO APPLY FOR LIQUOR LICENCE IN TERMS OF SECTION (42)(1)(b)(iii) OF ACT
KwaZulu-Natal Liquor Licensing Act, 2010 (Act No. 6 of 2010)

KZNLA 3

(To be displayed in a prominent place at the proposed premises USING A NOTICE BOARD 1 m x 1 m in size)

Name and surname of the applicant:
DUMISANI ELVIS KUNENE
Category of licence applied for: (on-/off-consumption/micro-manufacturer/special event):
ON - CONSUMPTION
Type of premises for which licence is applied for:
RESIDENTIAL
Trading name of the premises:
ENKOMENI PALACE
Address of the premises:
ENKOMENI PALACE, LOT 2166 LANGALIBALELE STREET, 16 STREET 122693, INANDA, 4310
Date of display:
25 MAY 2018
Expiry date of display:
22 JUNE 2018

NB: Objections should be lodged with the local committee in the district from where the application emanates within 21(working) days from the date of the display.
Address: KZN Liquor Authority, The Marine Building, 1st Floor, 22 Dorothy Nyembe Street, Durban, 4001

ISAZISO SOKUCELWA KWEMVUME EMNYANGWENI WEZEMVELO
King Shaka International Airport, La Mercy, Kwazulu Natal

Umphakathi uyaziswa ngesicelo esifakiwe ngaphansi komthetho wama EIA Regulations, abuyekeziwe ngo 2014 (ngokuka Chapter 6 womthetho owaziwa ngokuthi yi- National Environmental Management Act, 107 wango 1998) ukuthi isicelo sokuthola imvume ngokwezemvelo sizofakwa emnyangweni wezeMvelo (DEA).

Ikampani i-Geomeasure Group (Pty) Ltd iqashwe inkampani yezokundiza yalapha e Ningizimu Afrika (ACSA) ukuba yenze isicelo ngokwezemvelo mayelana nomgwaqo ohlelwayo esikhumulweni sezindiza i- King Shaka eyakhiwe endaweni yase La Mercy. Lomgwaqo uzokwakhiwa eningizimu yesikhumulo ukuze ukwazi ukusetshenziswa uma kunesimo esiphuthumayo khona esikhumulweni.

Lomgwaqo uhlelwa ukuba ube ngamamitha ayisithupha (6m) ububanzi, bese uba ngamamitha amakhulu amathathu namashumi amabili (320m) ubude. Usozuka ngaphakathi kwisikhumulo ku Runway 06 bese uphela kumgwaqo obizwa nge Dube Boulevard. Lomgwaqo uzokwazi ukumelana nesisindo esingamathani angu 80 uphinde uqondane nesango lezimo eziphuthumayo (Gate 3).

Indawo: Isikhumulo sezindiza i- King Shaka International Airport itholakala ku King Shaka Drive endaweni yase La Mercy. Ama-coordinates ngu 29°36'34.72" S Kanye no 31°07'00.72" E.

Imininingwane yesicelo: Lomsebenzi wokwakhiwa ohleliwe uthinta imisebenzi ebhalwe ku Listing 1 (GNR 983) nokungunamba 12, 19 no 61, ngaloku ke, kumele kwenziwe isicelo ngokulandela imibandela ebhalwe ku GNR 982 (Ingxenye 1) kuma 2014 EIA Regulations (abuyekeziwe).

Uma uthanda ukuthola ulwazi olwengeziwe ngalesi sicelo noma ufisa ukuba ubhalise njengomuntu othanda ukwazi okwenzekayo ngokuqhubeka kwalesi sicelo uyanxuswa ukuba uthintane no Vicki King nge posi, feksi noma nge imeyili okubhalwe ngezansi, engakapheli amasonto amane kuphume lesisaziso.

Geomeasure Group
PO Box 1194
Hillcrest
3650
Ucingo: 031 765 1900
ifeksi: 031 765 1935
Imeyili : vicki@geomeasuregroup.co.za

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713 Sale In Execution

IN THE MAGISTRATE'S COURT FOR THE DISTRICT OF UMZIMKHULU HELD AT UMZIMKHULU

CASE NO.04/15

In the matter between:

JONGINKOSI LENFORD ZONGWANA
EXECUTION CREDITOR
AND
MEC FOR TRANSPORT, KZN
1ST EXECUTION DEBTOR
MEC FOR DOJ & CD, KZN
2ND EXECUTION DEBTOR

NOTICE OF SALE (AUCTION)

In pursuance of a judgment in the Magistrates' court for the District of uMzimkhulu held at uMzimkhulu.

In the above mentioned case and by virtue of a writ of Execution issued therefrom, the goods listed hereunder will be sold by the Sheriff by public Auction to the highest bidder at sheriff's office at **Stall 4, uMzimkhulu Tourist Centre, Gate way, 223 Main Road uMzimkhulu on the 31st day of May 2018 at 11h00.**

SALES ARE FOR CASH ONLY.

GOODS TO BE SOLD:-
1 X NISSAN NP 300 KZN 12561

AND TAKE A NOTICE FURTHER THAT:

1. This sale is a sale in execution pursuant to a judgment obtained in the above court.

2. The rules of this auction and a full advertisement is available 24 hours before the auction at the offices of the Sheriff for uMzimkhulu, **Stall 4, uMzimkhulu Tourist Centre, Gate way, 223 main Road, uMzimkhulu.**

3.Registration as a buyer is a pre-requisite subject to specific conditions, inter alia:

(a)Directive of the Consumer Protection Act 68 of 2008.
(b)FICA-Legislation i.r.o proof of Identity.
(c)Payment of a registration fee of R1500-00 in cash.
(d)Registration conditions

The office of the Sheriff for UMzimkhulu will conduct the sale.

Advertising costs at a current publication rates and sale cost according to Court Rules apply.

DATED AT UMZIMKHULU THIS 30th DAY OF APRIL 2018

EXECUTION CREDITOR'S ATTORNEYS
ZAKUZA, MZOLISI & ASSOCIATES
OFFICE NO.3
DR MLISANA BUILDING
50 MAIN STREET
UMZIMKHULU
TEL/FAX: 039 2590 564
E-MAIL: mzolisizakuza@yahoo.co.uk
REF: MZ/NPN/E-38

714 Sale Of Business

NOTICE OF SALE OF BUSINESS

Notice is hereby given in terms of Section 34 of the Insolvency Act, No 24 of 1936, as amended, that ABH Trading (Pty) Ltd, Reg No. 2012/204458/07, carrying on as a hardware retailer at Shop 3 AM Centre, 12 Chestnut Crescent, Mariannhill, Durban, 3604, intends transferring the said business and assets used in the conduct of the business, after 30 days from publication here-of, to JD Corp (Pty) Ltd, Reg No. 2017/252000/07, which will there after carry on the said business at the same address, for its own account and benefit.

ILUMINA ACCOUNTING
6/8 Royal Palm Boulevard
Umhlanga
Gateway
4319
Tel: 0824900285
Ref: AAK Moolla

711 Public Notices

714 Sale Of Business

NOTICE OF SALE OF BUSINESS

Notice is hereby given in terms of Section 34 of the Insolvency Act, No 24 of 1936, as amended, that Palace Base Trading CC, Reg No. 1990/036834/23, carrying on as a hardware retailer at 44 Main Street, Umzimkhulu, 3297, intends transferring the said business and assets used in the conduct of the business, after 30 days from publication here-of, to Eagle Discount Hardware and Furnitures CC, Reg No. 2005/095752/23, which will there after carry on the said business at the same address, for its own account and benefit.

ILUMINA ACCOUNTING
6/8 Royal Palm Boulevard
Umhlanga
Gateway
4319
Tel: 0824900285
Ref: AAK Moolla

716 Town Planning

eTHEKWINI MUNICIPALITY CENTRAL REGION

Notice is hereby given that application has been made to the eThekwini Municipality in terms of Chapter 9 the eThekwini Municipality Planning and Land Use Management By-Law 2017 (Municipal Notice 114 of 2017) for :

THE AMENDMENT OF THE DURBAN SCHEME BY REZONING OF THE FOLLOWING SITES : PORTION 16 OF ERF 3417 DURBAN NORTH; PORTION 15; PORTION 18; PORTION 19; PORTION 22; AND PORTION 23 (ALL OF ERF 3417) DURBAN NORTH, SITUATED AT 166 BAILEY ROAD; 1229; 1233; 1235; AND 1237 (ALL SITUATED AT) CHRIS HANI ROAD FROM SPECIAL RESIDENTIAL 650 TO GENERAL RESIDENTIAL 1 ZONE.

A copy of the application and its accompanying documents will be open for inspection by interested members of the public between the hours of 08h00 and 12h30 Mondays to Fridays (excluding Public Holidays) at the offices of the Land Use Management Branch.

Members of the public are invited to lodge written comments by 6th July 2018 as follows :

1. **By hand to the Regional Co-Ordinator : Central Region, Land Use Management Branch, Ground Floor, 166 KE Masinga Road, Durban, or by registered post to P O Box 680, Durban, 4000, or by Fax to 031-3117859, or by email to lucky.bokoana@durban.gov.za (Central Regional Office Tel No : 031-3117208).**

AND

2. **The Applicant : Vishaal Dhanrathan, c/o K3 Developments CC P O Box 40010, Redhill, 4071. Tel : 083-2708985 vishaal@niarch.co.za**

Should you fail to lodge or forward objections to both parties by the said date, your objection will be invalid.

711 Public Notices

711 Public Notices

ANNEXURE D

NOTICE TO DISPLAY INTENTION TO APPLY FOR LIQUOR LICENCE IN TERMS OF SECTION (42)(1)(b)(iii) OF ACT

KwaZulu-Natal Liquor Licensing Act, 2010 (Act No. 6 of 2010)

KZNLA 3

(To be displayed in a prominent place at the proposed premises USING A NOTICE BOARD 1 m x 1 m in size)

Name and surname of the applicant:
SFUNDO SELULEKO MAJOLA
Category of licence applied for: (on-/off-consumption/micro-manufacturer/special event):
OFF - CONSUMPTION
Type of premises for which licence is applied for:
LIQUOR STORE
Trading name of the premises:
SFUNDO BOTTLE STORE
Address of the premises:
QUDENI NO:7822 KWAMTSHWILI AREA, WARD 11, NKANDLA
Date of display:
25 MAY 2018
Expiry date of display:
22 JUNE 2018

NB: Objections should be lodged with the local committee in the district from where the application emanates within 21(working) days from the date of the display.

Office Address: King Cetshwayo (former UThungulu) District Office, Lot 61137, Via Verbena Road, 1st Floor SEDA Building, Vledvlei, Richardss Bay, 3900

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716 Town Planning

NORTH REGION

Notice is hereby given that application has been made to the eThekwini Municipality in terms of Chapter 9 the eThekwini Municipality Planning and Land Use Management By-Law 2016 (Municipal Notice 114 of 2017) for: A Special Consent application to construct a 25 metre monopole mast and associated telecommunications infrastructure on Erf 1625 Waterloo situated at 202 Python Road.

A copy of the application and its accompanying documents will be open for inspection by interested members of the public between the hours of 08h00 and 12h30 Mondays to Fridays (excluding Public Holidays) at the offices of the Land Use Management Branch as per the address below.

Members of the public are invited to lodge written objections by 06 July 2018 as follows:

1. By hand to the Regional Co-Ordinator: North Region, Land Use Management Branch, 1ST Floor, 327 Umhlanga Rocks Drive, Umhlanga, or by registered post to Private Bag x4, Umhlanga, 4320, or by fax to 031 311-6034, or by e-mail to Nancy.Moonsamy@durban.gov.za (North Regional Office Telephone No. 031 311 6063).

AND

2.The Applicant
Warren Petterson Planning
P.O. BOX 1702, Umhlanga Rocks, 4320
Applicant's Tel. No: 072 519 0366 Email address: martin@wpplanning.co.za

Should you fail to lodge or forward objections to both parties by the said date, your objection will be invalid.

CENTRAL REGION:

Notice is hereby given that application has been made to the eThekwini Municipality in terms of Chapter 9 the eThekwini Municipality Planning and Land Use Management By-Law 2017 (Municipal Notice 114 of 2017) for:

1.THE REMOVAL OF RESTRICTIVE CONDITION (C) OF DEED OF TRANSFER T17053/2016; AND
2.SPECIAL CONSENT IN TERMS OF CLAUSE 7(6) BIS OF THE DURBAN SCHEME, FOR THE CONVERSION AND USE OF THE DWELLING HOUSE FOR MEDICAL OFFICE PURPOSES;

ON ERF 1868, DURBAN NORTH, SITUATED AT NO. 75 ADELAIDE TAMBO DRIVE, DURBAN NORTH

A copy of the application and its accompanying documents will be open for inspection by interested members of the public between the hours of 08h00 and 12h30 Mondays to Fridays (excluding Public Holidays) at the offices of the Land Use Management Branch.

Members of the public are invited to lodge written objections by Friday, 6th July 2018 as follows:

1.By hand to the Regional Co-Ordinator: Central Region, Land Use Management Branch, Ground Floor, 166 KE Masinga Road, Durban, or by registered post to P O Box 680, Durban, 4000, or by fax to 031 311 7859, or by e-mail to Malcolm.Moonsamy@durban.gov.za (Central Regional Office, Telephone No. (031) 311 7939.

AND

2. Name and Address of Applicant / Agent:
TC Chetty and Associates C/o Mr TC Chetty, P O Box 1461, Kloof, 3640;
Telephone number: (031) 764 4645 / or email: tc.chetty@tcaa.co.za

Should you fail to lodge or forward objections to both parties by the said date, your objection will be invalid.

716 Town Planning

eTHEKWINI MUNICIPALITY CENTRAL REGION

Notice is hereby given that application has been made to the eThekwini Municipality in terms of Chapter 9 the eThekwini Municipality Planning and Land Use Management By-Law 2017 (Municipal Notice 114 of 2017) for:

SPECIAL CONSENT APPLICATION FOR RELAXATION OF THE BUILDING LINE FACING TWELFTH AVENUE FROM 6M TO 3.78M AT REMAINDER OF ERF 1197 DURBAN LOCATED AT 77 ELEVENTH AVENUE

A copy of the application and its accompanying documents will be open for inspection by interested members of the public between the hours of 08h00 and 12h30 Mondays to Fridays (excluding Public Holidays) at the offices of the Land Use Management Branch.

Members of the public are invited to lodge written comments by : 9 July 2018 as follows:

1. **By hand to the Regional Co-Ordinator: Central Region, Land Use Management Branch, Ground Floor, 166 KE Masinga Road, Durban, or by registered post to P O Box 680, Durban, 4000, or by fax to 031-3117859, or by e-mail to reshan.annoop@durban.gov.za. (Central Regional Office Tel : 031-3117499).**

AND

2. **The Applicant : W Govindsamy, P O Box 351101, Northway, 4065 Tel : 061 280 9784 wesleygovindsamy3@gmail.com**

Should you fail to lodge or forward objections to both parties by the said date, your objection will be invalid.

716 Town Planning

INNER WEST REGION

Notice is hereby given that application has been made to the eThekwini Municipality in terms of Chapter 9 of the eThekwini Municipality Planning and Land Use Management By-Law 2016 (Municipal Notice 114 of 2017) for:

WESTVILLE SCHEME NO.2 (RESERVOIR HILLS): REZONING: APPLICATION TO REZONE THE REMAINDER OF PORTION 6 & REMAINDER OF PORTION 10 OF ERF 4707 RESEVOIR HILLS: 94 & 90 UMGUDULU ROAD FROM SPECIAL RESIDENTIAL 900 TO GENERAL RESIDENTIAL 3.

A copy of the application and its accompanying documents will be open for inspection by interested members of the public between the hours of 08h00 and 12h30 Mondays to Fridays (excluding Public Holidays) at the offices of the Land Use Management Branch as per the address below:

Members of the public are invited to lodge written objections by /before **05 JULY 2018** as follows:

1.By hand to the Regional Co-Ordinator: Inner West Region, Land Use Management Branch, Pinetown Civic (Sizakala) Centre, 2nd Floor, 60 Kings Road, Pinetown, or by registered post to P.O Box 680, Durban, 4000, or by fax to 031 701 8863, or by e-mail to celiwe.mpungose@durban.gov.za (Inner West Region Regional Office Telephone No. 031 322 1915).

AND

2.The Applicant: Zimanga Urban and Rural Design Consultants
P.O Box 18788,
Dalbridge, 4014
Applicant's Tel. No:
031 566 3935:
Email address: andisiwe@zimangaconsultants.co.za

Should you fail to lodge or forward objections to both parties by the said date, your objection will be invalid.

Classifieds

0512 RECRUITMENT SERVICES

BALI PLACEMENT SERVICES
Need staff? Domestic cleaning (home & office), Housekeeper, Child Minder, Gardener, Pool Technician, Driver? Email placements@baliserivces.co.za
KK003385

0600 MOTORING

0601 USED CARS

AA BAKKIES AND CARS WANTED FOR CASH
Rust is no problem. Will beat any price and pay cash! Phone 082-2588724.
KK003381

MCCHLOE AUTO TRADERS
63 Laundry Lane Umhlali. Cash paid for cars. Runners or non-runners. Up to R100`000. Phone Kenny 083-6617752/ 032-9471414 (b/h).
KK002585

0610 CARS WANTED

A1 & A ½ TON
All bakkies and all cars any condition wanted for cash. Will beat any price. Phone 082-2588724.
KK003382

ALL BAKKIES AND CARS
Used, rusted and damaged vehicles, canopies and used tyres wanted for cash. Phone 082-4550107/082-6230986.
JM003675

0700 PROPERTY

0702 PREMISES TO LET

TO LET - BALLITO INGENUITY PARK
❖A-Grade professional offices, all fully air-conditioned ❖Doctors rooms ❖25sqm furnished mini suites with private ablution ❖300sqm restaurant, with well equipped kitchen, seats 160 people ❖200sqm conference room ❖Gym ❖Huge secure parking area in garden setting ❖24 hour security
Call us to tailor make your ideal office !
ALAN 060 787 3229
BOB 082 952 6453

SHAKA`S ROCK
Shop to let. 160 square metres Phone 082-5540635.
JM003653

0808 SENIOR ACCOMMODATION

OLD age home offering 24 hour care, 3 meals per day and laundry. Opening 1st July 2018. Phone 084-5098872.
JM003704

0800 ACCOMMODATION

0810 HOUSES TO LET

CHAKA`S Rock Beach, 2 minutes: 2 en-suite beds, study-dorm, unfurnished, off-road parking, pet friendly. R11`500 incl. L&W. Phone 082-3724291.
KK003430

R12`500PM: 3 bedrooms, 2 baths, fully furnished. Near Thompsons Beach. Brenda 082-8997240.
KK003485

THREE bedrooms, fitted kitchen with hob, open plan dining/lounge. 1km pass Shakaskraal on Tinley Manor road before Palm Lakes. Phone 083-2659560.
JM003706

0820 APARTMENTS TO LET

BALLITO: Lovely 2 beds, 2 baths, fully furnished, close to main beach, DSTV, laudromat, covered parking, pool, large garden, 24 hour security. Avail. immed. R7`500pm. Phone 082-9205064.
JM003707

BALLITO: Sea facing, fully furnished, 2 beds, 2 baths, lounge/kitchen ground floor flat in 3 unit building. Pool, private garden, walking distance to beach and village shops. R9`500pm plus utilities. Extras avail. incl. DSTV, cleaning, laundry services. Avail. 1 June. Deposit & references required. Phone William 083-2277561 or Colleen 072-0625543.
JM003705

MAIDSTONE Village: Large, spacious bedroom and kitchen. Newly built in Maidstone Village Tongaat. Built in cupboards, kitchen units. Suitable for couples or singles. R4`500 incl. water. Prepaid electricity. 24 hour security patrol. Available immed. 071-8625273.
JM003695

SALT Rock, Cottage: Fully furnished, 2 beds, open plan kitchen/lounge, alarm. Suit single person/couple. R7`000 pm incl. L&W. Phone 032-5258601.
JM003696

0630 Vehicle Services

Ballito
MOTOLEK
YOUR AUTO ELECTRICAL SPECIALISTS
WE ALSO SPECIALISE IN AUTO AIRCONDITIONING
Battery Centre™
THE BATTERY SPECIALISTS
27 Kyalami Park, Ballito●Tel: 032-9460341
Fax: 032-9460351●A/H: 082-6978892/082-3144031

0820 APARTMENTS TO LET

SALT Rock: Lovely modern, spacious, double story unit, beach across the road, only 4 units in complex, 4 beds, 3.5 baths, splash pool, double garage. Avail. immed. R22`500 excl. L&W . Phone Bradley 083-2702245.
JM003708

SALT Rock: Sea view, 2 beds, 2 baths, garden unit, prepaid electricity, gas stove, parking, pool in secure complex. R8`500. Phone 082-4443848.
JM003714

SALT Rock: Sea view, lovely 3 beds, 2 baths, gas stove, prepaid electricity, parking, pool in secure complex. R11`500 pm. Phone 082-4443848.
JM003713

0840 HOLIDAY ACCOMMODATION

BALLITO Beachfront: 2 beds, 6 sleeper. Fully furnished, fully serviced, self-catering. Close to beach and all amenities. Phone 083-7015477/ www.simbalina.co.za

0900 EMPLOYMENT

0903 DOMESTIC

BONGIWE wants domestic position. Speaks English. Code 10 and Matric. 063-2237086.
KK003486

CAROL wants Mon/Wed/Thur domestic position. Speaks English. 076-7461736.
JM003710

FLORENCE wants Wednesday/Friday domestic position. Speaks English. References. 060-4180005.
KK003371

JANET wants domestic position. Speaks English. Reference. 072-7021337.
JM003711

LONDEKA wants domestic position. Speaks English. 071-4010057.
JM003712

MARGARET wants domestic position. Speaks English. Reference. 079-7422976.
JM003715

0903 DOMESTIC

ADVERTISEMENTS in this column are only R85.00. Call in at our offices, First Floor, Suite 9 Ballito Business Centre, Ballito Drive before 12 noon on Mondays. Bring your ID book, references, certificates and/ or diplomas and a contact telephone number. Please note: We are not an agency and cannot guarantee a job for an advertiser.

DO YOU require a domestic worker? The Stanger Child and Family Welfare Society runs a domestic workers empowerment programme for unemployed women. These women graduate with cetificates. Phone 032-5512129/032-5511922.

IZIKHANGICO zokufuna umsebenzi. Imali yokufaka isikangiso sokufuna umsebenzi izokhuphuka sekuzoba uR85.00. Uphathe umazisi wakho (ID book), izitifiketi, Amagama namakheli abantu esingathola kubo ulwazi olwanele ngawe (references) nezinombolo zocingo lwabo. Ngaphambili kokuba kushaye: 12 emini ngoMsombuluko.

NOMUSA wants domestic position. Speaks English. References. 081-8782114.
JM003716

PATIENCE wants domestic position. Speaks English. 083-9487386.
JM003717

ROSE wants domestic position. Speaks English. Matric, HIV/ AIDS certificates. 064-8745356.
JM003718

SINDI seeks Tues/Thurs/Sat domestic position. Excellent reference available. Phone Adele 082-9237312.
JM003599

SLINDILE wants Tue/Fri domestic position. Speaks English. Reference. 060-4398160.
JM003719

THEMBELENI wants domestic position. Speaks English. 063-2005277.
JM003720

VICTORIA wants Mon/Wed/Fri domestic position. Reference. Speaks English. 063-7101923.
JM003721

ZIME wants domestic position. Speaks English. 073- 8580241.
JM003722

0860 PREMISES TO LET

•Commercial •Retail •Medical space available to let. Prime location in the heart of Ballito.
Contact MARCO 083 825 8578

0905 GENERAL

ANELE wants hospitality position. Speaks English. 071-9764032.
JM003723

AZANDE wants caregiver position. Speaks English. Matric, GETC Ancillary, counselling, home based care, HIV/AIDS certificates. 083-5947922.
JM003724

DUMISANI wants gardener/ landscaping position. Speaks English. Reference. 063-5537805/081-0204133.
JM003725

NCINCI wants admin position. Speaks English. Matric, business management N4/5/6 certificates. 060-9393164.
JM003726

NZUZO wants driver position. Speaks English. Matric and Code 10. 073-7628530.
JM003728

0905 GENERAL

NOKUZOLA wants caregiver position. Speaks English. Reference. Code 10 licence. Matric, GETC Ancillary, home based caregiver, HIV/AIDS certificates. 076-4926215.
JM003727

OWEN wants gardener position. Speaks English.073-3800695.
JM003729

PRECIOUS wants admin position. Speaks English. Matric, office admin level 2/3 certificates. 073-0380643.
JM003730

ZANELE wants security position. Speaks English. Matric, security grade E/D/C certificates. 064-0119913.
JM003731

0910 SITUATIONS VACANT

AVON COSMETICS
Be the best with the best. Join Avon today and earn up to 30% discount. SMS your name/ address/phone number to 071-8712179/082-2910128.
JM003294

JUNIOR manager wanted: Fast food restaurant. Send CV with details of experience and references to: stevetuna@gmail.com
KK003476

MECHANIC REQUIRED
Trade test qualified mechanic required for a franchise dealer workshop in Ballito. Only qualified applications will be considered. Send CV to: robin@ smdgroup.co.za
KK003400

RAWSON PROPERTIES BALLITO
Career as agent. Become part of our new Ballito branch. No previous experience needed. We give full training and support to make you successful. We require: Own transport, laptop//iPad, digital camera, and strong drive to be successful. Commission only. Forward brief C.V to: 032-5860473 or e-mail: Denise Hattingh, Office Manager, Rawson Properties Ballito, denise. hattingh/@rawson.co.za Phone 032-1500500.
KK003444

Legals

1001 PUBLIC NOTICES

NOTICE OF AN APPLICATION FOR AN ENVIRONMENTAL AUTHORISATION

Notice is hereby given in terms of Section 24 of the National Environmental Management Act (No. 107 of 1998): EIA Regulations 2014 (amended) that the Airports Company of South Africa will be submitting an application for environmental authorisation to the Department of Environmental Affairs (DEA).

Project Background: Geomeasure Group (Pty) Ltd has been appointed by the Airports Company of South Africa (ACSA) to undertake an Environmental Authorisation process for the proposed emergency access road at the King Shaka International Airport (KZN). The road will be located at the southern end of the airport property in order to allow access in an event of an emergency.

Road Description: The road is proposed to be 6m wide and 320m long, from Runway end 06 to Dube Boulevard, the road will have capacity to withstand 80 tons and will be in line with emergency access gate 3.

Site Location: The King Shaka International Airport is located on King Shaka Drive in the area of La Mercy. Site coordinates are 29°36’34.72” S and 31°07’00.72” E.

EIA Process: The proposed development has been identified to trigger Activity 12, 19 and 61 of Listing Notice 1 (GNR 983) therefore the application will follow procedures of the Basic Assessment Process as specified in GNR 982 (Appendix 1) of the 2014 EIA Regulations (amended).

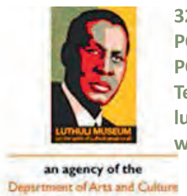
Opportunity to register/ comment: Parties wishing to register as Interested and Affected Parties (I&AP) or who have comments on the proposed development are requested to forward their details and comments to Geomeasure Group (Pty) Ltd no later than 30 days after the publication of this advertisement.

Comments/queries regarding this matter must be referred to:

Company:
GEOMEASURE GROUP (PTY) LTD
Name: Ms. V King
Tel: 031 765 1900
Fax: 031 765 1935
Postal address: PO Box 1194, Hillcrest, 3650
vicki@geomeasuregroup.co.za
Date of Notice: 1 June 2018

1003 TENDERS

LUTHULI MUSEUM



an agency of the
Department of Arts and Culture

3233 Nokukhanya Luthuli Street, Groutville,
PO BOX 1869, Kwa-Zulu Natal, South Africa,
PO Box 1869, KwaDukuza, 4450
Tel: 032 559 6822 Fax: 032 559 6806
luthulimuseum@luthulimuseum.org.za
www.luthulimuseum.org.za

INVITATION TO TENDER SITE PRE-FEASIBILITY STUDY

Tender No.: LM 3/05/2018

1. The Luthuli Museum intends appointing a suitably qualified professional service provider to conduct a prefeasibility study on the monument site in Charlottedale, near the uMvoti River where Chief Albert Luthuli was fatally injured on the 21st of July 1967.
2. Tender documents can be collected at the Luthuli Museum between 09:00–15:00, Monday to Friday, at address no. 3233 Nokukhanya Luthuli Street, Groutville, KwaDukuza, from date: 4 June 2018
3. A tender briefing session will take place at the Luthuli Museum on the 11 June 2018 at 10:30 and will include the Monument Site.
4. Parties collecting the Tender Document Ref. LM 3/05/18 must pay R300 (non-refundable) and sign for the receipt of the documents stating their full name; address and telephone number of the company they represent.
5. Submitted tenders (3 copies & 1 original) must be in a sealed envelope marked for attention: Director: Luthuli Museum and deposited at the Museum reception in a tender box marked ***‘Prefeasibility Tender’.*** Tenders can also be couriered by registered mail to Luthuli Museum 3233 Nokukhanya Luthuli Street, Groutville, KwaDukuza, 4450.
6. No faxed; emailed or posted tenders will be accepted.
7. The tender closes on: **22 June 2018 at 12:00**
8. Only written inquiries will be accepted and must be forwarded to email address: financeofficer@luthulimuseum.org.za. For general inquiries please phone 032 559 6822 / 23.

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Imbonini Park, Shakashead
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info@xmdc.co.za • www.xmdc.co.za

PLACEMENT OF SITE NOTICES -25/05/2018

ISAZISO SOKUCELWA KWEMVUME EMNYANGWENI WEZEMVELO
King Shaka International Airport, La Mercy,
Kwazulu Natal Province

USUKU LWALESAZISO : 25 MAY 2018

NOTICE OF AN APPLICATION FOR AN ENVIRONMENTAL AUTHORISATION

DATE OF NOTICE : 25 MAY 2018

BACKGROUND INFORMATION DOCUMENT

APPLICATION FOR ENVIRONMENTAL AUTHORISATION FOR THE CONSTRUCTION OF THE EMERGENCY ACCESS ROAD AT THE KING SHAKA INTERNATIONAL AIRPORT (KSIA)

Background Information Document *May 2018*

Purpose

The purpose of this document is to:

- Inform Interested and Affected Parties (I&APs) about the proposed project
- Provide brief background details of the proposed project
- Allow interested parties to register their details and provide initial comments on the proposed development

Background

Emergency road from the end of Runway 06 is not in line with the designated emergency gate (Emergency gate 3) and this could affect the response time required for emergency vehicles to arrive at an incident at the airport.

On Emergency gate 3 - ambulances and other emergency LDV’s cannot easily gain access to the airport property due to the raised concrete curb being too high. Currently a temporary solution is in place where sandbags are being used to enable these LDVs to mount the curb. A long term, permanent solution is required, this will involve the construction of a hardstanding surface between the M65 and the gate, which is capable of withstanding a carrying capacity of 80 tons.

The access will be located at the entrance to the existing Emergency Access Gate 3, at the southern end of the airport property in order to allow access to this end of the runway in an event of an emergency. This road is proposed to be 6m wide and 320m long.

The Study

Geomeasure Group (Pty) Ltd has therefore been appointed by the Airports Company of South Africa (ACSA) to undertake an Environmental Authorisation process and submit it to the National Department of Environmental Affairs (DEA) as per the requirements of Section 24(5) of the National Environmental Management Act (Act 107 of 1998).

A legislative review has indicated that the application triggers the requirement for a Basic Assessment under the National Environmental Management Act: GNR 983:

Activity 12: “ *The development of -*

(xii) infrastructure or structures with a physical footprint of 100 square metres or more, where such development occurs-

(a) within a watercourse;
(b) in front of a development setback; or

(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;

excluding-

(dd) where such development occurs within an urban area; [or]

(ee) where such development occurs within existing roads, [or] road reserves or railway line reserves".

Activity 19: **"***The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse:*

but excluding where such infilling, depositing, dredging, excavation, removal or moving—

(a) will occur behind a development setback;

(b) is for maintenance purposes undertaken in accordance with a maintenance management plan; [or]

(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;

(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or

(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies".

Activity 61: "*The expansion of airports where the development footprint will be increased*"

The proposed scope of work for the environmental process will follow the procedure detailed in GNR 982 (Appendix 1) of the 2014 EIA Regulations (amended), promulgated in terms of Section 24(5) of the National Environmental Management Act (Act 107 of 1998). The assessment will involve consultation with all Interested and Affected Parties (neighbours, NGOs, local conservancies, authorities, public etc.) and assessment of any potential environmental impacts associated with the project. Regular consultation with the Department of Environmental Affairs will be undertaken to ensure that environmental regulations are complied with throughout the process.

Location of the airport

The King Shaka International Airport is located on King Shaka Drive in the area of La Mercy. Site coordinates are 29°36'34.72" S and 31°07'00.72" E.

Figure 1: Location of the King Shaka Airport

Description of the proposed road

The road is proposed to be 6m wide and 320m long, from Runway end 06 to Dube Boulevard, the road will have capacity to withstand 80 tons and will be in line with existing Emergency Access Gate 3.

Figure 2 Proposed Alignment of the emergency road

Next steps in the process

A four week registration period will be allowed for individuals to formally register their full details and thereafter a public meeting will be scheduled if deemed necessary. The public meeting will enable interested and affected parties to discuss the proposed development in detail thus giving them the opportunity to express any issues and concerns related to the development. If a public meeting is not deemed necessary, focus group meeting will be held with key interested or affected parties as appropriate.

If you wish to register as an Interested and Affected Party (I&AP) please complete the form overleaf.

YOUR INVITATION TO COMMENT

You are invited as an Interested and Affected Party to register and comment on the proposed emergency access roads at the King Shaka International Airport, please complete the form below and return it to Ms. King (details below) before **27 June 2018**

PLEASE NOTE - IF YOU DO NOT REGISTER AS AN I&AP, YOU WILL NOT AUTOMATICALLY RECEIVE FURTHER INFORMATION ON THE PROJECT

Ms. V King
Fax: (031) 765 1935
e-mail: vicki@geomeasuregroup.co.za

Title: **First name:**		**Surname:**	**Initials:**
Organisation:		**Designation:**	
Postal Address:			
Postal Code:			
Tel No:		**Cell No:**	
Fax No:		**E-mail:**	

COMMENTS

Kindly forward us details of I&APs that you think might have interest in the proposed development. Thank you for your participation.

I&AP LIST

KSIA EMERGENCY ACCESS ROAD – I&AP LIST

Name and surname	Organisation	Contact number	Email address
Kamogelo Molawa	ACSA	051 407 2279	Kamogelo.Molawa@airports.co.za
Clint Mckenzie	ACSA	032 436 6000	Clint.McKenzie@airports.co.za
Christopher Jones	ACSA	032 436 6080	Christopher.Jones@airports.co.za
Kate Ralfe	Tongaat Hulett Developments	031 560 1900	Kate.Ralfe@tongaat.com
Anthony Gould	Dube Tradeport	032 814 0000	Anthony.Gould@dubetradeport.co.za
Mathabo Mosia	Dube Tradeport	032 814 0000	Mathabo.Mosia@dubetradeport.co.za
Zama Dlamini	Dube Tradeport	032 814 0000	Zama.Dlamini@dubetradeport.co.za
Clarissa Naicker	Dube Tradeport	032 814 0000	Clarissa.Naicker@dubetradeport.co.za
Coleen Moonsamy	DWS	031 336 2700	MoonsamyC@dws.gov.za
Hassina Aboobaker	DWS	031 336 2764	AboobakerH@dws.gov.za
Siyabonga Sikhakhane	EDTEA	031 366 7345	Siyabonga.Sikhakhane@kznedtea.gov.za
Bernadet Pawandiwa	AMAFA	033 394 6543	bernadetp@amafapmb.co.za
Diane Van Rensburg	eThekwini Municipality	031 311 7136	Diane.VanRensburg@durban.gov.za
Dominic Wieners	EKZNW	033 845 1999	dominic.wieners@kznwildlife.com
Geoff Pullan	Ward Councillor	083 695 9190	geoffpullan@iafrica.com
Siva Narainsamy	Tongaat Civic Association /Tongaat Ratepayers' Ass: President	082 822 2127	tongaatcivicassociation@gmail.com
Jeeva Pillay	Tongaat Civic Association: Vice President	083 494 8596	tongaatcivicassociation@gmail.com
Ananthan Govender	Private land owner - Portion 35 of 923	011 254 3430	vasoog@gmail.com
Krish Govender	Herrwood Resident		krish.govender@actom.co.za
Gabriel Aubrey	S A Cane Growers Association		agabriel@canegrowers.co.za
Paul Ramlal	La Mercy Ratepayers Association: Chairman	082 458 4125	paulramlal@optinetsa.co.za
Angie Wilken	Mount Moreland Ratepayers Association and Mount Moreland Conservancy		angie@mountmoreland.com; angie@barnswallow.co.za
Glen Evans	Mount Moreland Ratepayers Association		lahiq@netactive.co.za
Sandra Le Roux	Mount Moreland Ratepayers Association	0829246376	sandra.freegard@gmail.com

Justin Taylor	Mount Moreland Ratepayers Association (NCC Environmental Services)	0733334359	justint@ncc-group.co.za
	Swallows Rest	031 5682616	info@swallowsrest.co.za
	Shapes of Africa	082 432 5513	info@shapesofafrica.co.za
	Lake Victoria Conservancy		parlay@mweb.co.za
T.P Dutton		032 525 4512 082 295 7327	i_dutton@tiscali.co.za
E Gori		039 973 0308 083 300 2385	whatabuzi@iafrica.com
P Underwood		031 561 2012 083 456 0161	penny@umhlangaaccommodation.co.za
F B Ashe	Earthlife Africa eThekwini	031 261 6524 082 652 1533	bryan@earthlife.org.za
R Siedle	La Mercy Airport Environmental Forum	031 568 1033	zalbroker@wol.co.za
Wade Menne		031 765 2115 082 444 2083	wallym@iafrica.com
K T Holtzhuizen		039 695 1260	
T Duane		032 525 4169	
Rob Reardon			robreardon@telkomsa.net
Bradley Chetty			bradley.chetty@gmail.com
Tracey Simkiss	Dolphin Coast Dental	031 568 1341	traceysimkiss@gmail.com
Dhanjay Kassie			kassied@durban.gov.za
Glen Evans			lahiq@netactive.co.za
Pierre Jevon			yooit@iafrica.com
Mark Raubenheimer			raubenheimer.m@telkomsa.net
Parlay Projects cc			parlay@mweb.co.za
Prudence Borlase			dhbff@telkomsa.net
Ray van der Poll & Kieth Doyle			kdoyle@tfd.co.za
Ray van der Poll & Wendy O'Grady			Ray@smdgroup.co.za
Keith Doyle			kdoyle@tfd.co.za
Jason Jamun			btservices@telkomsa.net

Hayley Esteves			hayley4@mtnloaded.co.za
AS Bosman			bonnins@mweb.co.za
Brett Wilkinson			wilkinson@easihome.co.za
Coline Botha			coline_botha@hotmail.com
Raymond John Bray Lyle			thelyles@mweb.co.za
Norman & Joan Barry			adelebarry@ymail.com
Kirsten and Mike Cunningham			Kirsten.Cunningham@derivco.com
Sharon Basel			sharon@sagreetings.co.za
Victoria E Singh			victoria@ronsalter.co.za
Dorothy Hattingh			sales@easyplug.co.za
EJ Vickers			vickht@iuncapped.co.za
Eddie Forbes			forbes@tiscali.co.za
Jennifer Beresford			beresford@webstorm.co.za
Greg De Ricquebourg		0826527017	greg@enertec.co.za
Bully De Ricqyebourg		0832659694	bulnet@iafrica.com

COMMENTS RECEIVED FROM I&APs

Subject: FW: Ward 58 - King Shaka Airport - Access Rd EIA - 26 May 2018

From: Geoff D A Pullan <geoffpullan@iafrica.com>
Sent: 26 May 2018 07:13 AM
To: vicki@geomeasuregroup.co.za
Subject: Ward 58 - King Shaka Airport - Access Rd EIA - 26 May 2018

Hi Vicky,

My details at foot of page.

YOUR INVITATION TO COMMENT

You are invited as an Interested and Affected Party to register and comment on the proposed emergency access roads at the King Shaka International Airport, please complete the form below and return it to Ms. King (details below) before **27 June 2018**

PLEASE NOTE - IF YOU DO NOT REGISTER AS AN I&AP, YOU WILL NOT AUTOMATICALLY RECEIVE FURTHER INFORMATION ON THE PROJECT

Ms. V King
Fax: (031) 765 1935
e-mail: vicki@geomeasuregroup.co.za

Kindly forward us details of I&APs that you think might have interest in the proposed development.
Thank you for your participation.

Geoffrey Douglas Ayrton Pullan

No efficient postal service, please use email
geoffpullan@iafrica.com

No fax

City governance with eThekwini
58 Ward Councillor

Comments
Would like to see ACSA get rid of stop streets and traffic lights, and substitute traffic circles.
The advantages of circles are...
1. Slow down traffic, 24/7
2. Not affected by power outages
3. Unattractive to street vendors, hitch hikers and potential smash and grab people

Therefore I would be happy to see a traffic circle where the proposed road meets the M65.

Also, where possible, please try and use local labour as the proposal is slap bang in the Centre of ward 58.

Thanks.

Kind regards
Geoff D A Pullan
58 Ward Councillor
083 6959190
Support Blue Flag Beaches

From: Kate Ralfe <Kate.Ralfe@tongaat.com>
Sent: Wednesday, 30 May 2018 12:58 PM
To: khanya@geomeasuregroup.co.za
Subject: RE: Proposed Emergency Access Road- King Shaka International Aiport, La Mercy

Hi Khanya and Vicki

Please register Tongaat Hulett as an IAP on this project.

Thanks

Tongaat Hulett

Kate Ralfe | Portfolio Executive, Tongaat Hulett Developments
phone | +27 31 560 1900 **mobile** | +27 63 253 1486
www.tongaat.com
website online disclaimer offline disclaimer

From: khanya@geomeasuregroup.co.za [mailto:khanya@geomeasuregroup.co.za]
Sent: 25 May 2018 03:58 PM
To: Kate Ralfe
Cc: Anthony.Gould@dubetradeport.co.za; Mathabo.Mosia@dubetradeport.co.za
Subject: RE: Proposed Emergency Access Road- King Shaka International Aiport, La Mercy

Good Afternoon

Kindly find attached Background Information Document relating to the proposed construction of an emergency access road at the King Shaka International Airport, situated in the area of La Mercy, KwaZulu Natal.

Please do not hesitate to contact Vicki (details in the attached document) should you require additional information regarding the project and kindly forward contact details of I&APs who may have interest on this application.

Kind Regards

Khanya Gasa
Environmental Scientist

GEOMEASURE GROUP
Groundwater, Environmental & Geotechnical Consultants

Durban Office
Unit 3 Burnside Office Park
1 Builders Way
Hillcrest, 3610
P. O. Box 1194
Hillcrest, 3650
Tel: 031 765 1900
Fax: 031 765 1935
Cell: 073 984 3806

Gauteng Office
39 Michelson Road
Westwood AH
Boksburg North
1469

Tel: 011 396 3866

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khanya@geomeasuregroup.co.za

From:	Diane VanRensburg <Diane.VanRensburg@durban.gov.za>
Sent:	Monday, 28 May 2018 9:04 AM
To:	khanya@geomeasuregroup.co.za
Subject:	RE: Proposed Emergency Access Road- King Shaka International Aiport, La Mercy

Dear Khanya,

Please will you register eThekwini Municipality as an Interested and Affected Party, would you like me to provide comments on the BID application bearing in mind that it will take at least three weeks to circulate and provide comment?

Kind Regards
Diane.

From: khanya@geomeasuregroup.co.za [mailto:khanya@geomeasuregroup.co.za]
Sent: Friday, May 25, 2018 3:59 PM
To: MoonsamyC@dws.gov.za
Cc: AboobakerH@dws.gov.za; Siyabonga.Sikhakhane@kznedtea.gov.za; Diane VanRensburg; dominic.wieners@kznwildlife.com
Subject: RE: Proposed Emergency Access Road- King Shaka International Aiport, La Mercy

Good Afternoon

Kindly find attached Background Information Document relating to the proposed construction of an emergency access road at the King Shaka International Airport, situated in the area of La Mercy, KwaZulu Natal.

Please do not hesitate to contact Vicki (details in the attached document) should you require additional information regarding the project and kindly forward contact details of I&APs who may have interest on this application.

Kind Regards

Khanya Gasa
Environmental Scientist

GEOMEASURE GROUP
Groundwater, Environmental & Geotechnical Consultants

Durban Office
Unit 3 Burnside Office Park
1 Builders Way
Hillcrest, 3610
P. O. Box 1194
Hillcrest, 3650
Tel: 031 765 1900
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Tel: 031 311 1111, Fax: 031 311 7776
www.durban.gov.za

Our Ref.: (21/11) DPM/EIA 808(N)
DEDTEA:
Enquiries: Mrs D. van Rensburg
Telephone: 031 – 3117136

6 July 2018

Geomeasure Group
P.O. Box 1194
Hillcrest
3650

Att: Khanya Gasa

Dear Sir/Madam,

RE: BACKGROUND INFORMATION DOCUMENT FOR THE PROPOSED CONSTRUCTION OF THE EMERGENCY ACCESS ROAD AT THE KING SHAKA INTERNATIONAL AIRPORT (KSIA).

With reference to the abovementioned Background Information Document, please be advised that various Municipal Departments have had sight of the proposal and the following comments are submitted for your attention:-

1. eThekwini Electricity Department.

eThekwini Electricity (EE), HV Operations has no objection, however please note:

1.5. The applicant must consult eThekwini Electricity's mains records (held in the drawing office at eThekwini Electricity Headquarters, 1 Jelf Taylor Crescent, for the presence of underground electrical services. In addition should any overhead line and/or servitude be affected, the specific permission of the Head: Electricity must be sought regarding the proposed development.

1.6. The relocation of MV/LV electrical services, if required in order to accommodate the proposed development, will be carried out at the expense of the applicant.

2. Environmental Planning and Climate Protection Department.

The Environmental Planning and Climate Protection Department has noted the Background Information Document for the proposed construction of the emergency access road at the King Shaka International Airport (KSIA). However, the requirements of the KSIA Appeal Decision (Reference No.

12/12/20/686) and its associated decision in respect of the KSIA Conservation Area must inform the planning of the proposed emergency access.

Further comments on the proposal will be submitted when more details become available.

3. **Land Use Management Branch.**

No comment/objection from a land use management perspective.

4. **Strategic Spatial Planning Branch.**

This Branch has reviewed the Background Information Document for the proposed construction of the emergency access road at the King Shaka International Airport and submits the following comment:

4.1. The applicant needs to ensure that all construction activities onsite are in compliance with the environmental authorisation as contained in the Record of Decision (RoD) dated 23 August 2007 and a revised RoD dated 29 October 2008.

5. **Coastal, Stormwater and Catchment Management.**

This Department has no requirements.

6. **Parks, Leisure and Cemeteries.**

No comment received.

7. **Pavement and Geotechnical Engineering.**

No objection at this stage.

A geotechnical centre line investigation is recommended for the road alignment: past earthworks for the airport development has potentially resulted in variable conditions (cut/fill/imported materials). Of particular interest is the drainage line crossing in the east to ensure founding of culvert/causeway is adequate to avoid excessive settlement of the new structure under potentially heavy emergency vehicles.

8. **eThekwini Transport Authority.**

No objection to the proposed 320m long emergency road from runway end 06 to Dube Boulevard to enter/exit the King Shaka airport which will be 6m wide, subject to the following:

8.1. The emergency road must be gated.
8.2. Traffic signs must be properly placed for emergency vehicles accordingly.
8.3. It should be noted that the road is not a public road but an emergency driveway to the King Shaka Airport, therefore a driveway scoop must be provided at the road edge (Dube Boulevard) and not curb return.

9. **Environmental Health Department.**

Please note the following comments from this Department.

9.1. A comprehensive Environmental Management Programme is to be provided prior to the commencement of the project.
9.2. An integrated waste management approach must be implemented.
9.3. All solid waste generated must be disposed of at a licensed landfill site.
9.4. As there is no key provided for Figure 2, please indicate what is denoted by the red line traversing the proposed road?

10. **eThekwini Water and Sanitation Department.**

Pollution and Environment Branch: Source Control North.
This Branch has no objection.

11. **Durban Solid Waste.**

No comment received.

12. **Disaster Management.**

No concerns from this Department.

13. **Fire Safety.**

No comment received.

Should you seek clarification on any of the above issues, please contact the writer on telephone: 031 - 3117136 or via e-mail: diane.vanrensburg@durban.gov.za In addition, the Department requests that a copy of the Environmental Authorisation be emailed to the same address.

Yours faithfully

11/07/2018

MANAGER: LAND USE MANAGEMENT
CB NORTON
(Claire Norton: Professional Planner A/746/1993)

DATE:

HEAD: DEVELOPMENT PLANNING, ENVIRONMENT AND MANAGEMENT
TB MBHELE

DATE:

Copy To:
Department of Economic Development, Tourism and Environmental Affairs
Private Bag X 54321
Durban
4000

COMMENTS AND RESPONSES REPORT

Date	Name and surname /Organisation	Comment	Response
26/05/2018	Geoff Pullan (Ward 58 Councillor)	Would like to see ACSA get rid of stop streets and traffic lights, and substitute traffic circles. The advantages of circles are... 1. Slow down traffic, 24/7 2. Not affected by power outages 3. Unattractive to street vendors, hitch hikers and potential smash and grab people Therefore I would be happy to see a traffic circle where the proposed road meets the M65. Also, where possible, please try and use local labour as the proposal is slap bang in the Centre of ward 58.	The emergency road is proposed at an already existing route just out of emergency gate 3, the intention is to provide quick access for emergency vehicles directly from the M65 to the airport. The existing road design does not allow the presence of the circle at the proposed development area. Regarding the employment of local labour, preference will be given to the unemployed people living in the area as this will create temporary employment opportunities.
30/05/2018	Kate Ralfe (Tongaat Hulett Developments)	Please register Tongaat Hulett as an IAP on this project.	Comment noted, details added onto I&AP list
06/07/2018	eThekwini Municipality Electricity Department	eThekwini Electricity, HV Operations has no objection, however please note: 1.5 The applicant must consult eThekwini Electricty's mains records (held in the drawing office at eThekwini Electricity Headquarters, 1 Jelf Taylor Crescent, for the presence of underground electrical services. In addition, should nay overhead line and/or servitude be affected, the specific permission of the Head: Electricity must be sought regarding the proposed development. 1.6 The relocation of MV/LV electrical services, if required in order to accommodate the proposed development, will be carried out at the expense of the applicant.	Comments have been noted
	Environmental Planning and Climate	The Environmental Planning and Climate Protection	Comments have been noted, the proposed

	Protection Department	Department has noted the Background Information Document for the proposed construction of the emergency access road at the King Shaka International Aiport (KSIA). However, the requirements of the KSIA Appeal Decision (Reference No: 12/12/20/686) and its associated decision in respect of the KSIA Conservation Area must inform the planning of the proposed emergency access. Further comments on the proposal will be submitted when more details become available.	route of the emergency road will not impact the delineated KSIA conservation area. The associated construction activities will also not occur within the conservation area. It will be designated as a no-go area for the duration of the project.
	Land Use Management Branch	No comment/objection from a land use management perspective.	Noted
	Strategic Spatial Planning Branch	This branch has reviewed the Background Information Document for the proposed construction of the emergency access road at the King Shaka International Airport and submits the following comment: The applicant needs to ensure that all construction activities onsite are in compliance with the environmental authorisation as contained in the Record Of Decision (RoD) dated 23 August 2007 and a revised RoD dated 29 October 2008.	Comment noted
	Coastal, Stormwater and Catchment Management	This Department has no requirements	Noted
	Parks, Leisure and Cemeteries	No comment received.	Noted
	Pavement and Geotechnical Engineering	No objection at this stage. A geotechnical centreline investigation is recommended for the road alignment: past earthworks for the airport development has potentially resulted in variable conditions (cut/fill/imported materials). Of particular interest is the drainage line crossing in the east to ensure founding of culvert/causeway is adequate to avoid excessive settlement of the new structure under potentially heavy emergency vehicles.	The culvert will have concrete bedding to provide support under the vehicle loads to minimize settlement. The ground conditions will be assessed once excavation for the culvert is done and remedial measures can be implemented if required.

	eThekwini Transport Authority	No objection to the proposed 320m long emergency road from runway end 06 to Dube Boulevard to enter/exit the King Shaka airport which will be 6m wide, subject to the following: 8.1 The emergency road must be gated; 8.2 Traffic signs must be properly placed for emergency vehicles accordingly; 8.3 It should be noted that the road is not a public road but an emergency driveway to the King Shaka Airport, therefore a driveway scoop must be provided at the road edge (Dube Boulevard) and not curb return.	It must be noted that the scoop maybe too much of a 'hump' for the emergency personnel if they are in a hurry. A concrete strip to delineate the edge of road without compromising the rideability may be constructed.
	Environmental Health Department	Please note the following comments from this Department: 9.1 A comprehensive Environmental Management Programme is to be provided prior to the commencement of the project; 9.2 An integrated waste management approach must be implemented; 9.3 All solid waste generated must be disposed of at a licenced landfill site; 9.4 As there is no key provided for Figure 2, please indicate what is denoted by the red line traversing the proposed road?	Attached as Appendix E of the BA Report Noted Noted The red line represents the airport property boundary.
	eThekwini Water and Sanitation Department	Pollution and Environmental Branch: Source Control North This branch has no objection	Noted
	Durban Solid Waste	No comment received	Noted
	Disaster Management	No concerns from this Department	Noted
	Fire Safety	No comment received	Noted

APPENDIX D

SPECIALIST STUDIES

APPENDIX D1

WETLAND REPORT

PROPOSED KING SHAKA INTERNATIONAL AIRPORT SOUTHERN EMERGENCY ACCESS ROAD IN THE ETHEKWINI MUNICIPALITY, KWAZULU-NATAL

Freshwater Habitat Impact Assessment

Version: 1.0

Date: 29th June 2018

Eco-Pulse Environmental Consulting Services

Report No: **EP352-01**

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SPECIALIST ASSESSMENT REPORT DETAILS AND DECLARATION OF INDEPENDENCE

This is to certify that the following report has been prepared as per:

The requirements of Section 32 (3) of the NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (Act No. 107 OF 1998) ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS 2014 as per Government Notice No. 38282 GOVERNMENT GAZETTE, 4 DECEMBER 2014.

The Department of Water & Sanitation (DWS) for Water Use Licensing and specialist wetland/aquatic assessments, as outlined in the 'Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals' contained in the Government Gazette No. 40713 of 24 March 2017.

Document Title:	Proposed King Shaka International Airport Southern Emergency Road in the eThekwini Municipality, KwaZulu-Natal
Report No:	EP352-01
Version:	1.0
Revision No:	1.0
Report prepared by:	Ryan Kok (MSc) & Ryan Edwards (Pr. Sci. Nat.)
Field of study/Expertise:	Wetland & Aquatic Ecology
Internally Reviewed and Approved by:	Ryan Edwards (Pr. Sci. Nat.)
Signature	
Date:	22nd June 2018
Client:	Geomeasure Group

I, **Ryan Edwards**, hereby declare that this report has been prepared independently of any influence or prejudice as may be specified by the KZN Department of Economic Development, Tourism & Environmental Affairs (EDTEA) and the Department of Water & Sanitation (DWS).

Signed: ______________________ Date: 29th June 2018

DETAILS OF AUTHORS & REVIEWER

The relevant experience of specialist team members involved in the compilation of this report are briefly summarized below. *Curriculum Vitae's* of the specialist team are available on request.

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Mr. Ross van Deventer Environmental Scientist	Fieldwork	Ross van Deventer has an MSc (Environmental Science) with training in integrated environmental management along with specialist training in the field of water resource management and aquatic science. His MSc research focused on water quality and ecological integrity of stream networks in the upper uMngeni catchment in response to catchment land use impacts. His specialised training is further complemented by experience gained at Eco-Pulse Environmental Consulting Services in a number of wetland and riparian assessments. This includes wetland and riparian delineation, Present Ecological State and Ecological Importance and Sensitivity assessments. He is competent in the application of current best practise guidelines and assessments tools and is accredited in the application of the SASS5 bio-monitoring technique.
Ryan Kok Junior Environmental Scientist	Fieldwork and Co-Author	Ryan Kok is a Junior Environmental Scientist at Eco-Pulse with a BSc degree in Environmental Science; BSc Honours and MSc degree in Biological Sciences. His MSc thesis focused primarily on the impacts of climate change and human land use on the species distribution of Malagasy bats (past-present-future). Ryan has 4 years' experience in GIS and environmental niche modelling, with extensive field experience in monitoring and analysing species data. He also has experience in undertaking conservation planning and biodiversity assessments. Ryan is currently involved in wetland delineation, background research and undertaking wetland assessments.

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1. INTRODUCTION

1.1 Project Description & Locality

The Airports Company SA plans to develop an emergency access road at the southern end of the King Shaka International Airport (KSIA) near the suburb of La Mercy in the eThekwini Municipality, KwaZulu-Natal, as shown in Figure 1 below. The emergency road is proposed within the south-eastern corner of the KSIA and will be aligned in a north-south direction. The proposed road will connect with M65 / Mdloti Street which links to the N2 highway (East) and is the main access road to the KSIA. The proposed construction phasing plan for the southern road is included in **Annexure A**.

Eco-Pulse Environmental Consulting Services (Eco-Pulse) was appointed by Geomeasure Group to undertake a freshwater habitat assessment to inform all relevant environmental legislative applications.

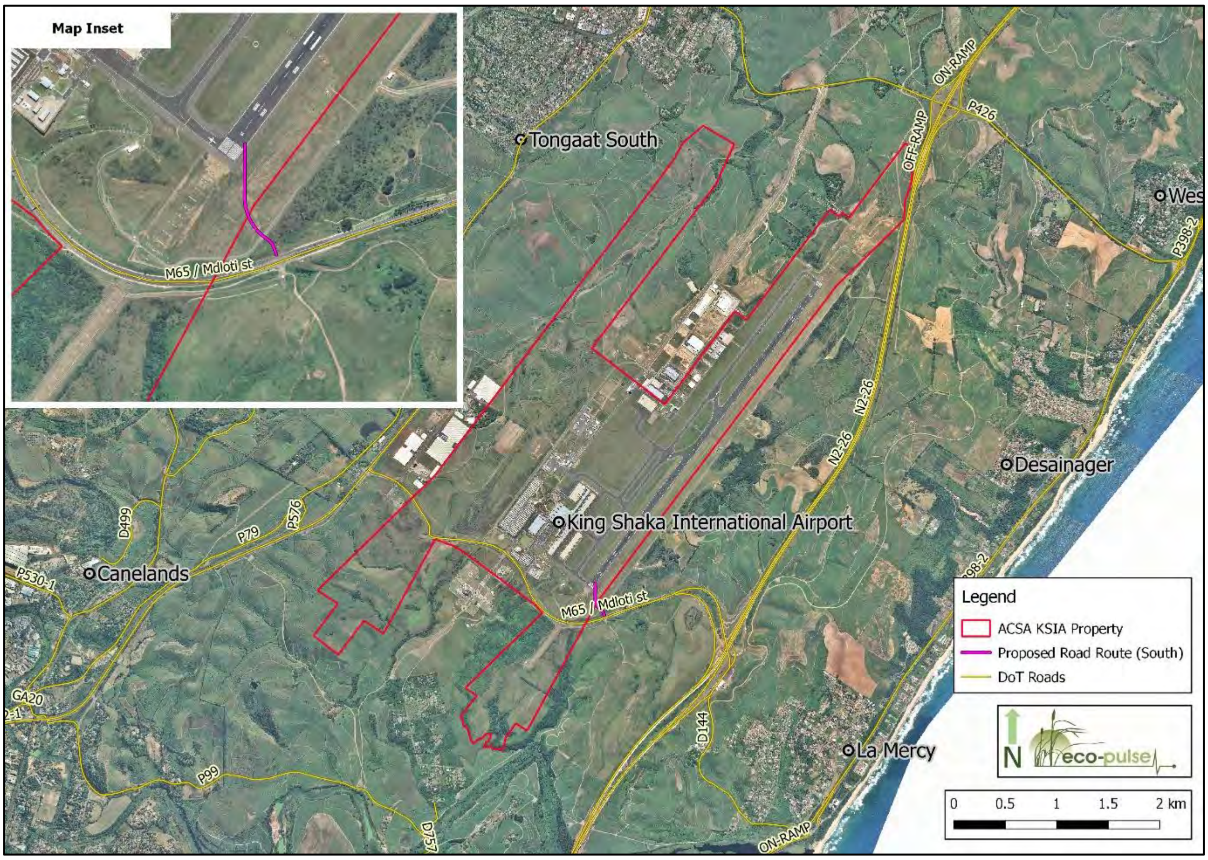

Figure 1 Location of the proposed road in relation to the KSIA property, main roads and surrounding towns.

1.2 Scope of Work

The scope of work undertaken as part of the Freshwater Habitat Assessment was as follows:

- Delineation of all watercourses (e.g. wetlands, rivers, streams, dams) likely to be measurably impacted / negatively affected by the proposed activities.
- Classification of all delineated watercourses according to the national wetland and aquatic ecosystem classification system (Ollis et al., 2013).
- Assessment of the Present Ecological State (PES) of the delineated watercourse units.
- Assessment of the Ecological Importance and Sensitivity (EIS) of the delineated watercourse units.
- Assessment of the supply, demand and importance of the direct and indirect ecosystem services provided by the delineated watercourse units.
- Identification and assessment of the significance of the likely negative impacts of the proposed activities on the onsite delineated and downstream watercourses.
- Provision of impact management and mitigation measures to avoid and/or reduce the potential impacts identified and assessed.
- Compilation of a freshwater habitat impact assessment report documenting the findings and recommendations of the assessment.

1.3 Key Concepts and Terms

1.3.1 What are Freshwater Ecosystems?

An ecosystem is a group of plants, animals and other organisms interacting with each other and with non-living (abiotic) components of their environment. Ecosystems can be classified broadly into terrestrial and aquatic ecosystems. Terrestrial ecosystems occur on land where water is a limiting factor, whereas aquatic ecosystems occur within landforms that are permanently or periodically inundated with flowing or standing water (Ollis et al., 2013). Freshwater ecosystems are a subset of the Earth's aquatic ecosystems and include all inland freshwater rivers, streams, wetlands, lakes, ponds and springs. This broad range of freshwater ecosystem types contains a multitude of habitats of varying ecological complexity and diversity (Wrona et al., 2016). Wetlands, streams and rivers fall under the umbrella term of 'freshwater ecosystems'.

Under Section 1(1)(xxiv) of the National Water Act (Act No. 36 of 1998) (NWA), a 'watercourse' is defined as:

a) a **river** or **spring**;
b) a **natural channel** in which water flows regularly or intermittently;
c) a **wetland, lake or dam** into which, or from which, water flows; and
d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

This assessment focusses on the assessment of all-natural watercourses and their associated habitats / ecosystems likely to be measurably affected by the proposed development, focussing specifically on wetlands, streams and rivers. For the purposes of this assessment, wetlands, streams and rivers are defined as follows:

- **Wetlands** are areas that have water on the surface or within the root zone for extended periods throughout the year such that anaerobic soil conditions develop which favour the growth and regeneration of hydrophytic vegetation (plants which are adapted to saturated and anaerobic soil conditions). In terms of Section 1 of the NWA, wetlands are legally defined as: (1) "…land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."
- **Rivers and streams** are natural channels that are permanent, seasonal or temporary conduits of freshwater. In terms of ecological habitats, rivers and streams comprise in-stream aquatic habitat and riparian habitat. Generally, riparian zones mark the outer edge of stream and river systems. Streams and rivers are differentiated in terms of channel dimensions and generally fall within the broad category of rivers / riverine ecosystems in this report.
- **Instream habitat** is the aquatic habitat (or alluvial in the case of intermittent / ephemeral watercourses) within the active channel that includes the water column, river bed and the inundated active channel margins, and associated vegetation. In terms of Section 1 of the NWA, instream habitat is legally defined as habitat that includes "…the physical structure of a watercourse and the associated vegetation in relation to the bed of the watercourse."
- A **riparian zone** is a habitat, comprising bare soil, rock and/or vegetation that is: (i) associated with a watercourse; (ii) commonly characterised by alluvial soils; and (iii) inundated or flooded to an extent and with a frequency sufficient to support vegetation species with a composition and physical structure distinct from those of adjacent land areas (DWAF, 2005). In terms of Section 1 of the NWA, riparian habitat is legally defined as: 'habitat that "…includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas."

1.3.2 Why are Freshwater Ecosystems Important?

Human flourishing, well-being and development relies greatly on the functions, goods and services provided by ecosystems, collectively referred to as ecosystem services. Ecosystem functions refer to the capacity of ecological processes and structure to provide services that satisfy human well-being (de Groot, 1992). Ecosystem services are the benefits provided by ecosystems that contribute to making human life both possible and worth living (Díaz et al., 2006a).

Freshwater ecosystems in particular provide a distinct range of ecosystem goods and services critical to human development and are increasingly being recognised as critical ecological infrastructure in the landscape.

Firstly, freshwater ecosystems are conduits, regulators, filters and ultimately suppliers of freshwater water. South Africa is a water-stressed country whose socio-economic development places enormous pressure on water resources. With predicted population growth and associated urban and agricultural expansion, in conjunction with the predicted effects of climate change, pressure on water resources is going to continue to increase, and with this the value of water resources and the ecosystems that sustain them. The proper protection and management of water resources associated with and provided by freshwater ecosystems is thus critical to all current and future levels of human development. Wetlands in particular are known to provide important regulating services to society in support of water resource management, namely streamflow regulation, water quality enhancement services and carbon storage / sequestration services.

Secondly, being conduits, regulators and filters of freshwater water, freshwater ecosystems provide key streamflow regulation services that contribute to disaster risk management and climate change reliance / adaptation e.g. reducing the impact of floods and droughts. Linked to climate resilience and adaptation, permanently and seasonally saturated wetlands are also known to provide relatively high levels of carbon storage / sequestration benefits, which is important considering the global need to reduce the amount of carbon dioxide in the atmosphere.

Thirdly, freshwater ecosystems provide critical habitat for aquatic and wetland specific species uniquely adapted to take advantage and thrive in such conditions. Being spatially and geographically restricted ecosystem types associated with particular and varied hydro-geomorphic landforms, and with South Africa having a high level of climate variability, freshwater ecosystems typically support a comparatively large number of rare and endemic species, and in some circumstances can support uniquely large populations of resident and migratory animals like birds, a phenomenon that is linked to their high productivity and refuge value.

Fourthly, freshwater ecosystems provide a number of direct goods to communities (provisioning services), particularly rural and/or un-serviced communities that often relay directly on freshwater ecosystems for meeting basic human needs and supporting livelihoods. Typical ecosystem goods capitalized on in South Africa include: (i) the supply of fresh water for domestic and agricultural uses; (ii) harvestable resources for food, combustion (cooking and heating), building materials, medicinal materials and crafts for exchange; and (iii) cultivated food and grazing benefits, especially in arid regions. These direct goods and services can be life-saving ‘safety nets’ in arid and semiarid regions, often being the only source of water and food in the dry season.

Fifthly, freshwater ecosystems can also deliver significant non-material benefits. In South Africa, rivers and wetlands are recognized as having cultural significance for an array of different local cultures. Rivers and wetlands not only provide several culturally significant plants species (for medicine, food and craft) significant for cultural ceremonies but they also act as places of special cultural significance in of themselves (e.g. where baptisms or cleansing ceremonies take place). Rivers and wetlands also have value as sites for tourism and recreation as they are generally visually appealing and usually have an abundance of wildlife. In urban settings in particular, the preservation of river and wetland corridors can improve the aesthetics and amenity value of urban areas and contribute to improving the livability of urban spaces.

1.3.3 What is the State of Freshwater Ecosystems in South Africa

South Africa's freshwater ecosystems are diverse, ranging from subtropical in the north-eastern part of the country, to semi-arid and arid in the interior, to the cool and temperate rivers of the Western Cape.

Freshwater ecosystems, including rivers and wetlands, are particularly vulnerable to anthropogenic or human activities, which can often lead to irreversible damage or longer term, gradual/cumulative changes to freshwater resources and associated aquatic ecosystems. Since channelled systems such as rivers, streams and drainage lines are generally located at the lowest point in the landscape; they are often the "receivers" of wastes, sediment and pollutants transported via surface water runoff as well as subsurface water movement (Driver et al., 2011). This combined with the strong connectivity of freshwater ecosystems, means that they are highly susceptible to upstream, downstream and upland impacts, including changes to water quality and quantity as well as changes to aquatic habitat & biota (Driver et al., 2011).

Freshwater ecosystems are also likely to be particularly hard hit by the rising temperatures and shifting rainfall patterns associated with climate change while at the same time being vital for maintaining resilience to climate change and mitigating its impact on human wellbeing by helping to maintain a consistent supply of water and for reducing flood risk.

South Africa's freshwater ecosystems have been mapped and classified into National Freshwater Ecosystem Priority Areas (NFEPAs). This work shows that 60% of our river ecosystems are threatened and 23% are critically endangered. The situation for wetlands is even worse: 65% of our wetland types are threatened, and 48% are critically endangered (Driver et al., 2011). Recent studies reveal that less than one third of South Africa's main rivers are considered to be in an ecologically 'natural' state, with the principal threat to freshwater systems being human activities, including river regulation, followed by catchment transformation (Rivers-Moore & Goodman, 2009). South Africa's freshwater fauna also display high levels of threat: at least one third of freshwater fish indigenous to South Africa are reported as threatened, and a recent southern African study on the conservation status of major freshwater-dependent taxonomic groups (fishes, molluscs, dragonflies, crabs and vascular plants) reported far higher levels of threat in South Africa than in the rest of the region (Darwall et al., 2009). Clearly, urgent attention is required to ensure that representative natural examples of the different ecosystems that make up the natural heritage of this country for current and future generations to come. The degradation of South African rivers and wetlands s is a concern now recognized by Government as requiring urgent action and the protection of freshwater resources, including rivers and wetlands, is considered fundamental to the sustainable management of South Africa's water resources in the context of the reconstruction and development of the country.

1.4 Relevant Environmental Legislation related to Freshwater Ecosystems

Rivers and wetlands as ecosystem types are not formally protected by law but their alteration is regulated by the water use licensing process of the National Water Act (No. 36 of 1998) ('NWA'), the environmental authorization process of the National Environmental Management Act (No. 107 of 1998) ('NEMA') and the regulated activity permission process of the Conservation of Agricultural Resources Act (No. 43 of 1983) ('CARA').

2. APPROACH & METHODS

2.1 General Approach

The general approach to the freshwater ecosystem assessment was based on the proposed framework for wetland assessment proposed in the Water Research Commission's (WRC) report titled: '*Development of a decision-support framework for wetland assessment in South Africa and a Decision-Support Protocol for the rapid assessment of wetland ecological condition*' (Ollis et al., 2014). This is shown graphically in Figure 2.

Note that the wetland/aquatic assessment report has been developed in line with the National Environmental Management Act No. 107 of 1998 and the requirements of the Department of Water & Sanitation (DWS) for Water Use Licensing, as outlined in the 'Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals' contained in the Government Gazette No. 40713 of 24 March 2017.

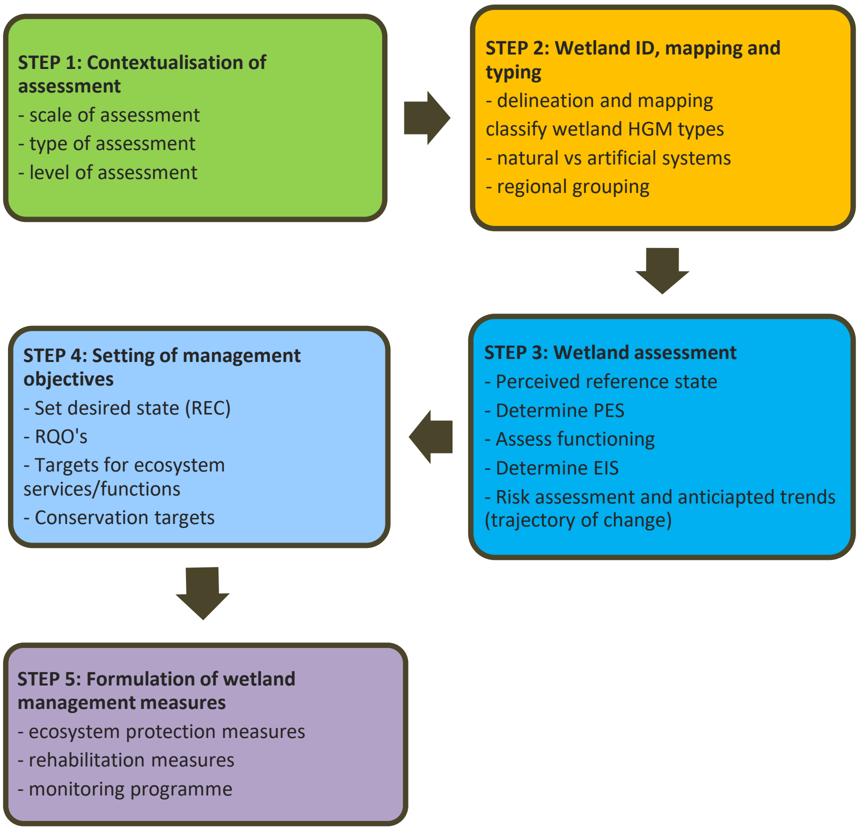

Figure 2 Proposed decision-support framework for wetland assessment in SA (after Ollis et al., 2014).

2.2 Desktop Assessment

2.2.1 Data Sources Consulted

The following data sources and GIS spatial information provided listed in Table 2 (below) was consulted to inform the specialist assessment. The data type, relevance to the project and source of the information has been provided.

Table 1. Data sources and GIS information consulted to inform the aquatic assessment.

DATA/COVERAGE TYPE	RELEVANCE	SOURCE
Biophysical Context		
Colour aerial photography	Desktop mapping of drainage network, wetlands, etc.	NGI (online)
Latest Google Earth ™ imagery	To supplement available aerial photography where needed	Google Earth™ On-line
DWA Eco-regions (GIS Coverage)	Classification of local Ecoregions	DWA (2005)
Geomorphological Provinces of South Africa	Understand regional geomorphology controlling the physical environment	Partridge *et al.* (2010)
South African Vegetation Map (GIS Coverage)	Classify vegetation types and determination of reference primary vegetation	Mucina & Rutherford (2006)
KwaZulu-Natal Vegetation Map (GIS Coverage)	Classify vegetation types and determination of reference primary vegetation	EKZNW (2011)
NFEPA: river and wetland inventories (GIS Coverage)	Highlight potential onsite and local rivers and wetlands	CSIR (2011)
KZN Rivers (GIS Coverage)	Highlight potential onsite and local rivers and wetlands and map local drainage network	SA Rivers dataset
Conservation Context		

DATA/COVERAGE TYPE	RELEVANCE	SOURCE
NFEPA: River, wetland and estuarine FEPAs (GIS Coverage)	Shows location of national aquatic ecosystem conservation priorities	CSIR (2011)
KwaZulu-Natal Vegetation Map (GIS Coverage)	Determination of provincial threat status of local vegetation types	EKZNW (2011)
Freshwater Systematic Conservation Plan for KZN (GIS Coverage)	Location and extent of conservation planning units	EKZNW (2007)
Strategic Water Source Areas (GIS Coverage)	Location and extent of strategic water source areas	(Nel *et al.*, 2013)
Durban Metropolitan Open Space System (D'MOSS) (GIS Coverage)	Location and extent of open space systems and ecological corridors	EThekwini Municipality (2011)
Durban Systematic Conservation Plan (GIS Coverage)	Municipal conservation planning importance.	Maclean *et al.* (2015)

2.2.2 Desktop Mapping

The desktop delineation of all watercourses within 500m of the proposed development / activities was undertaken by analysing available 2m elevation contours and colour aerial photography supplemented by Google Earth^{TM} imagery where more up to date imagery was needed. Digitization and mapping was undertaken using QGIS 2.16.3 GIS software. All of the mapped watercourses were then broadly subdivided into distinct resource units (i.e. level 4 hydro-geomorphic types of Ollis et al., 2013. This was undertaken based on aerial photographic analysis and professional experience in working in the region. Please note that the desktop map was updated as part of the finalisation of the assessment to include the detailed delineation of the units occurring within the study area.

2.2.3 'Impact Potential' Screening Assessment

Following the desktop identification and mapping exercise, watercourses were assigned preliminary 'likelihood of impact' ratings based on the likelihood that activities associated with the proposed development will result in measurable direct or indirect changes to the mapped watercourse units within 500m of the proposed development. The 'impact potential' ratings were refined following the completion of the field work. Each watercourse unit was ascribed a qualitative 'impact potential' rating according to the ratings and descriptions provided in Table 3, below.

Table 2. Qualitative 'likelihood of impact' ratings and descriptions.

Likelihood of Impact Rating	Description of Rating Guidelines
High	These resources are likely to require impact assessment and a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons: • resources located **within the footprint** of the proposed development activity and will definitely be impacted by the project; and/or • resources located **within 15m upstream and/or upslope** of the proposed development activity and trigger requirements for Environmental Authorisation according to the NEMA: EIA regulations; and/or • resources located **within 15m or downslope** of the development and trigger requirements for Environmental Authorisation according to the NEMA: EIA regulations; and/or • resources located downstream within the following parameters: o **within 15m downstream** of a low risk development; o **within 50m downstream** of a moderate risk development; and/or o **within 100m downstream** of a high-risk development e.g. mining large industrial land

Likelihood of Impact Rating	Description of Rating Guidelines
	uses.
Moderate	These resources may require impact assessment and a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons: • resources located **within 32m but greater than 15m upstream, upslope or downslope** of the proposed development; and/or • resources located within a range at which they are likely to incur indirect impacts associated with the development (such as water pollution, sedimentation and erosion) based on development land use intensity and development area. This is generally resources located downstream within the following parameters: o **within 32m downstream** of a low risk development; o **within 100m downstream** of a moderate risk development; and/or o **within 500m downstream** of a high risk development (note that the extent of the affected area downstream could be greater than 500m for high risk developments or developments that have extensive water quality and flow impacts e.g. dams / abstraction and treatment plants);
Low	These resources are unlikely to require impact assessment or Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons: • resources located a distance upstream, upslope or downslope (>32m) of the proposed development and which are unlikely to be impacted by the development project; and/or • resources located downstream but well beyond the range at which they are likely to incur impacts associated with the development (such as water pollution, sedimentation and erosion). This is generally resources located downstream within the following parameters: o **greater than 32m downstream** of a low risk development; o **greater than 100m downstream** of a moderate risk development; and/or o **greater than 500m downstream** of a high-risk development (note that the extent of the affected area downstream could be greater than 500m for high risk developments or developments that have extensive water quality and flow impacts e.g. dams / abstraction and treatment plants);
Very Low / None	These resources will not require impact assessment or a Water Use License in terms of Section 21 (c) & (i) of the National Water Act for the following reasons: • resources located within another adjacent sub-catchment and which will not be impacted by the development in any way, shape or form.

2.3 Baseline Assessment

2.3.1 Delineation

Formal identification and delineation of the present extent of the watercourses within the study area was undertaken according to the national wetland and riparian zone delineation guidelines (DWAF, 2005).

For wetlands, sampling was undertaken systematically across valley lines and concave slopes where wetlands and riparian zones were predicted to occur. At each sampling point the following information was collected and recorded:

- **Terrain unit indicator** – The location of the areas sampled in the landscape was recorded based on visual observations i.e. valley bottom, foot slope etc.
- **Soil wetness indicator** – The texture, colour and presence/absence of redoximoprhic features within the top 50cm of the soil profile was sampled and recorded using a clay auger. Texture was recorded based on feel and professional experience, soil matrix colour was recorded in

terms of hue, value and chroma using a Munsell Soil Colour Chart and the degree of mottling was recorded qualitatively in terms of colour, size and abundance based on visual observation.
- **Vegetation indicator** – All identifiable plant species within a 5m radius of each sample point was recorded and the cover abundance qualitatively rated on a three-point scale (low, moderate and high).
- **Soil formation indicator** – This indicator was not sampled / investigated as part of this study.

For riparian zones, sampling was undertaken systematically across valley lines where river and stream channels are predicted to occur. At each sampling point the following information was collected and recorded:

- **Fluvial morphological / topographical features** – The outer edges of distinct fluvial geomorphic / morphological features were recorded e.g. macro channel bank.
- **Vegetation** – The location of observable changes in species composition and structure of vegetation in the vicinity of natural and artificial channels was recorded based on visual observations. All identifiable plant species within a 5m radius of each morphological and vegetation change sample point was recorded and the cover abundance qualitatively rated on a three-point scale (low, moderate and high).
- **Presence of alluvial soils and deposited material** – The texture and colour within the top 50cm of the soil profile was sampled and recorded using a clay auger to confirm. Texture was recorded based on feel and professional experience.

2.3.2 Classification

The delineated wetlands were classified in terms of Level 4 of the national wetland and aquatic ecosystems classification system (Ollis et al., 2013), which is classification at the hydro-geomorphic unit scale / level. This classification was based on observations of topographical setting, position within the landscape and flow regime. Please refer to Annexure C2 for a description of the HGM types considered.

The delineated river and stream units were classified in terms of four (4) attributes in line with the approach adopted for the EcoClassification namely perenniality, longitudinal zonation, channel width and channel material. This classification was based on observations of channel width, bank and bed materials and observable flow during field work at sampling / observation points. Please refer to Annexure C2 for a more comprehensive description on the attributes considered.

2.3.3 Present Ecological State (PES)

Present Ecological State (PES) is a measure of the deviation of the ecological integrity (health / condition) of a definable ecosystem unit from its reference state.

Wetland PES Assessment:

The wetland assessment involved the application of the Level 1 WET-Health tool, a rapid desktop based assessment supplemented and refined based on onsite observations. Where wetlands were encountered during field work, key aspects like disturbance / impact zones and clear vegetation community boundary changes were recorded using a hand-held GPS. This data was supplemented with desktop analysis of catchment land cover and land uses, and other within-wetland impacts observed using colour aerial photography and Google Earth imagery.

River PES Assessment:

The river reach assessment involved the application of the IHI (Index of Habitat Integrity) 1996, version 2 (Kleynhans, 2012) (referred to as the Q-IHI). As part of rapid Q-IHI assessment a specific set of defined impact indicators were assessed qualitatively for both the instream and riparian components of the affected river / stream reach. Where streams and rivers were encountered, sampling involved the recording visual observations at selected points along the channel and such sampling was generally confined to the delineation transects. Key riparian features relevant to the IHI assessment were recorded using a hand-held GPS. This data was supplemented with desktop analysis of catchment land cover and land uses, and other within-channel impacts observed using colour aerial photography and Google Earth imagery.

2.3.4 Present Ecological Importance & Sensitivity (EIS) Assessment

"Ecological importance" of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales (Duthie, 1999). Therefore, ecological importance encompasses the role water resources play in maintaining biodiversity as well as the importance of regulating and supporting functions / services for maintaining and buffering freshwater ecosystems. "Ecological sensitivity" refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (Duthie, 1999). As an overarching measure of the importance of an ecosystem, EIS provides a guideline for determination of the Ecological Management Class (EMC) (Duthie, 1999).

Wetland EIS:

The wetland EIS assessment was undertaken using a tool developed by Eco-Pulse adapted from the published Wetland EIS tool (Duthie, 1999). The assessment involved three (3) components, namely:

- Biodiversity maintenance importance assessment – this involved a review of conservation status assessments and conservation plans for the study area,
- Regulating and supporting services (functional) assessment.
- Ecological sensitivity assessment.

The regulating and supporting ecosystem services assessment was undertaken using a tool developed by Eco-Pulse adapted from the Level 2 WET-EcoServices tool (Kotze et al., 2016).

Although not technically part of the EIS assessment, a socio-cultural importance assessment, which considers provisioning and cultural goods and services, was also undertaken using the Eco-Pulse tool adapted from the Level 2 WET-EcoServices tool.

River EIS:

The River EIS assessment was undertaken using a tool developed by Eco-Pulse adapted from the published River EIS tool (Kleynhans, 1999).

2.4 Impact Assessment

While details of specific impacts will vary according to the site and development activity, aquatic / freshwater ecosystem impacts can typically be grouped into the following three (3) categories based on distinct impact-causing activities, ecosystem components and impact pathways:

1. **Direct habitat loss and modification impacts** – This impact type refers to the direct physical destruction and/or disturbance of freshwater habitat by human activities like vegetation / habitat clearing (stripping / grubbing), surface reshaping / alteration, earthworks (i.e. excavation and infilling) and flooding. This impact also includes the resultant impacts to ecosystem condition and ecosystem services but does not include the indirect hydrological, geomorphological and ecological impacts of such activities like flow modification, erosion and sedimentation and associated downstream habitat degradation.
2. **Indirect flow modification, erosion and/or sedimentation impacts** – This impact type refers to all of the indirect impacts resulting from and associated with human activities that alter wetland hydrological and geomorphological (erosion and sedimentation) processes and structures like: (i) direct physical habitat modification; (ii) catchment and buffer zone land cover modification and transformation (e.g. vegetation clearing, surface hardening, stormwater management and cultivation); and (iii) flow regulation, abstraction and controlled discharges. This impact also includes the resultant impacts to ecosystem condition and ecosystem services.
3. **Water pollution impacts** – This impact refers to the alteration or deterioration in the physical, chemical and biological characteristics of water within watercourses and the associated ecological impacts. In the context of this impact assessment, water quality refers to its fitness for maintaining the health of aquatic ecosystems and for current uses, domestic and agricultural.

The significance of each impact type in terms of the above listed impact characteristics was assessed in terms of the ultimate impact consequences or end-points (i.e. impacts to resources of known societal value) in line with the National Wetland Offset Guidelines (SANBI & DWS, 2014), namely:

(i) **Impacts to water resource supply and quality**: This addresses impacts to the quantity and quality of water provided by water resources. Such impacts may be the result of more direct impacts like abstraction, regulation and/or return discharges, and/or the result of freshwater ecosystem loss or degradation that affects the ability of watercourses to provide supporting regulating and supporting services.

(ii) **Impacts to ecosystem and habitat conservation (ecosystem biodiversity):** This deal specifically with impacts to quality and condition of habitat and the ability to meet conservation targets for freshwater ecosystems. This therefore accounts for the loss or change in freshwater habitat, which is particularly important for highly threatened ecosystem types.

(iii) **Impacts to species of conservation concern (species biodiversity)**: This addresses impacts on freshwater biota, with a particular emphasis on species or populations of conservation concern and the ability to meet species conservation targets.

(iv) **Impacts to local communities**: This deals with impacts to local communities reliant on freshwater ecosystem goods and services, specifically impacts to provisioning (e.g. water supply & cultivated foods) and cultural services (e.g. cultural significance or recreational values) of direct value to local users and consequences for human health, safety and livelihood support.

The approach to impact conceptualisation is depicted by the diagram in Figure 3, below.

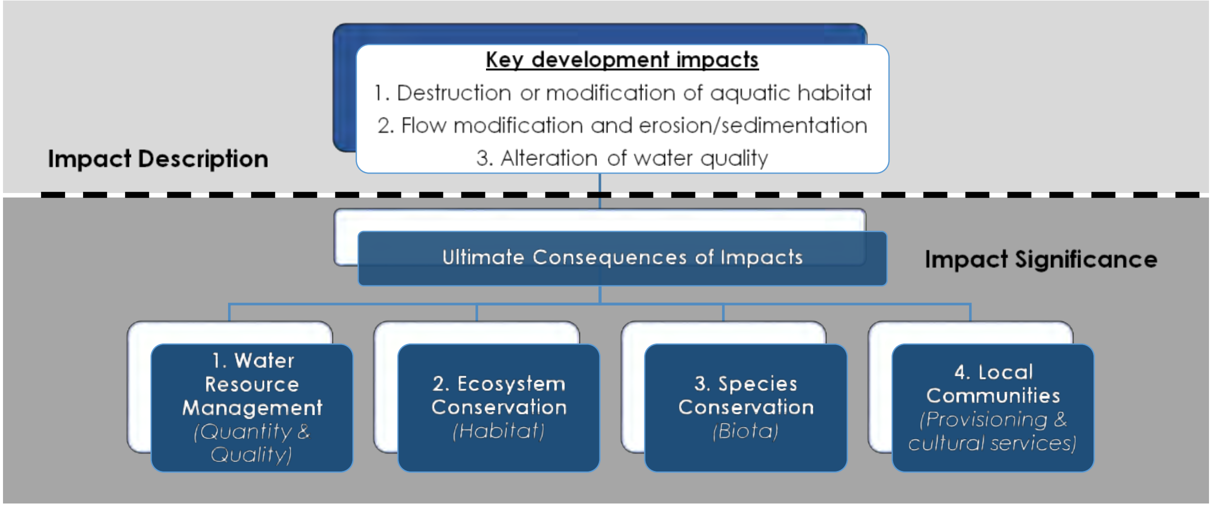

Figure 3 Diagram illustrating how the impact assessment framework is conceptualized.

The impact assessment was undertaken for the following mitigation scenarios only:

- **Realistic Poor Mitigation Scenario**: This scenario involves the implementation of the development plan and designs that are current proposed with the associated implementation of standard construction and operational phase mitigation measures. In terms of implementation success, this scenario assumes a realistic / likely poor implementation scenario based on the author's experience with such developments. It is important to note that it is our experience in similar development settings that contractor compliance with construction Environmental Management Programmes (EMPr) is poor and that operational maintenance is poor.
- **Realistic Good Mitigation Scenario**: This scenario involves the implementation of the development plan and designs that are current proposed with the associated implementation of the construction and operational phase mitigation measure recommended by the author. In terms of implementation success, this scenario assumes a realistic best-case scenario for implementation based on the author's experience with such developments.

2.5 Risk Assessment

Government Notice 509 of 2016 published in terms of Section 39 of the NWA sets out the terms and conditions for the General Authorisation of Section 21(c) [1] and 21(i) [2] water uses, key among which is that only developments posing a 'Low Risk' to watercourses can apply for a GA. Note that the GA does not apply to the following activities:

- Water use for the rehabilitation of a wetland as contemplated in GA 1198 contained in GG 32805 (18 December 2009).
- Use of water within the 'regulated area'[3] of a watercourse where the Risk Class is **Medium or High.**
- Where any other water use as defined in Section 21 of the NWA must be applied for.
- Where storage of water results from Section 21 (c) and/or (i) water use.
- Any water use associated with the construction, installation or maintenance of any sewerage pipeline, pipelines carrying hazardous materials and to raw water and wastewater treatment works.

To this end, the DWS have developed a Risk Assessment Matrix/Tool to assess water risks associated with development activities. The DWS Risk Matrix/Assessment Tool (based on the DWS 2015 publication: 'Section 21 c and I water use Risk Assessment Protocol') was applied to the proposed project. The tool uses the following approach to calculating risk:

RISK = CONSEQUENCE X LIKELIHOOD

whereby:

CONSEQUENCE = SEVERITY + SPATIAL SCALE + DURATION

and

LIKELIHOOD = FREQUENCY OF ACTIVITY + FREQUENCY OF IMPACT + LEGAL ISSUES + DETECTION

The key risk stressors[4] associated with each of the three impact groups / types considered were:

1. **Direct habitat loss and modification impacts** – Physical disturbance.
2. **Indirect flow modification, erosion and/or sedimentation impacts** – Erosive surface runoff, sediment and increased and/or reduced water inputs.
3. **Water pollution impacts** – Chemical, organic and biological pollutants.

For each of the above stressors, risk was assessed qualitatively using the DWS risk matrix tool.

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[1] 21(c): Impeding or diverting the flow of water in a watercourse

[2] 21(i): Altering the bed, banks, course or characteristics of a watercourse

[3] The 'regulated area' of a watercourse; for Section 21 (c) or (i) of the Act refers to:

- i. The outer edge of the 1:100 yr flood line and/or delineated riparian habitat, whichever is greatest, as measured from the centre of the watercourse of a river, spring, natural channel, lake or dam.
- ii. In the absence of a determined 1:100 yr flood line or riparian area, refers to the area within 100m from the edge of a watercourse (where the edge is the first identifiable annual bank fill flood bench).
- iii. A 500m radius from the delineated boundary of any wetland or pan.

[4] A stressor is any physical, chemical, or biological entity that can induce an adverse response. Stressors may adversely affect specific natural resources or entire ecosystems, including plants and animals, as well as the environment with which they interact (USA EPA - https://www.epa.gov/risk/about-risk-assessment#whatisrisk).

It is important to note that the risk matrix/assessment tool also makes provision for the downgrading of risk to low in borderline moderate/low cases subject to independent specialist motivation granted that (i) the initial risk score is within twenty five (25) risk points of the 'Low' class and that mitigation measures are provided to support the reduction of risk. The tool was applied to the project for the highest risk activities and watercourses was used to inform WUL requirements for the proposed development.

2.6 Assumptions, Limitations & Information Gaps

The following limitations and assumptions apply to this assessment:

2.6.1 Sampling

- Although all watercourses occurring within 500m of the proposed activities were mapped at a desktop level, field investigations were confined to only those areas that stand to be measurably negatively affected. These areas constituted the study area of assessment.
- The mapping and classification of the watercourse units outside of the study area but occurring within a 500m radius of activities should be considered preliminary and coarse in resolution. These units were not verified in the field.
- Sampling by its nature means that not all parts of the study area were visited. The assessment findings are thus only applicable to those areas sampled, which were extrapolated to the rest of the study area.
- Systematic sampling of was undertaken along transects spaced approximately 50-200m apart. The outer boundary of the wetland and riparian zones identified can be considered accurate along and in the vicinity of these transects. Between transects the outer boundary had to be extrapolated using aerial photography and 2m contours and, as such, the accuracy of such extrapolated sections has limitations and is open to the interpretation of the delineator.
- A Soil Munsell Colour Chart was used to determine the soil matrix colour of the soil sampled. However, it is important to note that the recording of the colours using the soil chart is highly subjective and varies significantly depending on soil moisture and the prevailing light conditions. In this case, all the soils sampled were dry and sampling was undertaken in sunny conditions.
- Soil wetness indicators (i.e. soil mottles, grey soil matrix), which in practice are primary indicators of hydromorphic soils, are not seasonally dependent (wetness indicators are retained in the soil for many years) and therefore seasonality has no influence on the delineation of wetland areas.
- The accuracy of the delineations are based solely on the recording of the onsite wetland indicators using a GPS. GPS accuracy will therefore influence the accuracy of the mapped sampling points and therefore water resource boundaries, and an error of 1-5m can be expected. All soil/vegetation/terrain sampling points were recorded using a Garmin MontanaTM Global Positioning System (GPS) and captured using Geographical Information Systems (GIS) for further processing.

- All vegetation information recorded was based on the onsite visual observations of the author and no formal vegetation sampling was undertaken. Furthermore, only dominant and noteworthy plant species were recorded. Thus, the vegetation information provided has limitations for true botanical applications.
- Although every effort was made to correctly identify the plant species encountered onsite, wetland plants, particularly the Cyperaceae (sedge) family, are notoriously difficult to identify to species level. Every effort as made to accurately identify plants species but where identification to species level could not be determined, such species were only identified to genus level.
- Seasonality can also influence the species of flora encountered at the site, with the flowering time of many species often posing a challenge in species identification. Since the wetland vegetation in the study area was found to be largely secondary/degraded with low native plant diversity, seasonality would not be as significant a limitation when compared with a vegetation community that is largely natural or high in native plant diversity.
- The location of the study area within the coastal zone of KZN means that climate has less of an effect on aquatic ecosystems and vegetation characteristics than typical temperate inland systems which are exposed to more extreme variations in temperatures between seasons. Thus, vegetation response is limited and species structure and composition tend to remain the same or very similar between seasons.
- In environments with multiple artificial water sources (e.g. leaking septic tanks, leaking pump stations, road runoff, and waste water discharge from chicken houses), interpretation of natural versus artificial hydric soils or wetland soil indicators can be difficult, especially in loamy and sandy soils where wetland soil indicators can be missing despite regular soil saturation. In such cases, we have made an effort to substantiate all claims where applicable and necessary while acknowledging limitations.
- With the exception of aquatic macroinvertebrates, no wetland or riparian / riverine fauna sampling or faunal searches were conducted. The assessment was purely habitat focussed.

2.6.2 PES & EIS Assessments

- The PES and EIS assessments undertaken are qualitative assessment tools and thus the results are open to professional opinion and interpretation. We have made an effort to substantiate all claims where applicable and necessary.
- The setting of the hypothetical reference state for each of the wetland and riverine units assessed was extremely difficult due to the transformed and modified nature of the systems and a lack of information regarding reference state. Therefore, the reference states presented should be considered highly speculative with a low level of confidence.
- The EIS assessment did not specifically address in detail all the finer-scale ecological aspects of the water resources such as a list of aquatic fauna likely to occur (i.e. invertebrates, amphibians and fish) within and make use of these systems.

2.6.3 Impact Assessment

- The assessment of impacts and recommendation of mitigation measures was informed by the site-specific ecological concerns arising from the field survey and based on the assessor's working knowledge and experience with similar development projects.
- The impact descriptions and assessment are based on the author's understanding of the proposed development based on the information provided.
- Evaluation of the significance of impacts with mitigation takes into account mitigation measures provided in this report and standard mitigation measures included in the Environmental Management Programme (EMPr).

2.6.4 Risk Assessment

- All risk ratings generated by the DWS risk matrix are conditional on the effective implementation of the mitigation measures provided in the specialist freshwater habitat assessment report for the project.
- For the purposes of this study, the term 'stressor[5]' was favoured instead of the term 'aspect' referred to in the DWS risk matrix.
- For the purposes of this study, the criterion 'frequency of stressor occurrence' was favoured instead of the criterion 'frequency of activity' referred to in the DWS risk matrix.
- For the severity ratings, impacts to wetlands were assessed on their merits rather than automatically scoring impacts to wetlands as 'disastrous' as guided in the DWS risk matrix.
- The severity assessment for changes in flow regime and physico-chemical impacts were interpreted in terms of the changes to the local freshwater ecosystem represented by the potentially affected reaches.
- For the scoring of impact duration, the predicted change in PES was also considered which could override the actual duration of the impact where applicable e.g. if the impact duration was long term (typically a score of 4 out of 5) but the predicted change in PES is negligible, the impact duration was downs-scored to a score of 2 in line with the duration criteria descriptions in the risk matrix tool.

3. BASELINE ASSESSMENT

3.1 Desktop Assessment: Biophysical & Conservation Context

Understanding the biophysical and conservation context of the study area and surrounding landscape is important to inform decision making regarding the significance of the area to be affected.

3.1.1 Biophysical Setting & Context

A summary of key biophysical details for study area and catchment area is presented in Table 3 below.

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[5] Any physical, chemical or biological entity that can induce an adverse response to the structure and function of an ecosystem (Reference: USEPA (1998). Guidelines for Ecological Risk Assessment; Notice Fed. Reg. 6326846-26924. Environmental Monitoring Systems Laboratory, Office of Research and Development, US Environmental Protection Agency, Cincinnati, Ohio.

Table 3. Key biophysical setting details of the study area.

Biophysical Aspects	Desktop Biophysical Details	Source
Elevation	81 – 96m	Google Earth™
Mean annual precipitation (MAP)	600 - 700 mm	Schulze, 1997
Rainfall seasonality	Late Summer, mid-summer	DWAF, 2005
Average temperature range	22 - 24ºC in winter (July) to 20 - >20ºC in summer (February)	DWAF, 2005
Potential Evaporation (%)	<20 - 20	DWAF, 2005
Median Annual Simulated Runoff (mm)	150 - >250 mm/annum	Schulze, 1997
Geomorphic Province	South-eastern Coastal Hinterland	Partridge *et al*., 2010
Geology	Fine to coarse grained sandstone, shale and coal seams	RSA 1:1000 0000 Geological Map (SA Geological Society)
Water management area	Pongola–Mtamvuna	DWS
Quaternary catchment	U30B	DWS
Main collecting river(s) in the catchment	Mdloti River	CSIR, 2011
DWS Ecoregion	17.01 and 17.02 (South-eastern Coastal Hinterland)	DWA, 2005

3.1.2 Drainage Setting & Catchment

The study area is located within DWS Quaternary Catchment U30B which is drained primarily by the perennial Mdloti River (Figure 4), situated in the Pongola - Mtamvuna Water Management Area (WMA). The study area is located in the headlands of a small stream and drains into a stormwater drain network which drains in a south-easterly direction, entering a first order stream downstream. The series of small tributary streams feed into the Mdloti River and Mdloti Estuary some 2km downstream to the south-east of the King Shaka International Airport (KSIA) site.

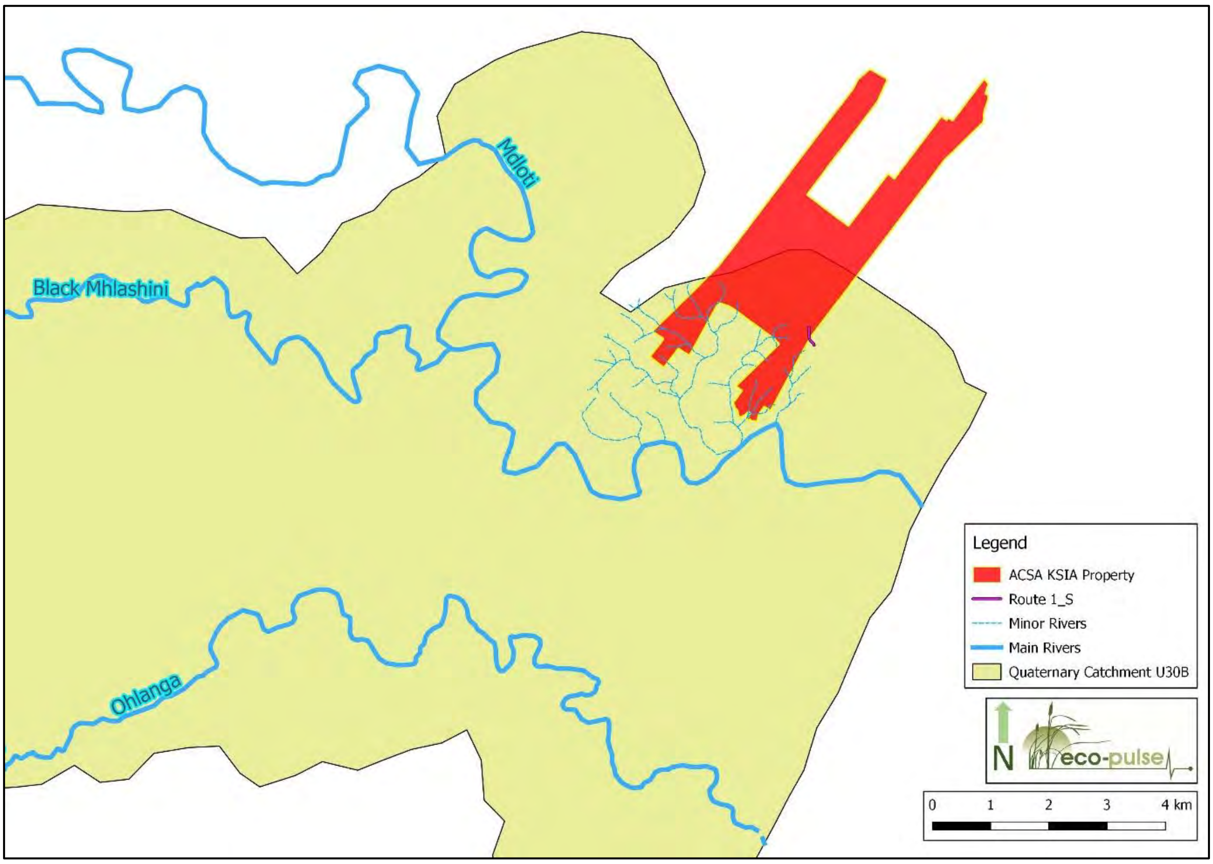

Figure 4 Map showing the quaternary catchment and local drainage network within the study area.

3.1.3 Conservation Context

National, provincial and regional biophysical and conservation datasets were screened, the results of which are presented in Table 4 and the relevant sections that follow.

Table 4. Key conservation context details for the study area.

Conservation Planning Dataset	Relevant Conservation Feature	Location in Relation to Project Site	Conservation Planning Status
NATIONAL CONSERVATION PLANNING CONTEXT			
National Vegetation Map (Mucina & Rutherford, 2006)	KwaZulu-Natal Coastal Belt (CB 3)	Entire project site	**Endangered vegetation type**
The National Freshwater Ecosystem Priority Area (NFEPA) Assessment (CSIR, 2011)	None	-	-
PROVINCIAL CONSERVATION PLANNING CONTEXT			
KZN Vegetation Map (EKZNW, 2012)	KwaZulu-Natal Coastal Belt Grassland	Entire project site	**Endangered**
KZN Aquatic Conservation Plan (EKZNW, 2007)	Freshwater Planning Units No. 4052 and 4534	Study area catchment	**Available**
KZN Terrestrial Conservation Plan (EKZNW, 2010)	Terrestrial Planning Units No. 81577, 81573, 81577, 83155, 83156, 83158 and 831557	Entire development footprint	None

Conservation Planning Dataset	Relevant Conservation Feature	Location in Relation to Project Site	Conservation Planning Status
KZN Terrestrial Systematic Conservation Assessment (EKZNW, 2016)	North Coastal Grassland	Portion of the development footprint	**CBA: Irreplaceable**
Durban Metropolitan Open Space System (D'MOSS)	Thicket, Forest, Field crops, Freshwater wetland and woodland	Within the 500m buffer	N/A
Durban's Systematic Conservation Assessment (Maclean et al., 2015)	CBA and ESA	Within the 500m buffer	N/A

It is important to note that the King Shaka International Airport (KSIA) conservation zone is adjacent to the study area.

3.2 Desktop Mapping & Screening Results

The watercourses mapped within 500m of the proposed emergency road is shown in Figure 5 below, with the majority of watercourses within this area being identified as wetlands. The impact potential screening assessment indicates that only one wetland stands to be measurably negatively impacted (possibly directly and indirectly) by the proposed development and was rated as having a high impact potential (see Figure 5). This was due to its close proximity to the proposed activities (within 15m). This unit was thus taken forward for detailed infield assessment only.

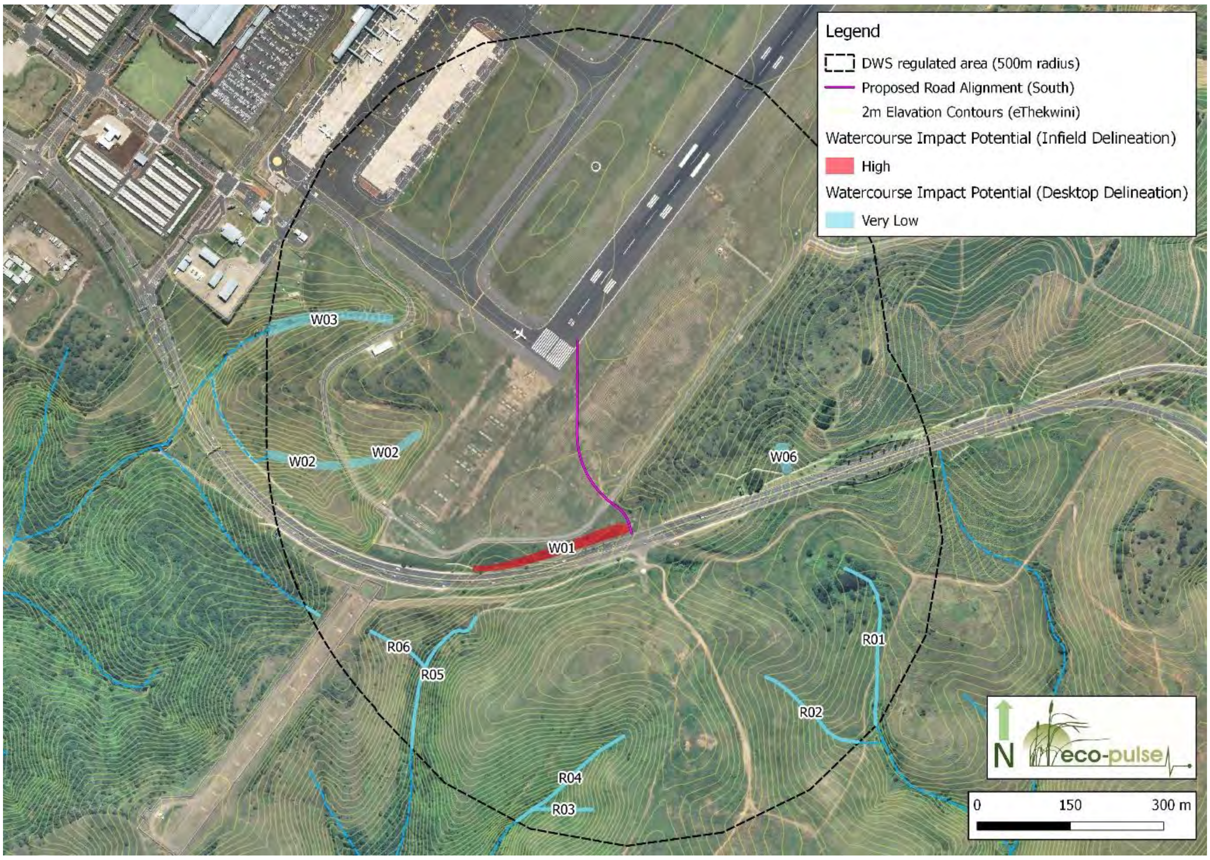

Figure 5 Map showing the desktop 'wetland impact potential' screening outputs for the proposed southern emergency access road.

4. BASELINE WETLAND ASSESSMENT RESULTS & DISCUSSION

4.1 Delineation

Soil and vegetation sampling along the in close proximity to the proposed emergency road and servitude confirmed that no natural wetlands stand to be impacted by the proposed road. The wetland unit flagged as part of the desktop mapping and impact potential screening assessment was confirmed to be an artificial wetland formed within a stormwater drain, hereafter referred to as a 'stormwater wetland'. The location and extent of the artificial wetland is shown in Figure 5 below. Flow within the drain is conveyed under the Mdloti Street / M65 via a culvert and discharged into the headwaters of a small stream via a large stormwater headwall within the KSIA conservation area. The headwall is located approximately 300m downstream of the study area. This stream was not assessed as it was assumed that it would not be measurably negatively affected by the proposed development. Furthermore, the stormwater wetland provides added protection and buffering top this stream.

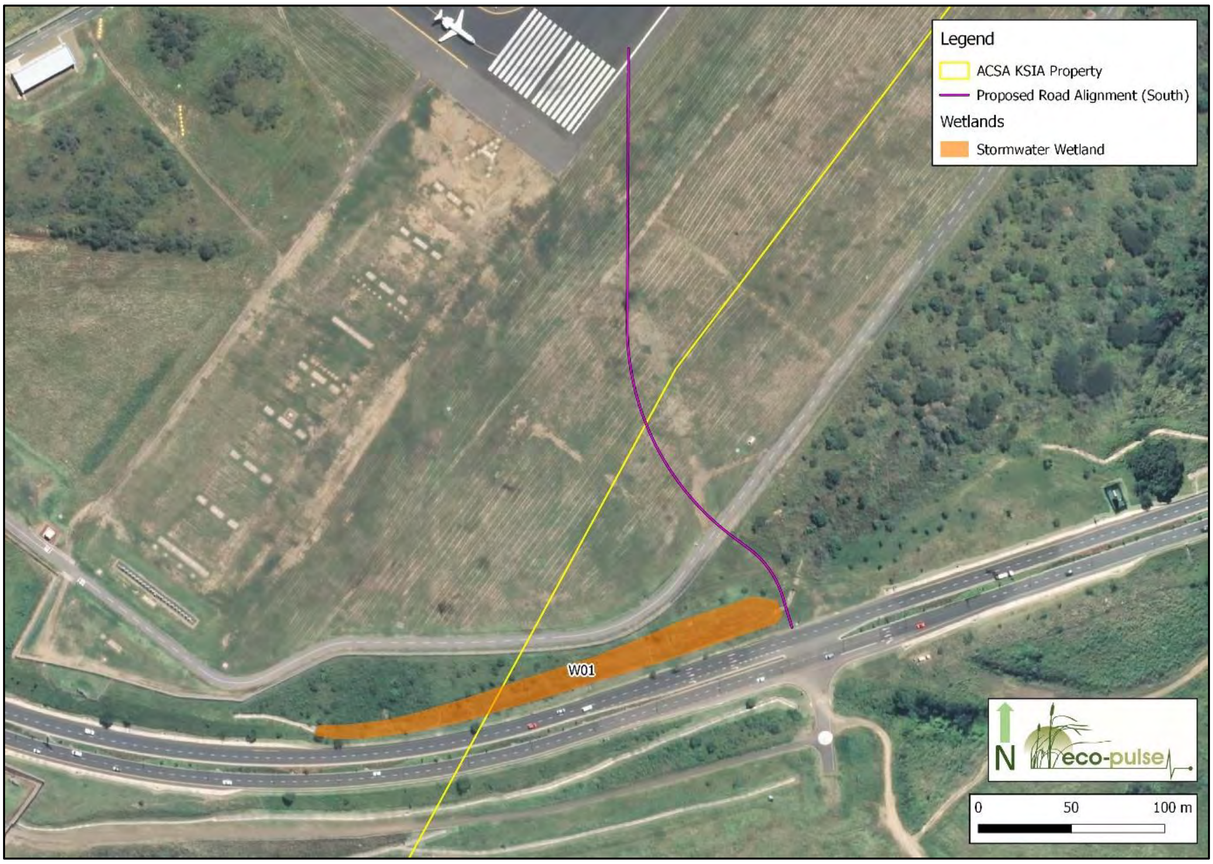

Figure 6 Map showing the location extent of delineated watercourses.

4.1.1 Soils and Terrain

All soils sampled within the study area were dryland soils that showed no signs of wetness / hydric soil indicators. The soil texture[6] was found to range between moderately textured soils (sandy loam) and fine textured soils (clay loam) with a brown soil matrix[7] (hue[8] 10yr; chroma[9] 4/3; value[10] 2/3). No redoximorphic features like a gleyed matrix of the presence of mottles were found. Strategic sampling points were taken along the moderate to steep terrain. At a number of the sampling locations, signs of soil mixing and infilling from alterations to the landscape (construction of the King Shaka International Airport) made soil sampling and the interpretation of soil colour and morphology extremely difficult. Photos A to C provide an example of soil samples collected onsite. The artificial stormwater wetland is characterised by seasonal to permanent saturated soils, however parts of the stormwater drain is lined with concrete.

A. Example of a typical terrestrial (dryland) soil sample extracted on site.

B. Example of a mixed sandy loam soils extracted on site.

C. Example of the mixed clay loam soil (with sand particles present) extracted from the site (with a brown grey matrix).

4.1.2 Vegetation Characteristics

Due to the historic transformation of the study area, the vegetation communities encountered were all secondary and dominated by common weeds and opportunistic species with very low species diversity. Three broad but distinct vegetation communities were identified within and in close proximity to the study area, namely:

1. Dense *Typha capensis* (Bulrush) community within the stormwater drain, referred to as the 'stormwater wetland'. *T. capensis* is a robust emergent wetland plant that occurs in permanently

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[6] Soil texture is a measure of the relative proportion of the various soil particle size fractions in soil (http://www.soilquality.org.au/factsheets/soil-texture).

[7] Soil matrix is the portion of a given soil having the dominant colour, in most cases, the matrix will be the portion of the soil having more than 50 percent of the same colour.

[8] A characteristic of colour related to one of the main spectral colours (red, yellow, green, blue or purple), or various combinations of these principle colours, one of the three variables of colour, each colour chart in the Munsell Soil Colour Charts represents a specific hue.

[9] Chroma refers to the intensity or brightness of the color and has also been described as the purity of the color. It has also been described as the richness of the color.

[10] Value refers to the lightness and darkness of a color in relation to a neutral gray scale.

saturated soils. This species often proliferates under disturbed wetland conditions and is an aggressive invader of disturbed wetlands. The presence of T. *capensis* indicates that there is likely flow impoundment within the stomrwater drain. Whether this is designed for or a consequence of blockage is not known. The banks of the drain have been planted with *Stenotaphrum secundatum* (Buffalo Grass), a locally occurring stoloniferous lawn grass.

2. Mowed *Cynodon dactylon* (Couch Grass) grassland occurring on levelled platform between the M65 and the KSIA boundary fence. *C. dactylon* is a creeping lawn grass that is used locally in revegetation applications. This species is also a weed of cultivation.
3. Mixed woody Panicum maximum grassland and shrubland within an undulating valley-head like landform.

Further details are provided in Table 5, below.

Table 5. Description of plant communities.

Plant community	Photo
Typha capensis stormwater drain *Typha capensis* is the dominant wetland species in this zone. The banks are covered with the grass *Stenotaphrum secundatum* (Buffalo grass), with some scattered IAPs on the edges e.g. *Chromolaena odorata* (Triffid Weed).	
Mowed grassland on platform This zone occurs along the periphery of the stormwater drain and along the M65, with *Cynodon dactylon* and *Paspalum urvillei* identified as the most common species.	

Plant community	Photo
Mixed woody grassland and shrubland within modified valley head landform This small patch occurs upslope of the platform and the stormwater wetland. This patch occurs within an undulating valley-head like landform that appears to have been modified by earthworks in the past. The vegetation can be characterised as a mix of *Panicum maximum* grassland, scrubland and bushclumps. Other species present within the grassland assemblage include Paspalum *urvillei, Setaria megaphylla, Sorghum bicolor, Stenotaphrum secundatum, Cyperus sphaerospermus, Commelina benghalensis and Mimosa pudica*. The buschclumps comprised *Acacia sp.* and *Erythrina caffra* identified in this area along the edge. Alien species invasion is present but is in low densities. Alien species recorded include *Ipomoea purpurea,* and *Mimosa pudica*, *Chromolaena odorata,* and *Lantana camara*.	

4.2 Classification

The only watercourse identified within the study area was an artificial wetland located within a stormwater drain. Thus, this watercourse could not be formally classified, and was classified as an 'artificial wetland' for the purposes of this assessment.

4.3 Present Ecological State (PES)

As the wetland delineated is an artificial wetland that has formed in a man-made stormwater drain, PES could not be assessed. PES assessment is only applicable to natural features / ecosystems where deviation from a natural or reference state can be assessed.

4.4 Ecological, Functional & Socio-cultural Importance

Although the wetland is artificial, dense wetland vegetation is present, which could provide habitat for important flora and fauna as well as provide regulating ecosystem services like water quality enhancement. For this reason, the artificial wetland was formally assessed.

A summary of the importance scores and ratings for the artificial wetland is provided in Table 6 below.

The artificial wetland was assessed as being of moderate importance in terms of the provision of regulating services. This moderate importance score was driven by the score for erosion control services. Erosion control factors are important due to the high stormflows passing through the wetland and the stabilizing effect of the wetland vegetation. It is also important to mention that the wetland was also assessed as being of moderate importance in terms of the provision of water quality enhancement services, specifically toxicant removal services. The wetland is reasonably well situated to trap sediment contaminants due to factors such as the high surface roughness provided by wetland vegetation. Furthermore, stormwater runoff from the adjacent road and portion of the runway is likely to contain a level of toxicants, which wash into the wetland, increasing the demand of this service. The remaining regulating and supporting services were assessed as being of moderately-low importance. This is due to the low demand of these services.

In terms of biodiversity maintenance (ecological importance), the stormwater wetland was assessed as being of very-low importance due to the wetland being artificial with limited vegetation diversity and probably does not provide habitat for threated wetland flora and fauna.

The provisioning and cultural services provided by the wetland were assessed as being of very-low importance due to the wetland being located in a restricted area (no community access) and the limited occurrence of natural resources of direct and indirect use value for communities.

Table 6. Summary of the importance scores and ratings for Wetland Unit W1.

Assessment Aspect / Component	**Unit W1**
Ecological Importance (Biodiversity Maintenance)	0,50
Ecological Sensitivity	0,00
EIS	**0,50**
EIS Rating	**Very Low**
Flow regime regulation	0,86
Water quality enhancement	1,79
Sediment trapping & erosion control	1,94
Carbon storage	1,44
Functional Importance	**1,94**
Functional Importance Rating	**Moderate**
Provisioning services	0,44
Cultural services	0,33
Socio-cultural Importance	**0,44**
Socio-cultural Importance Rating	**Very Low**

Note that the WET-Ecoservices assessment Excel ™ and EIS spreadsheets can be made available by Eco-Pulse upon request.

5. RISK & IMPACT ASSESSMENT

This section deals with the prediction, description and assessment of the potential construction and operational impacts and risks of the proposed activities as described in the introduction (Section 1). Each one of the potential impact types are discussed and assessed separately for the construction and operational phases, under the 'realistic poor' and 'realistic good' mitigation scenarios as defined in the methods section. Construction impacts are denoted 'C' and operational impacts 'O'. The significance and risk assessment spreadsheets are included in Annexures C and D respectively.

5.1 Risk and Impact Prediction & Description

A summary of the potential risks and impacts of the proposed development activities is provided in Table 7 below. The impacts and risks have been grouped into distinct categories based on the impact-causing activity and the definable impact pathways arising from such activities. The risk and significance assessment results tables are provided in **Annexure A**.

Due to the proposed development being located outside of any watercourses or freshwater habitats, direct impacts will be limited. There is however a possibility of accidental direct, physical impacts to the artificial wetland if the construction of the road is poorly managed. The indirect impacts that could impact in the stormwater wetland and possibly downstream aquatic ecosystems under a very poor (worst case) management scenario are sedimentation impacts / risks and pollution impacts / risks during both construction and operational phases.

Table 7. List of key impact-causing activities with associated risks, impacts and impact pathways.

Activities	Stressors (Risks) (R)	Impacts (I)	Impact Pathways
Construction Phase (C)			
C1. Clearing and earthworks	C1_R1. Physical disturbance of watercourse (accidental / unintended)	C1_I1. Physical disturbance of watercourse (accidental / unintended)	Watercourse changes: Accidental / unintended clearing, excavation or infilling of artificial wetland habitat, degradation of wetland functions, reduction in supply of ecosystem services.
	C1_R2. Sediment C1_R3. Erosive water	C1_I2. Erosion and/or sedimentation of watercourses	Catchment changes: Reduced vegetation cover, decreased soil cohesion, increased surface runoff, increased soil erosion, increased sediment inputs to artificial wetland. Watercourse changes: Vegetation smothering, and/or burial, decreased rates of waterlogging, increased invasion of ruderals and alien plants, degradation of wetland functions, reduction in supply of ecosystem services.
	C1_R4. Alien invasive plants	C1_I3. Invasion of alien invasive plants	Catchment changes: Removal of vegetation and disturbance and exposure of soils within the activity footprint, recolonization of disturbed soils by ruderals including alien invasive plants, increased presence of alien invasive species propagules within the vicinity of the artificial wetland. Watercourse changes: Due to the proliferation of dense *Typha capensis* within the stormwater drain, alien plant invasion is unlikely as long as the wetland is not physically disturbed. However, if the wetland is directly or indirectly disturbed such that the soils are exposed and saturation levels decrease, alien invasive plant invasion of these areas is a possibility.

Activities	**Stressors (Risks) (R)**	**Impacts (I)**	**Impact Pathways**
C2. Hazardous substances handling, storage and disposal	C2_R1. Pollutants	C2_I1. Water quality deterioration	Catchment changes: Contamination of soils, contamination of surface runoff and/or subsurface flows / interflows. Watercourse changes: alteration of physico-chemical and biological characteristic of water inputs, wetland substrate contamination, alteration of wetland vegetation communities, degradation of wetland functions, reduction in supply of ecosystem services, deterioration in downstream instream aquatic and wetland habitats.
Operational Phase (O)			
O1. Road maintenance and repair	O1_R1. Physical disturbance of watercourse (accidental / unintended)	O1_I1. Physical disturbance of watercourse (accidental / unintended)	Watercourse changes: Accidental / unintended clearing, excavation or infilling of artificial wetland habitat, degradation of wetland functions, reduction in supply of ecosystem services.
O2. Stormwater management	O2_R1. Erosive water	O2_I1. Erosion and/or sedimentation of watercourses	Catchment changes: Surface hardening, increased surface runoff, surface runoff concentration, increased velocity of water inputs. Watercourse changes: Increased velocity of flows through wetland, increased rates of erosion, decreased rates of waterlogging, alteration of vegetation communities, degradation of wetland functions, reduction in supply of ecosystem services.
O3. Vehicular use of road	O3_R1. Pollutants	O3_I1. Water quality deterioration	Catchment changes: Contamination of road surface from vehicular use (oils, hydrocarbons, particulate matter), discharge of pollutants into the artificial wetland.

Activities	Stressors (Risks) (R)	Impacts (I)	Impact Pathways
			Watercourse changes: Wetland substrate contamination, alteration of wetland vegetation communities, degradation of wetland functions, reduction in supply of ecosystem services, deterioration in downstream instream aquatic and wetland habitats.

5.2 Risk and Impact Assessment Results

A summary of the potential risk and impacts ratings for the proposed development activities is provided in Table 8 below, the results of which are discussed as follows.

5.2.1 Preliminary Risk Assessment (DWS Risk Matrix)

It is our understanding that the purpose of the risk matrix tool developed by the DWS is to give a preliminary indication of the likely impact (consequence) of activities (water uses) to the resource quality of local and regional freshwater ecosystems.

Under a realistic good mitigation scenario, the risks were all assessed as being low. This is due largely to the severity of impacts to resource quality being predicted to be low, the small spatial scale of the impacts that are unlikely to extend beyond the stormwater wetland, the short duration of the construction impacts and the infrequent use of the road during operation (low stressor frequency). It's also important to note that the stormwater wetland will likely buffer the downstream aquatic ecosystems from the stressors and impacts and reduce the probability of impacts.

5.3 Impact Significance

All of the potential impacts identified were assessed as being of low significance under the poor and good mitigation scenarios. This is because the change in the condition and level of ecosystem services provided by the local freshwater ecosystems will be negligible under a good mitigation scenario to small under a poor mitigation scenario. Nevertheless, it is important that all potential impacts are adequately mitigated to ensure duty of care.

Table 8. List of key impact-causing activities with associated risks, impacts and impact pathways.

Risk / Impact Groups	**Risk / Significance Rating**	
	Poor Mitigation	**Good Mitigation**
Risks		
C1_R1: Physical disturbance	-	Low
C1_R2: Eroded sediment	-	Low
C1_R3: Erosive water	-	Low
C1_R4: Alien invasive plants	-	Low
C2_R1: Pollutants	-	Low
O1_R1: Physical disturbance	-	Low
O2_R1: Erosive water	-	Low
O3_R1: Pollutants	-	Low
Impacts		
C1_I1: Physical loss / modification of watercourse	Low	Low
C1_I2: Erosion and/or sedimentation of watercourses	Low	Low
C1_I3: Invasion of alien invasive plants	Low	Low

Risk / Impact Groups	Risk / Significance Rating	
	Poor Mitigation	Good Mitigation
C2_I1: Water quality deterioration	Low	Low
O1_I1: Physical loss / modification of watercourse	Low	Low
O2_I1: Erosion and/or sedimentation of watercourses	Low	Low
O3_I1: Water quality deterioration	Low	Low

Note that the risk and significance assessment Excel ™ spreadsheets can be made available by Eco-Pulse upon request.

6. IMPACT MITIGATION PLAN

6.1 Mitigation for Impact C1_I1

6.1.1 Planning & design measures

The road is proposed outside of the delineated artificial stormwater channel that hosts wetland. Furthermore, a buffer zone is not applicable to the stormwater wetland. Thus, no road location or layout planning recommendations have been provided and the proposed location is considered acceptable from a freshwater ecosystem impact perspective.

6.1.2 Sensitive area / working area demarcations

- The edges of the construction servitude within the vicinity of the artificial watercourse must be clearly staked-out by a surveyor and demarcated using highly visible material (e.g. danger tape) prior to construction commencing.
- The demarcation work must be signed off by the Environmental Control Officer (ECO) before any work commences.
- Demarcations are to remain until construction and rehabilitation is complete.
- All areas outside of this demarcated working servitude must be considered no-go areas for the entire construction phase.
- No equipment laydown or storage areas must be located within delineated wetland areas.
- Access to and from the development area should be either via existing roads or within the construction servitude.
- Any contractors found working inside the ‘No-Go’ wetland/river areas (areas outside the construction/ working servitude) should be fined as per a fining schedule/system setup for the project.

6.1.3 Rehabilitation measures (if accidental disturbance)

- If the artificial wetland is disturbed during the construction phase, such disturbance (infilling, excavation, compaction etc.) must be rehabilitated immediately. All foreign material must be removed and disposed, the natural ground level reinstated (reshaping) and the disturbed areas re-vegetated to the satisfaction of the ECO as per the watercourse rehabilitation and management plan. In this case, existing and intact vegetation (*Typha capensis*) within the wetland should be translocated to the disturbed area by a suitably experienced planting contractor. For the disturbed stormwater drain banks, sods or plugs of *Stenotaphrum secundatum* must be planted by a suitably experienced planting contractor.

6.2 Mitigation for Impact C1_I2

6.2.1 Runoff, erosion and sediment control

- Wherever possible, existing vegetation cover on the development site should be maintained during the construction phase. The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes which will not be developed.
- Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.
- All bare slopes and surfaces to be exposed to the elements during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals (e.g. every 2m) to break the energy of surface flows.
- Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately. Revegetation using plugs and/or sods of *Cynodon dactylon* is recommended.
- If re-vegetation of exposed surfaces cannot be established immediately due to phasing issues, temporary erosion and sediment control measures must be maintained until such a time that re-vegetation can commence.
- All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when damaged. All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas.
- After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gulley for additional protection until vegetation has re-colonised the rehabilitated area.

6.2.2 Soil management

- Soil stockpiles must be established on flat ground at least 15m away from the artificial wetland.
- Erosion/sediment control measures such as silt fences, low soil berms or wooden shutter boards must be placed around the stockpiles to limit sediment runoff from stockpiles.

- Subsoil and topsoil is to be stockpiled separately. Stockpiled soil must be replaced in the reverse order as to which it was removed (subsoil first followed by topsoil).
- Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils.
- The stockpiles may only be placed within demarcated stockpile areas, which must fall within the demarcated construction area. The contractor shall, where possible, avoid stockpiling materials in vegetated areas that will not be cleared.
- Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions.
- If soil stockpiles are to be kept for more than 3 months they must be hydroseeded.
- The slope and height of stockpiles must be limited to 1.5m and are not be sloped more than 1:2 to avoid collapse.

6.3 Mitigation for Impact C1_I3

6.3.1 Invasive Alien Plant Control

- All alien invasive vegetation that colonise the construction site must be removed, preferably by uprooting. The contactor should consult the ECO regarding the method of removal.
- All bare surfaces across the construction site must be checked for IAPs every two weeks and IAPs removed by hand pulling/uprooting and adequately disposed.
- Herbicides should be utilised where hand pulling/uprooting is not possible. ONLY herbicides which have been certified safe for use in wetlands by independent testing authority are to be used. The ECO must be consulted in this regard.

6.4 Mitigation for Impact C2_I1

6.4.1 Hazardous substances / materials management

- The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, etc.) needs to be administered.
- Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater.
- Drip trays should be utilised at all dispensing areas.
- No refuelling, servicing or chemical storage should occur within 15m of the artificial wetland.
- No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site.
- Vehicle maintenance should not take place on site unless a specific bunded area is constructed for such a purpose.

- Hazardous storage and refuelling areas must be bunded prior to their use on site during the construction period following the appropriate SANS codes. The bund wall should be high enough to contain at least 110% of any stored volume. The surface of the bunded surface should be graded to the centre so that spillage may be collected and satisfactorily disposed of.
- All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.
- Sanitation - portable toilets (1 toilet per 10 users) to be provided where construction is occurring. Workers need to be encouraged to use these facilities and not the natural environment. Toilets must not be located within the 1:100yr flood line of a watercourse or within the buffer of any natural watercourses. Waste from chemical toilets must be disposed of regularly (at least once a week) and in a responsible manner by a registered waste contractor. Toilet facilities must be serviced weekly and in a responsible manner by a registered waste contractor to prevent pollution and improper hygiene conditions.
- Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site.
- An emergency spill response procedure must be formulated and staff are to be trained in spill response. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.
- 44-gallon drums must be kept on site to collect contaminated soil. These should be disposed of at a registered hazardous waste site.
- Provide adequate rubbish bins and waste disposal facilities on-site and educate/encourage workers not to litter or dispose of solid waste in the natural environment but to use available facilities for waste disposal.
- Clear and completely remove from site all general waste, constructional plant, equipment, surplus rock and other foreign materials once construction has been completed.
- Litter generated by the construction crew must be collected in rubbish bins and disposed of at registered landfill sites.
- Litter bins must be equipped with a closing mechanism to prevent their contents from blowing out or wild animals from accessing the contents.

6.4.2 Solid waste management

- Eating areas must not be located within 30m of the wetland/aquatic habitats.
- Waste bins must be provided at the eating areas.
- Bins and/or skips need to be supplied at convenient intervals on site for disposal of waste within the construction camp. The bins should have liner bags for easy control and safe disposal of waste.
- Bins should be provided to all areas that generate waste e.g. worker eating and resting areas and the camp site. General refuse and construction material refuse should not be mixed.
- Regular clearing/maintenance of bins is required.

6.4.3 Monitoring measures

The ECO should inspect the visual quality of the water exiting the M65 culvert at least once every week during the construction phase, particularly after rainfall events. A baseline assessment of the visual quality of water at this point should be established prior to construction commencing.

6.5 Mitigation for Impact O1_I1

6.5.1 Planning & design measures

Same as for Section 6.1.1.

6.5.2 Incorporation of sensitive areas into maintenance and repair plans

The location and extent of the artificial wetland, as well as the relevant mitigation measures within Section 6 of this report, must be incorporated into all formal maintenance and repair plants for the emergency road.

6.5.3 Rehabilitation measures (if accidental disturbance)

Same as for Section 6.1.3.

6.6 Mitigation for Impact O2_I1

6.6.1 Planning and design measures: Stormwater management

It is assumed that stormwater generated by the proposed road will be discharged into the existing concrete stormwater channel that drains into the stormwater wetland. As this infrastructure is already existing and the road is relatively small, this plan is considered acceptable. Nevertheless, limited details on stormwater management have been provided to the authors and as such the following road stormwater design measures are recommended:

- **Stormwater conveyance:**
    - Wherever possible, stormwater conveyance outside of the road surface should be via open, grass-lined channels/swales and/or stone-filled infiltration ditches rather than underground piped systems or concrete V-drains.
    - Wherever possible, velocity / energy reduction measures should be established within the open conveyance systems to reduce the velocity at planned outlets.
- **Stormwater discharge / outlets:**

- Wherever possible, many stormwater outlets should be favoured over few large. Ideally, the stormwater outlets should be established at regular intervals to reduce the volumes and velocities of flow at outlets. In this regard, discharge via mitre drains should be considered where suitable.
- All outlets must be designed to dissipate the energy of outgoing flows to reduce point source scouring and erosion risks. In this regard, adequately sized concrete stilling basins/sumps must be installed at all outlets and flow from these stilling basins must fall onto suitably designed gabion reno-mattresses with wing walls. The reno-mattresses must extend an appropriate distance downslope to ensure that erosion risks are minimised.
- The outlet reno-mattresses must be established to reflect the natural slope of the surface it is constructed on and are to be located at the natural ground-level.
- The outlets and associated outlet protection structures should be aligned parallel to contours wherever possible to reduce the gradient of outflows and remain outside of wetlands and their buffer zones where possible.
- Where stormwater is planned to be discharged into the existing concrete channel above the artificial stormwater wetland, energy dissipation measures should be installed along this channel wherever possible.

6.6.2 Rehabilitation measures (if significant erosion / sedimentation)

It is considered impractical to rehabilitate erosion damage within the artificial wetland habitat within the stormwater drain. However, it is beneficial that significant sediment deposits causing smothering or burial are removed as soon as possible after being detected. Refer to Section 6.1.3 for basic rehabilitation details.

6.6.3 Monitoring measures

The state of the wetland vegetation within the stormwater drain should be investigated annually for the first three years of operation. A baseline assessment of the visual quality of the vegetation should be established prior to construction commencing. If no problems are picked up, such monitoring could cease.

6.7 Mitigation for Impact O3_I1

6.7.1 Planning and design measures

The artificial stormwater wetland itself is considered mitigation for potential water quality impacts considering that the unit was assessed as having moderately important toxicant removal services. No specific water filtration measures for incorporation into the stormwater management systems are recommended.

6.7.2 Monitoring measures

The visual quality of the water exiting the M65 culvert must be inspected at least once per year at the end of the year (summer season). This should be undertaken by a freshwater ecologist or hydrologist. A baseline assessment of the visual quality of water at this point should be established prior to construction commencing. Such qualitative monitoring should also inform the need for formal water sampling and laboratory analysis if problems are identified.

7. LEGISLATIVE IMPLICATIONS

National Environmental Management Act (No. 2017 of 1998)

The proposed development activities do not constitute listed activities under NEMA because they do not occur in or within 32m of natural wetlands or other types of watercourses (rivers or streams).

National Water Act (No. 36 of 1998)

Provided that the construction and operational activities are well managed, limited to no negative impacts to downstream natural watercourses is expected. Only the adjacent artificial stormwater wetland stands to be negatively impacted by the proposed development. The impacts to this artificial feature are however expected to be low. Thus, one could argue that the proposed activities technically do not constitute Section 21(c) and 21(i) water uses under a realistic good mitigation scenario considering that the wetland is artificial and would not have existed under normal circumstances. Nonetheless, it is assumed that the DWS will require confirmation of the risk to natural watercourses and as such, a qualitative risk assessment was undertaken using the DWS risk matrix, which confirmed that the risks are very low.

8. CONCLUSION

The closest watercourse to the proposed emergency road development is an artificial wetland located within a stormwater drain located approximately 5m from the proposed activities at the closest point. The closest natural watercourse is a steam located approximately 350m downstream of the proposed activities. Although the artificial wetland was assessed as having limited biodiversity benefits, it was found to have some value in terms of toxicant removal and erosion control and thus provides some regulating functions in the landscape that can reduce impacts to downstream aquatic ecosystems.

A number of key risks and impacts associated with the proposed development activities were identified and assessed. All of the risks and impacts were assessed as being low in significance. This was due to the predicted change in downstream watercourse resource quality being low, as well as the probability of resource quality impacts. This was driven largely by the distance between the proposed activities and the closest natural watercourses, and the fact that the artificial stormwater wetland would act the reduce most of the potential impacts and risks to downstream aquatic ecosystems.

Considering the low impact significance and risk ratings, and the fact that the only watercourses likely to be negatively affected under a realistic good mitigation scenario is an artificial wetland located within a stormwater drain, it is debatable whether the proposed activities constitute a Section 21(i) water use. Nonetheless, it is assumed that the DWS will require confirmation of the risk to natural watercourses and as such, a qualitative risk assessment was undertaken using the DWS risk matrix, which confirmed that the risks are very low.

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APPENDIX D2

TERRESTRIAL VEGEATION REPORT

PROPOSED SOUTHERN EMERGENCY ACCESS ROAD AT THE KING SHAKA INTERNATIONAL AIRPORT

TERRESTRIAL VEGETATION ASSESSMENT

Version 1.0

Date: 18 July 2018

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Report No: EP352-01

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SPECIALIST ASSESSMENT REPORT DETAILS AND DECLARATION OF INDEPENDENCE

This is to certify that the following report has been prepared as per the requirements of Section 32 (3) of the NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (Act No. 107 OF 1998) ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS 2014 as per Government Notice No. 38282 GOVERNMENT GAZETTE, 4 DECEMBER 2014.

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Field of study/Expertise:	Botany and wetland ecology
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Client:	Geomeasure Group

I, **Ryan Edwards**, hereby declare that this report has been prepared independently of any influence or prejudice as may be specified by the Department of Environmental Affairs.

Signed: ______________________ Date: 18 July 2018

Details of Specialist Team

The relevant experience of specialist team members involved in the compilation of this report are briefly summarized below. *Curriculum Vitae's* of the specialist team are available on request.

Specialist	Role	Details
Ryan Edwards	Senior Ecologist	Ryan Edwards is a wetland specialist with 10 years experience in wetland associated environmental management work. Core field of focus and specialization is wetland ecology and regularly conducts wetland assessments for private, commercial and industrial clients as well as for provincial and national government departments and municipalities. Competent in data collection, analysis and report writing related to wetland assessments. Also has experience in wetland offset mitigation, wetland rehabilitation and management and basic riparian zone/aquatic/riverine assessments. Has an MSc in Environment Science (Wetland Hydro-geomorphology) and is a registered Professional Natural Scientist in the field of Environmental Science. Ryan also has extensive experience in riverine and riparian assessments and has assisted in the compilation of terrestrial vegetation and habitat assessments as a generalist ecologist working in conjunction with qualified and experienced botanists and zoologists.
David Styles	Botanist	David Styles is a botanist with 12 years experience in conducting botanical surveys (vegetation assessments) associated with environmental management work. David regularly conducts botanical surveys for private, commercial and industrial clients as well as for provincial and national government departments and municipalities. Competent in data collection, analysis and report writing related to vegetation assessments. Also has experience in grassland rehabilitation (including seed / plant harvesting) and management having worked for a number of years on the rehabilitation of the conservation area of the King Shaka International Airport in Durban. Has an MSc in Environment Science (Grassland Botany). David is arguably one of the most knowledgeable and experienced botanists in KwaZulu-Natal.

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1. INTRODUCTION

1.1 Project Background, Description & Locality

The Airports Company SA plans to develop an emergency access road at the southern end of the King Shaka International Airport (KSIA) near the suburb of La Mercy in the eThekwini Municipality, KwaZulu-Natal, as shown in Figure 1 below. The emergency road is proposed within the south-eastern corner of the KSIA and will be aligned in a north-south direction. The proposed road will connect with M65 / Mdloti Street which links to the N2 highway (East) and is the main access road to the KSIA. The proposed construction phasing plan for the southern road is included in **Annexure A**.

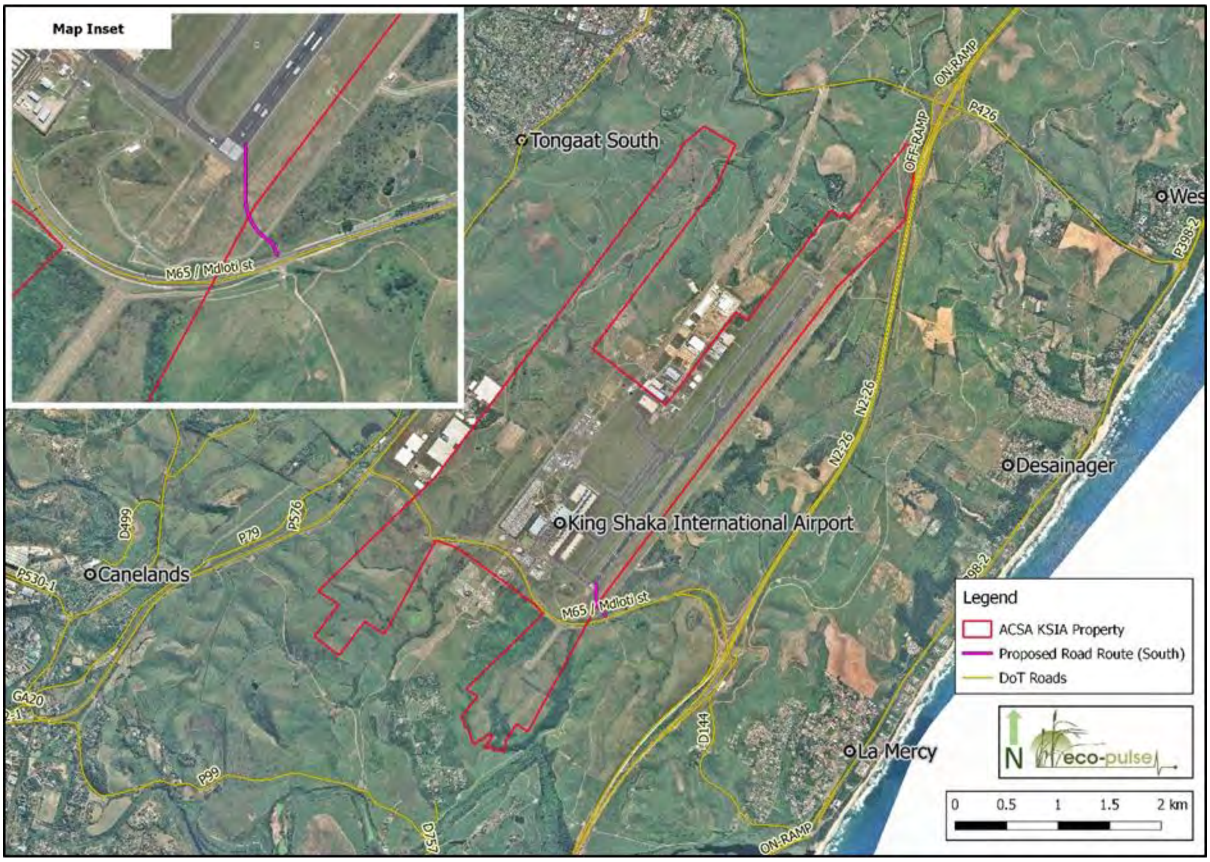

Figure 1 Locality map showing the project area in relation to the major towns and roads.

1.2 Scope of Work

The following scope of work was completed as part of this assessment:

- Contextualization of the study area in terms of important biophysical characteristics and conservation planning using available spatial datasets and conservation plans.
- Undertake an infield vegetation survey to delineate and classify the distinct terrestrial vegetation communities occurring within a 15m radius of the proposed road centre line (referred to as the 'study area').

- Brief description of the delineated vegetation communities within the study area based on species composition and structural types in line with available provincial and national vegetation classifications, and the compilation of vegetation maps. A floral species list was prepared.
- Identification and recording of the location of all floral species of conservation concern and/or legally protected species encountered during field work using a hand-held GPS.
- Assessment of the condition of the vegetation communities based on key variables like species composition and the presence of ruderal[1], pioneer[2], weedy[3] and invasive[4] species.
- Assessment of the conservation / biodiversity importance of the delineated vegetation communities / habitats.
- Provision of best-practice planning and design recommendations for inclusion in layout and designs.
- The identification, prediction and description of the potential impacts on the delineated plant communities and local floral biodiversity.
- Provision of planning, construction phase and operational phase mitigation measures to avoid, minimise and remediate ecological impacts of the proposed activities.
- Discussion of any permit/licensing requirements that may be relevant to the proposed activities, where relevant.

1.3 Introduction to Key Concepts and Terms

1.3.1 Terrestrial Ecosystems and Ecosystem Services

An ecosystem is a group of plants, animals and other organisms interacting with each other and with non-living (abiotic) components of their environment. Ecosystems can be classified broadly into terrestrial and aquatic ecosystems. Terrestrial ecosystems occur on land where water is a limiting factor, whereas aquatic ecosystems occur within landforms that are permanently or periodically inundated with flowing or standing water (Ollis et al., 2013).

Ecosystems can be classified at different scales from local to regional depending on what is being studied. Vegetation and soils are the most easily studied ecosystem components and thus typically form the basis of ecosystem classification. This is true for South Africa where ecosystems have been formally classified at a regional scale in terms of landscapes with broadly uniform / homogenous climate, soil and vegetation characteristics, as reflected in the national vegetation map developed by Mucina &

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[1] A ruderal species is a plant species that is first to colonize disturbed lands. Generally characterised by r-selected life history strategy i.e. produces a large number of small seeds and is short lived.

[2] Species that are well adapted for exploiting disturbed sites (also referred to as early successional species).

[3] A weed is a plant considered undesirable in a particular situation, "a plant in the wrong place". The term also is applied to any plant that grows or reproduces aggressively, or is invasive outside its native habitat (https://en.wikipedia.org/wiki/Weed).

[4] A plant that is not indigenous to a particular region or local area but which grows or reproduces aggressively in such an area.

Rutherford (2006). It is important to note however that this classification is coarse in resolution and is often not detailed enough to pick up ecosystem and vegetation community variation at the local level.

Human flourishing, well-being and development relies greatly on the functions, goods and services provided by ecosystems, collectively referred to as ecosystem services. Ecosystem functions refer to the capacity of ecological processes and structure to provide services that satisfy human well-being (de Groot, 1992). Ecosystem services are the benefits provided by ecosystems that contribute to making human life both possible and worth living (Díaz et al., 2006).

1.3.2 Biodiversity and its Value

Biodiversity (or biological diversity) is the variety of all life and its processes. It includes the variety of all organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning (eThekwini Municipality, 2012). This includes all species, habitats and ecosystems and the connections between these.

Ecosystems support biodiversity and biodiversity supports the integrity of ecosystems. Biodiversity is essential for the self-organizing capacity of complex-systems (Levin, 1999), both in terms of absorbing disturbance and of subsequently regenerating and reorganizing the system (Folke et al., 2004). Thus biodiversity assists in supporting and maintaining the provision of ecosystem services.

Biodiversity is also valuable in and of itself, particularly in the provision of food, medicines, breeding stock, wood products and ornamental plants to name a few goods.

Biodiversity also forms a critical part of most areas valued for tourism and recreational purposes. The 'draw cards' for such spaces is often due to the aesthetic qualities and/or target species supported by natural biodiversity. Similarly, biodiversity has cultural value through supporting spaces and resources with cultural significance, educational value and spiritual value.

The above-listed reasons for valuing and conserving biodiversity reflect human utilitarian / instrumental value. Biodiversity (and nature / ecosystems) is also considered to have intrinsic (inherent) and non-use value. Intrinsic value refers to the perceived value of nature irrespective of humans, and non-use value refers to the value of nature to humans even when there is no direct use (Pearson, 2016).

1.4 Relevant Environmental Legislation related to Terrestrial Ecosystems & Biodiversity

Terrestrial ecosystems, their relevant species, vegetation, habitats and biodiversity in general are governed in South Africa by the following legislation:

- National Environmental Management Act (NEMA) No. 107 of 1998) inclusive of all amendments;
- National Environmental Management: Biodiversity Act (NEMBA) No. 10 of 2004;

- Conservation of Agricultural Resources Act No. 43 of 1983; and
- National Forests Act No. 84 of 1998.

At a Provincial level, flora and fauna (plants and animals) of conservation significance are protected by the KZN Nature Conservation Ordinance (No. 15 of 1974). Refer to **Annexure B** for further details on relevant legislation applicable to the study.

2. METHODS

2.1 Desktop Assessment

2.1.1 Contextual Review: Data Sources Consulted

The following data sources and GIS spatial information provided listed in Table 2 (below) was consulted to inform the specialist assessment. The data type, relevance to the project and source of the information has been provided.

Table 1. Data sources and GIS information consulted to inform the aquatic assessment.

DATA/COVERAGE TYPE	RELEVANCE	SOURCE
Latest Google Earth ™ imagery	*To supplement available aerial photography in mapping vegetation communities*	Google Earth™ On-line
eThekwini Geology (GIS Coverage)	*Assessment of underlying geology controlling soil formation and consequently vegetation types*	eThekwini Municipality
South African Vegetation Map (GIS Coverage)	*Classification of vegetation types and determination of reference primary vegetation*	Mucina & Rutherford (2006)
KwaZulu-Natal Vegetation Map (GIS Coverage)	*Classification of vegetation types and determination of reference primary vegetation*	Scott-Shaw & Escott (2011)
National Biodiversity Assessment – Threatened Ecosystems (GIS Coverage)	*Identification of conservation important ecosystems*	SANBI 2011
KZN Terrestrial Conservation Plan (GIS Coverage)	*Identification of fauna, flora and ecosystems of conservation importance*	EKZNW (2010)
KZN Systematic Conservation Assessments (SCAs) (GIS Coverage)	*Identification of fauna, flora and ecosystems of conservation importance.*	EKZNW (2016)
SANBI On-line threatened species database	*Assessment of threatened plant species potentially occurring on site*	SANBI on-line database
SANBI's PRECIS (National Herbarium Pretoria Computerized Information System) (electronic database)	Determination of conservation important plant species	http://posa.sanbi.org
National Red List of South African Plants	Determination of treat status of plants of conservation concern	SANBI, 2009

2.2 Baseline Assessment

2.2.1 Field Work

The field survey was undertaken on the 12th June 2018 (winter season). This entailed undertaking site walkovers within the study areas at key locations. The following data was collected in the field:

- **Broad vegetation and structural type** – The vegetation communities encountered were classified into broad vegetation structural types e.g. grassland, forest, bushland, scrubland etc. where applicable. Overall morphology and architecture of the plant community were also recorded where applicable.
- **Qualitative plant species composition** – Species composition refers to the relative proportions (%) of various plant species in relation to the total on a given area. The relative abundance of each species encountered was rated qualitatively on a 3-point scale of low, moderate and high based on visual observations.
- **Species of conservation concern*** – Species of conservation concern are species that have a high conservation importance in terms of preserving South Africa's biodiversity and include rare and threatened species. This category also includes those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare, Declining and Data Deficient - Insufficient Information (DDD).
- **Observable onsite impacts** – Evidence of the physical disturbance to vegetation and soils and indirect impacts like erosion, sedimentation, contamination etc. were recorded.
- **Distinct vegetation boundaries** – Clear boundaries between distinct vegetation communities were recorded onsite. Between sampling points boundaries were extrapolated using the latest colour aerial photography for the area.

All sampling points were recorded using a handheld GPS device.

***Species of conservation concern**: South African conservation agencies use the internationally endorsed IUCN Red List Categories and Criteria to determine the conservation status of biota, which are published in various Red Lists for specific orders of animals and plants. SA uses a revised system of the IUCN criteria (Figure 3). Identification of conservation important species is important in order to ensure protection of flora and fauna. A description of the different South African Red List categories is provided in Table 2 below.

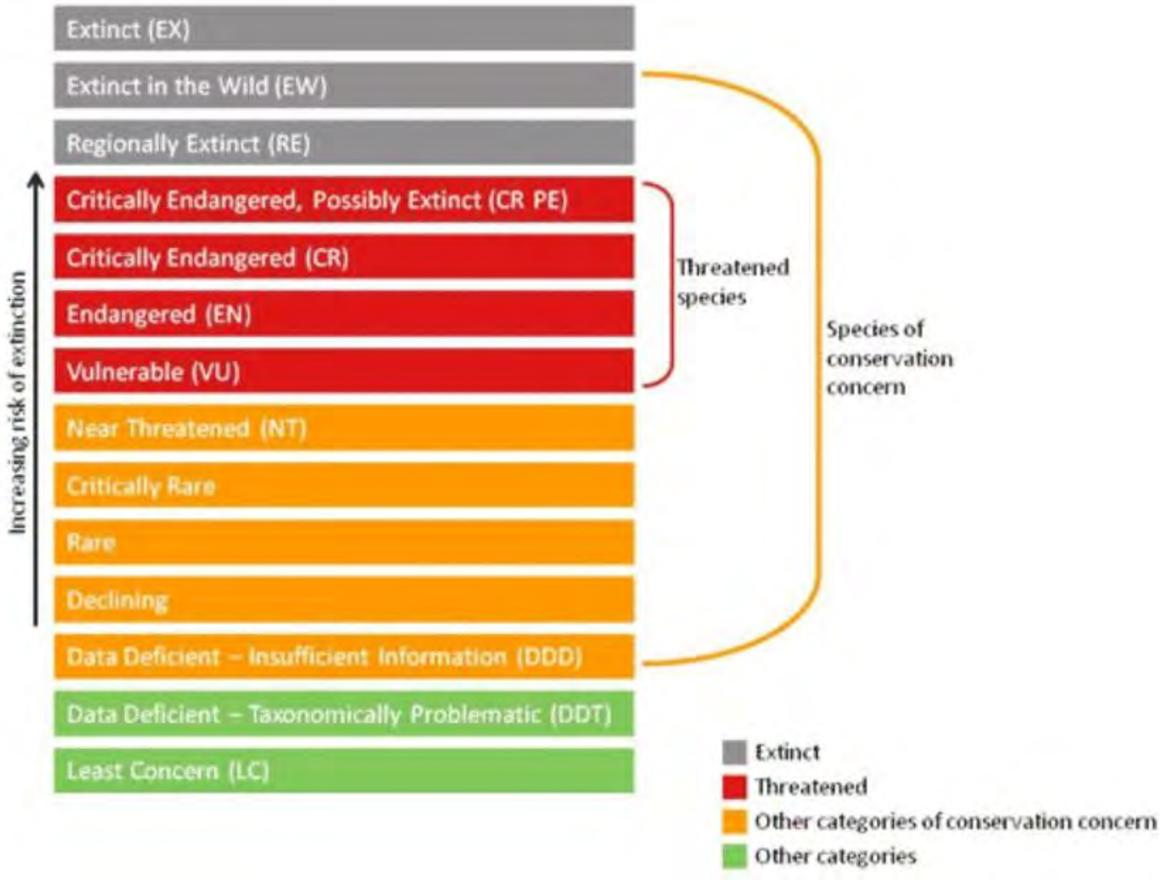

Figure 2 South African Red List categories (Source: SANBI on-line at http://redlist.sanbi.org/eiaguidelines.php).

Table 2. Description of South African Red List Categories (Source: SANBI on-line at http://redlist.sanbi.org/eiaguidelines.php).

Status	Category	Description
SPECIES OF CONSERVATION CONCERN	Extinct (EX)	A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
	Extinct in the Wild (EW)	A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
	Regionally Extinct (RE)	A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
	Critically Endangered, Possibly Extinct (CR PE)	Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered
	Critically Endangered (CR)	A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
	Endangered (EN)	A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
	Vulnerable (VU)	A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.

Status	Category	Description
	Near Threatened (NT)	A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.
	Critically Rare	A species is Critically Rare when it is known to occur at a single site, but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
	Rare	A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria.
	Declining	A species is Declining when it does not meet or nearly meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.
	Data Deficient - Insufficient Information (DDD)	A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required and that future research could show that a threatened classification is appropriate.
OTHER	**Data Deficient - Taxonomically Problematic (DDT)**	A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
	Least Concern (LC)	A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
	Not Evaluated (NE)	A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in Plants of southern Africa: an online checklist are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

2.2.2 Vegetation Mapping and Classification

Distinct vegetation communities were broadly mapped based on observed changes in species composition that were recorded using a hand-geld GPS. These GPS waypoints were imported into GIS for mapping purposes.

2.2.3 Condition Assessment

Vegetation communities / habitat units defined for the study area were assessed qualitatively in terms of their ecological condition. Ecological condition is defined as a measure of modification relative to a reference state in terms of species structure and composition. For the purposes of this study, vegetation was assessed qualitatively based on qualitative species composition.

2.2.4 Ecological Importance and Sensitivity Assessment

The ecological importance of the vegetation community refers to the ability of the ecological entity to: (i) meet conservation targets for conservation important flora and faunal species i.e. biodiversity maintenance value; and (ii) provide for the maintenance of biodiversity features. The importance of each vegetation community was therefore based on (i) whether it is representative of threatened habitat (condition), (ii) whether it provides habitat for species of conservation concern, (iii) rarity, diversity and uniqueness of flora and habitat and (iv) it's importance in terms of conservation planning.

Sensitivity refers to both the intensity and likelihood of change in key aspects as a result of changes to key ecosystem drivers. The more sensitive a system, the more likely and more intense the changes with a change in drivers. High sensitivity systems are those often characterised by with high diversity, specifically sensitive species (intolerant species), small patch size and/or low area to perimeter ratio and/or are located in areas sensitive to change e.g. located on highly erodible soils or steep slopes. In terms of species, sensitive species are those with narrow tolerance ranges and that cannot withstand elevated levels of disturbance. Low sensitivity systems are often those characterised by low diversity, high levels of modification and can withstand elevated disturbance regimes. Low sensitivity species are typically generalist and opportunistic species that have wide tolerances ranges. The sensitivity of each vegetation community was therefore assessed qualitatively based on the following aspects:

- Diversity and intactness / condition.
- Presence of sensitive species.
- Presence of sensitive habitats (i.e. to sediment and water quality changes).
- Community / habitat patch size and shape (perimeter to area ratio).
- Soil erodibility.
- Slope.

2.3 Impact Assessment

Impact significance is defined broadly as a measure of the 'desirability, importance and acceptability of an impact to society' (Lawrence, 2007). The degree of significance depends upon two dimensions: the measurable characteristics of the impact (e.g. intensity, extent, duration) and the importance societies/communities place on the impact. Put another way, impact significance is the product of the value or importance of the resources, systems and/or components that will be impacted and the intensity or magnitude (degree and extent of change) of the impact on those resources, systems and/or components.

The significance of each impact was assessed in terms of the ultimate consequences (impacts to resources of known societal value). The three ultimate consequences considered were:

i. Impacts to ecosystem conservation.
ii. Impacts to ecosystem services and terrestrial habitat resources.
iii. Impacts to species of conservation concern.

Please note that impacts to ecosystem services and terrestrial habitat resources was not assessed.

Ecosystem conservation:

Ecosystem conservation targets are determined at national, provincial or local scales for known reference ecosystem and vegetation types, and for the purposes of this assessment, not meeting or hindering the meeting of conservation targets represents a significant societal impact. For this reason, impacts to ecosystem conservation is seen as an important ultimate consequence that contextualises the significance of impacts.

Ecosystem goods and services:

Terrestrial ecosystems typically provide a range of important ecosystem goods and services to society. These ecosystems provide habitat for wildlife, maintain pollinator diversity, reducing runoff and erosion, store carbon storing carbon, etc. Benefits to local communities may include medicinal plants, grazing, recreation and harvestable resources to name a few. In general this impact is not assessed in detail.

Biota of conservation concern:

Like ecosystem conservation targets, such targets are also determined for biota. Impacts on populations of threatened biota is thus an important ultimate consequence that contextualises the significance of impacts.

Figure 3 shows that all four impacts were interpreted in terms of three possible ultimate consequences.

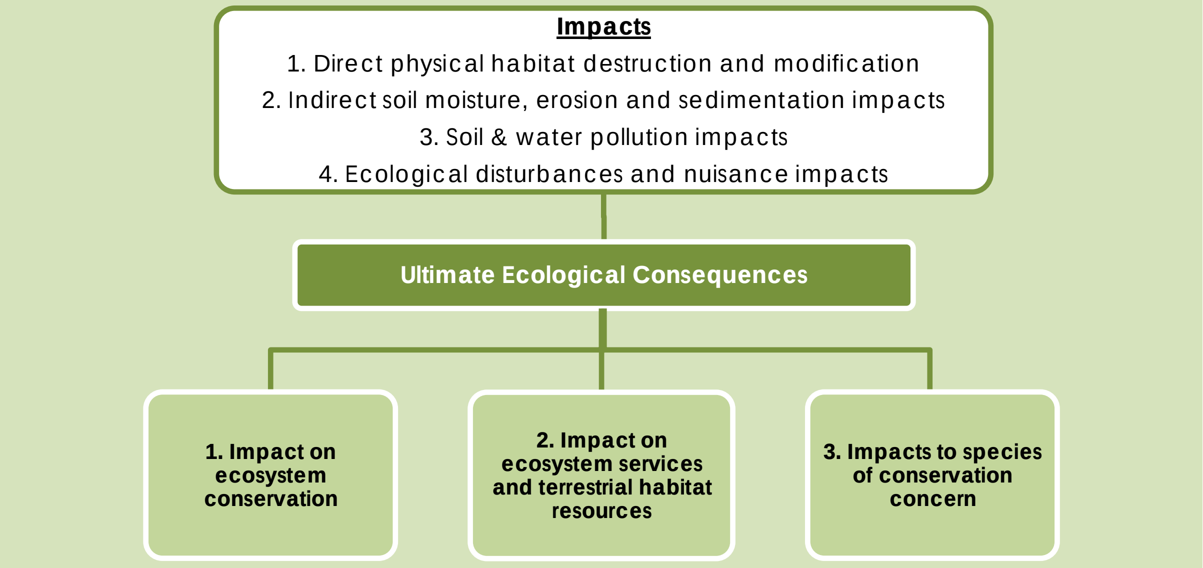

Figure 3 Conceptual diagram showing the approach to unpacking impact significance.

The significance of the potential impacts of the proposed development on terrestrial habitat was assessed for the following scenarios:

i. **Realistic "poor mitigation" scenario** – this is a realistic worst case scenario involving the poor implementation of construction mitigation, bare minimum incorporation of recommended design mitigation, poor operational maintenance, and poor onsite rehabilitation.

ii. **Realistic "good" scenario** – this is a realistic best case scenario involving the effective implementation of construction mitigation, incorporation of the majority of design mitigation, good operational maintenance and successful rehabilitation. Please note that this realistic scenario does not assume that unrealistic mitigation measures will be implemented and/or measures known to have poor implementation success (>90% of the time) will be effectively implemented.

2.4 Assumptions and Limitations

The following limitations and assumptions apply to this assessment:

- The study area for this report comprises exclusively of the 30m wide corridor (i.e. 15m buffer to the road centre line).
- The study focused on 'terrestrial' or dryland vegetation occurring within the study area. Wetland/aquatic vegetation and habitats were not included as these were dealt with separately in the Specialist Freshwater Habitat Impact Assessment Report dated July 2017 compiled by Eco-Pulse (Report No. EP352-01).
- Sampling by nature means that not all parts of the study area were visited. The vegetation findings are thus only applicable to the areas sampled, which were extrapolated to the rest of the study areas.
- The boundaries of the mapped secondary vegetation communities should be considered coarse because the distinct changes in species composition were only recorded in the areas sampled i.e. along the walkover transects. Therefore, for the most part, the vegetation community boundaries had to be extrapolated using aerial photography and onsite observations. It is also important to note that the species composition across the site was relatively homogenous with only localised variations. The mapping of all these localised variations were not considered necessary considering that all the vegetation was secondary and of low value.
- The location of species of conservation concern was recorded using a Garmin Montana™ Global Positioning System (GPS). GPS accuracy was limited to 3 – 5m.
- The field assessment was undertaken in winter. Thus, geophytes that die back in winter may have been missed.
- Information on the threat status of plants species was informed largely by the SANBI Threatened Species Online database, which was assumed to be up to date and accurate at the time of compiling this report. Any changes made after the compilation of the report are therefore not covered.
- The assessment of impacts and recommendation of mitigation measures was informed by the site-specific ecological concerns arising from the vegetation field surveys and based on the assessor's working knowledge and experience with similar development projects.

- Additional information used to inform the assessment was limited to data and GIS coverage's available for the province and district municipality at the time of the assessment.

3. DESKTOP SETTING REVIEW

3.1 Desktop Assessment: Biophysical & Conservation Context

An understanding the biophysical and conservation context of the study area and surrounding landscape is important to inform decision making regarding the significance of the area to be affected.

3.1.1 Biophysical Setting & Context

A summary of key biophysical details for study area and catchment area is presented in Table 3 below. The spatial dataset review indicates that the reference terrestrial vegetation for the study area is KZN Coastal Belt Grassland or Interior North Coast Grassland.

Table 3. Key biophysical setting details of the study area.

Biophysical Aspects	Desktop Biophysical Details	Source
Elevation	81 – 96m	Google Earth™
Mean annual precipitation (MAP)	600 - 700 mm	Schulze, 1997
Rainfall seasonality	Late Summer, mid-summer	DWAF, 2005
Average temperature range	22 - 24⁰C in winter (July) to 20 - >20⁰C in summer (February)	DWAF, 2005
Potential Evaporation (%)	<20 - 20	DWAF, 2005
Median Annual Simulated Runoff (mm)	150 - >250 mm/annum	Schulze, 1997
Geology	Vryheid Sandstone	eThekwini Municipality
Main collecting river(s) in the catchment	Mdloti River	CSIR, 2011
National Vegetation Map	KwaZulu-Natal Coastal Belt (CB 3)	Mucina & Rutherford, 2006
KZN Vegetation Map	KwaZulu-Natal Coastal Belt Grassland	EKZNW, 2012

3.2 Conservation Context

National, provincial and regional biophysical and conservation datasets were screened, the results of which are presented in Table 4 below. The reference vegetation for the study area, KZN Coastal Belt Grassland or Interior North Coast Grassland, is critically endangered and of high conservation importance. Furthermore, the 'NEMBA threatened ecosystems: remaining extent' dataset flags the potential presence of intact interior north coast grassland within portions of the study area. However, such intact grassland was confirmed to not be present (see Section 4 below).

It is also important to note that a small part of the study area encroached into the King Shaka International Airport (KSIA) conservation zone (see Figure 4 in next section). For this reason this portion of the study area has been classified as a 'Critical Biodiversity Area (CBA): Irreplaceable' as part of the 2016 KZN terrestrial systematic conservation plan, an 'Ecological Support Area' (ESA) as part of the eThekwini Systematic Conservation Assessment (SCA), and included in the Durban Metropolitan Open Space System (D'MOSS).

Table 4. Key conservation context details for the study area.

Conservation Planning Dataset	Relevant Conservation Feature	Location in Relation to Project Site	Conservation Planning Status
NATIONAL CONSERVATION PLANNING CONTEXT			
National Vegetation Map (Mucina & Rutherford, 2006)	KwaZulu-Natal Coastal Belt (CB 3)	Entire study area	**Endangered**
NEMBA List of Threatened Ecosystems: Remaining Extent (SANBI, 2011)	Interior North Coast Grasslands	Portions of the study area	**Critically Endangered**
PROVINCIAL CONSERVATION PLANNING CONTEXT			
KZN Vegetation Map (EKZNW, 2012)	KwaZulu-Natal Coastal Belt Grassland	Entire study area	**Critically Endangered**
KZN Terrestrial Conservation Plan (EKZNW, 2010)	Terrestrial Planning Units No. 81577, 81573, 81577, 83155, 83156, 83158 and 831557	Entire study area	None
KZN Terrestrial Systematic Conservation Assessment (EKZNW, 2016)	North Coastal Grassland	Portions of the study area within the KSIA conservation zone	**CBA: Irreplaceable**
MUNICIPAL CONSERVATION PLANNING CONTEXT			
Durban Metropolitan Open Space System (D'MOSS)	Transitional thicket	Portions of the study area within the KSIA conservation zone	N/A
Durban's Systematic Conservation Assessment (Maclean et al., 2015)	Transitional thicket	Portions of the study area within the KSIA conservation zone	**ESA**

4. RESULTS & DISCUSSION: VEGETATION ASSESSMENT

This section discusses the infield observations and recordings of the vegetation communities within the study area undertaken on the 12th June 2018.

4.1 Vegetation Description and Classification

Within the area fenced around the runways, the vegetation comprises secondary grassland. Regular mowing (multiple times a year), has prevented accumulation of scrubby or woody species and has otherwise had an important impact on species composition. It contains only grasses that are tolerant of disturbance, or which originate from plantings. Although 10 indigenous herbs were recorded, with the exception of *Zornia capensis*, these are all species that are not typical of open, primary grassland, but are instead either ruderal or weedy species, or associated with coarse or disturbed grassland i.e. opportunistic or tolerant species.

Vegetation within the footprint of the access road can be separated into two broad communities based on differential management regimes, namely a *Chloris gayana* (Rhode's Grass) secondary grassland on the runway platform and a *Cynodon dactylon* (Couch / Bermuda Grass) grassland community on a platform cut along the M65. The study area, which is more extensive than the road footprint, also includes a dense, moribund *Panicum maximum* grassland community on sloping land above / upslope of the platforms.

The C. gayana community assemblage also comprises moderate abundances Aristea ecklonii, xxx,Cyperus esculentus (Yellow Nut-sedge), Sporobolus africanus (Rat's Tail Dropseed) and Melinis repens (Red Top). All of these species are considered tolerant and opportunistic and typically increase in abidance with human disturbance and poor management practices.

Aristea ecklonii is the most abundant indigenous herb. The KwaZulu-Natal provincial conservation ordinance provides special protection not only to particular species, but whole genera and families. All members of the family Iridaceae are protected. However, this blanket protection means that both rare to very common members are specially protected. These specially protected species may not be damaged, destroyed or relocated without permit authorization from the provincial conservation authority, Ezemvelo KwaZulu-Natal Wildlife.

It is important to note that *Aristea ecklonii* is a common, widespread species which is not threatened. Moreover, it is a semi-ruderal, with a preference for disturbed or scrubby grassland, particularly where slightly damp. Within this polygon, it is possible that there are many hundreds of *Aristea ecklonii* plants. Given these numbers, and because it is a common species that is not threatened, and also abundant elsewhere within the airport precinct, it is not recommended that relocation occur. It will, however, be necessary to obtain a permit from EKZNW for disturbance or destruction of any plants.

Outside of the runway fence, the vegetation is different. Some on an informal road leading to an access gate appears even more frequently mown and contains less plant diversity (i.e. C. dactylon secondary grassland). This grassland appears to have largely been actively planted and resembles a garden lawn. Low to moderate abundances of Paspalum urvillei is present within this community. Away from the mown area grass is only seldom mown or burned and is tall and moribund, mainly comprised of *Panicum maximum* (i.e. P. maximum secondary grassland). While difficult to discern herbaceous diversity amongst the moribund grass, it is also well infiltrated by common or pioneer indigenous trees, most emergent or of smaller stature. The community is dense and is characterised by moderate to high abundances of *Commelina benghalensis* and *Stenotraphrumn secundatum* (Buffalo Grass) in places. Like the C. gayana grassland, the species recorded are all tolerant opportunistic species that are not representative of natural grassland species composition. No species occur that are noteworthy or threatened. There is a smaller presence of *Aristea ecklonii* than in the grassland fenced around the runway.

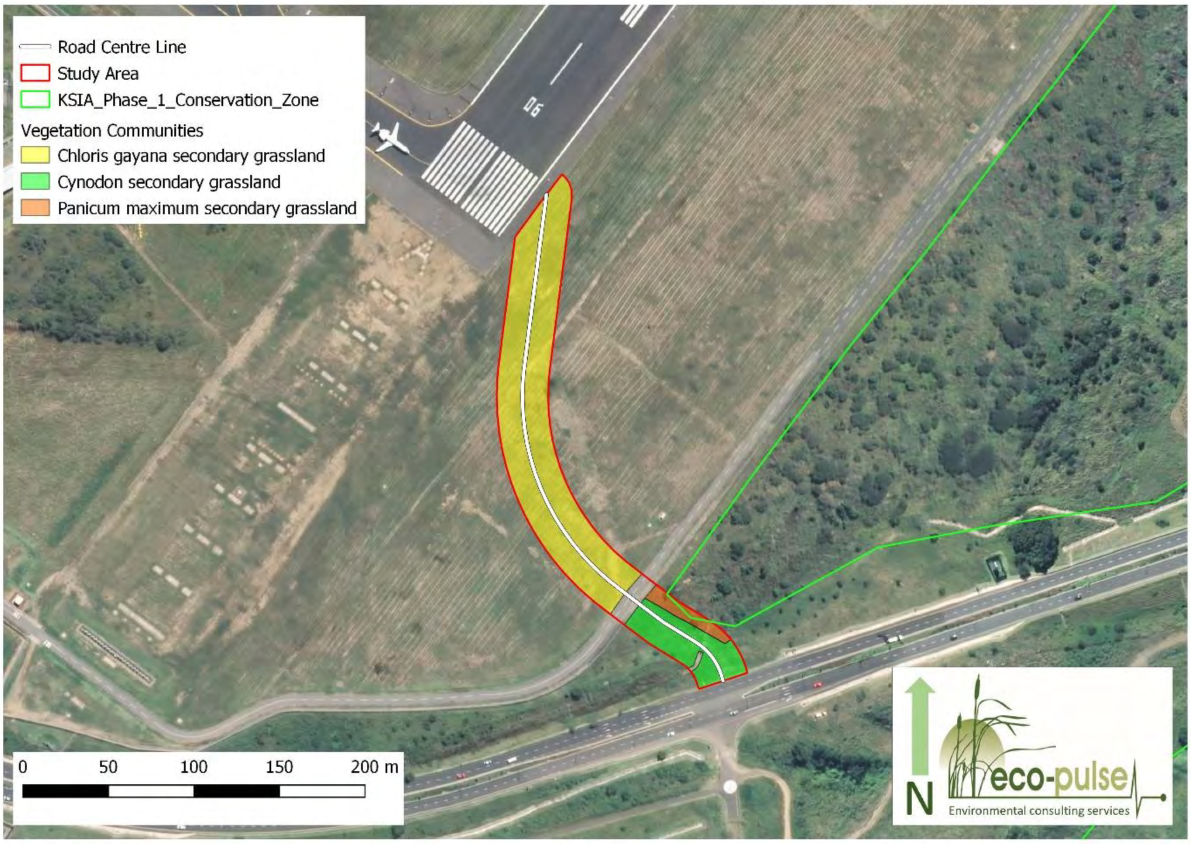

Figure 4 Broadly mapped secondary vegetation communities within the study area in relation to the KSIA conservation zone.

4.1.1 Species List

Grasses and sedges

Chloris gayana
Cyperus sphaerospermus
Cyperus esculentus
Cynodon dactylon
Digitaria eriantha
Imperata cylindrical
Melenis repens
Paspalum urveillii
Pycreus polystachyos
Sporobolus africanus

Indigenous herbs

Abrus precatorius
Aristea ecklonii
Centella asiatica
Gomphocarpus physocarpus
Helichcrysum cymosum
Hewittea malabarica
Ipomoea cairica
Senecio deltoidea
Triumfetta pilosa
Zornia capensis

Alien species

Bidens pilosa
Commelina benghalensis
Leucaena leucocephala

4.2 Comment on Ecological Condition

The grassland communities assessed were all in poor condition relative to the reference grassland type for the region (i.e. KZN Coastal Belt Grassland / KZN Sandy Grassland / North Coast Grassland). This is due to fact that the natural grassland that once would have existed in the study area has long been destroyed by clearing, cane cultivation and more recently by earthworks to create the KSIA platform. As a result all of the grasslands assessed were secondary in nature, characterised by particularly low forb diversity, and dominated by common, opportunistic and tolerant semi-perennial and perennial plant species.

4.3 Comment on Biodiversity / Ecological Importance

Interior North Coast Grasslands are a Critically Endangered ecosystem. Moreover, KwaZulu-Natal Coastal Belt Grassland, which in fact comprises a mosaic of different vegetation, is an 'Endangered' vegetation type. As a result, natural vegetation in these areas should be considered valuable. However, the grassland areas encountered within the study area and surrounds is secondary, contains little plant diversity and no species that are rare or threatened. The moribund *P. maximum* grassland east of the KSIA fence also contains relatively more common or pioneer woody species than the rest of the area assessed. Considering that these secondary grasslands are not representative of local primary grasslands and do not contain rare or threatened species, the grassland areas within the road footprint to be lost are of low conservation / biodiversity importance. The single issue noted is the large number of *Aristea ecklonii*. A permit will need to be obtained for their disturbance, destruction or relocation. However, as it is abundant within the airport precinct, and this is a common species in KwaZulu-Natal, relocation is not recommended.

It is important to note however that a small portion of the study area associated with the *P. maximum* grassland community encroaches into the KSIA Conservation Zone (see Figure 4). As this is a formally protected area and considered a municipal ESA and a provincial CBA, any vegetation communities occurring within this conservation area should be considered important and should be excluded from any development activities.

5. IMPACT ASSESSMENT

This section deals with the prediction, description and assessment of the potential construction and operational impacts of the proposed activities as described in the introduction (Section 1).

5.1 Potential Impacts

The proposed road development will result in the following impacts:

- Impact C1: Loss of secondary grassland areas within the road footprint during clearing and infilling during the construction phase.
- Impact C2: Physical disturbance of grassland areas (both planned and accidental) within close proximity to the road footprint during the construction phase e.g. compaction, clearing, infilling.
- Impact C3: Erosion and/or sedimentation of grassland areas within close proximity to the road footprint during the construction phase.

- Impact C4: Increased alien plant invasion as a result of soil disturbance and decreased plant competition / cover during the construction phase.
- Impact C5: Contamination of soils and associated plant stress and mortality during the construction phase. e.g. hydrocarbon, bitumen or cement spills.
- Impact O1: Physical disturbance of grassland areas (both planned and accidental) within close proximity to the road footprint during the repairs and maintenance during the operational phase.
- Impact O2: Erosion of the grassland areas within close proximity to the road footprint as a result of stormwater management during the operational phase.
- Impact O3: Contamination of soils and associated plant stress and mortality as a result of the use of the road by vehicles.

5.2 Comment on the Significance of the Potential Impacts

Considering the small area of grassland to be directly and indirectly impacted, the low intensity of the indirect impacts considering the gentle gradient of the grassland and the intense management regimes, and the fact that the grasslands encountered were of low value in terms of the maintenance of biodiversity, there is high confidence that the proposed development activities will have limited impacts on local floral biodiversity and that all of the above-listed impacts will be of low significance under poor and good mitigation scenarios. There is thus not fatal flaws associated with the proposed development activities. Nevertheless, the applicant is still legally obliged to ensure that all indirect impacts (and direct impacts outside of the road footprint) to the vegetation communities assessed are minimised as far as practically possible as per the 'duty of care' principle.

Please note that the above statements assume that there will be no impact to the KSIA conservation zone.

6. IMPACT MITIGATION PLAN

'Mitigation' is a broad term that covers all components involved in selecting and implementing measures to minimise anthropogenic impacts to ecological processes and ecosystems and ultimately maintain.

6.1 Mitigation for Impacts C1 & C2

6.1.1 Planning & design measures

No alternative road location or layout planning recommendations have been provided and the proposed location is considered acceptable from a terrestrial flora biodiversity perspective.

6.1.2 Sensitive area / working area demarcations

- The extent of the construction working area / servitude should be minimised as far as practically possible to ensure that the amount of grassland impacted outside of the road footprint is minimised.

- The western edge of the KSIA conservation zone must be clearly demarcated using shade cloth prior to construction commencing and considered a no-go area.
- Once the construction working area has been agreed to by the Environmental Control Officer (ECO), the working area should be clearly demarcated using highly visible material (e.g. danger tape / orange plastic bonnox) prior to construction commencing. This applies to site camps and storage / laydown areas as well.
- The demarcation work must be signed off by the Environmental Control Officer (ECO) before any work commences.
- Demarcations are to remain until construction and rehabilitation is complete.
- Please note that the above statements assume that there will be no impact to the KSIA conservation zone.

6.1.3 Plant rescue and relocation

Due to the low biodiversity value of the grassland, and the majority of the forb species being pioneer and/or opportunistic in nature, widespread in distribution and not threatened, plant rescue and relocation is not recommended for conservation purposes. However, some plant rescue (i.e. sod translocation) may assist in reducing the costs of post-development grassland rehabilitation. This will need to be informed by the planting contractor to be appointed by the applicant.

6.1.4 Rehabilitation measures

- All grassland areas that are directly disturbed (infilling, excavation, compaction etc.) or idnoerctly impacted (erosion or sedimentation) during the construction phase must be rehabilitated. Rehabilitation should involve the following actions:
    - i. All foreign material must be removed and disposed. This includes removing eroded sediment.
    - ii. The natural ground level must be reinstated (reshaping). This includes reshaping erosion rills and gullies.
    - iii. All compacted areas must be ripped to depths ranging from 150 – 250mm depending on the intensity of compaction.
    - iv. The disturbed areas must be re-vegetated to the satisfaction of the ECO as per the construction phase grassland rehabilitation plan – to be prepared as part of the construction phase Environmental Management Programme (EMPr). Hydroseeding of the disturbed areas using an indigenous grass mix comprising of locally sourced grass seeds should be acceptable. Where faster cover is required (i.e. for soil stabilisation purposes), re-vegetation should be undertaken using plugs or sods of locally sourced *Cynodon dactylon*.

6.2 Mitigation for Impact C3

6.2.1 Runoff, erosion and sediment control

- Wherever possible, existing vegetation cover on the development site should be maintained during the construction phase. The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes which will not be developed.
- Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.
  - All bare slopes and surfaces to be exposed to the elements during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals (e.g. every 2m) to break the energy of surface flows.
  - Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately as per the construction phase re-vegetation plan (see Section 5.1.3 above)
  - If re-vegetation of exposed surfaces cannot be established immediately due to phasing issues, temporary erosion and sediment control measures must be maintained until such a time that re-vegetation can commence.
  - All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when damaged. All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas.
  - After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gulley for additional protection until vegetation has re-colonised the rehabilitated area.

6.2.2 Soil management

- Soil stockpiles must be established on flat ground.
- Erosion/sediment control measures such as silt fences, low soil berms or wooden shutter boards must be placed around the stockpiles to limit sediment runoff from stockpiles.
- Subsoil and topsoil is to be stockpiled separately. Stockpiled soil must be replaced in the reverse order as to which it was removed (subsoil first followed by topsoil).
- Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils.
- The stockpiles may only be placed within demarcated stockpile areas, which must fall within the demarcated construction area. The contractor shall, where possible, avoid stockpiling materials in vegetated areas that will not be cleared.
- Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions.
- If soil stockpiles are to be kept for more than 3 months they must be hydroseeded.

- The slope and height of stockpiles must be limited to 1.5m and are not be sloped more than 1:2 to avoid collapse.

6.3 Mitigation for Impact C4

6.3.1 Invasive Alien Plant Control

- All alien invasive vegetation that colonise the construction site must be removed, preferably by uprooting. The contactor should consult the ECO regarding the method of removal.
- All bare surfaces across the construction site must be checked for IAPs every two weeks and IAPs removed by hand pulling/uprooting and adequately disposed.
- Herbicides should be utilised where hand pulling/uprooting is not possible. The ECO must be consulted in this regard.

6.4 Mitigation for Impact C5

6.4.1 Hazardous substances / materials management

- The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, etc.) needs to be administered.
- Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater.
- Drip trays should be utilised at all dispensing areas.
- No refuelling, servicing or chemical storage should occur within 15m of the artificial wetland.
- No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site.
- Vehicle maintenance should not take place on site unless a specific bunded area is constructed for such a purpose.
- Hazardous storage and refuelling areas must be bunded prior to their use on site during the construction period following the appropriate SANS codes. The bund wall should be high enough to contain at least 110% of any stored volume. The surface of the bunded surface should be graded to the centre so that spillage may be collected and satisfactorily disposed of.
- All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.
- Sanitation - portable toilets (1 toilet per 10 users) to be provided where construction is occurring. Workers need to be encouraged to use these facilities and not the natural environment. Toilets must not be located within the 1:100yr flood line of a watercourse or within the buffer of any natural watercourses. Waste from chemical toilets must be disposed of regularly (at least once a week) and in a responsible manner by a registered waste contractor. Toilet facilities must be serviced weekly and in a responsible manner by a registered waste contractor to prevent pollution and improper hygiene conditions.

- Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site.
- An emergency spill response procedure must be formulated and staff are to be trained in spill response. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.
- 44-gallon drums must be kept on site to collect contaminated soil. These should be disposed of at a registered hazardous waste site.
- Provide adequate rubbish bins and waste disposal facilities on-site and educate/encourage workers not to litter or dispose of solid waste in the natural environment but to use available facilities for waste disposal.
- Clear and completely remove from site all general waste, constructional plant, equipment, surplus rock and other foreign materials once construction has been completed.
- Litter generated by the construction crew must be collected in rubbish bins and disposed of at registered landfill sites.
- Litter bins must be equipped with a closing mechanism to prevent their contents from blowing out or wild animals from accessing the contents.

6.4.2 Solid waste management

- Eating areas must be clearly demarcated.
- Waste bins must be provided at the eating areas.
- Bins and/or skips need to be supplied at convenient intervals on site for disposal of waste within the construction camp. The bins should have liner bags for easy control and safe disposal of waste.
- Bins should be provided to all areas that generate waste e.g. worker eating and resting areas and the camp site. General refuse and construction material refuse should not be mixed.
- Regular clearing/maintenance of bins is required.

6.5 Mitigation for Impact O1

6.5.1 Planning & design measures

Same as for Section 5.1.1.

6.5.2 Incorporation of sensitive areas into maintenance and repair plans

All relevant mitigation measures within Section 5 of this report, must be incorporated into all formal maintenance and repair plants for the emergency road.

6.5.3 Rehabilitation measures (if accidental disturbance)

Same as for Section 5.1.3.

6.6 Mitigation for Impact O2

6.6.1 Planning and design measures: Stormwater management

It is assumed that stormwater generated by the proposed road will be discharged into the existing concrete stormwater channel that drains into the stormwater wetland. As this infrastructure is already existing and the road is relatively small, this plan is considered acceptable. Nevertheless, limited details on stormwater management have been provided to the authors and as such the following road stormwater design measures are recommended:

- **Stormwater conveyance:**
    - Wherever possible, stormwater conveyance outside of the road surface should be via open, grass-lined channels/swales and/or stone-filled infiltration ditches rather than underground piped systems or concrete V-drains.
    - Wherever possible, velocity / energy reduction measures should be established within the open conveyance systems to reduce the velocity at planned outlets.
- **Stormwater discharge / outlets:**
    - Wherever possible, many stormwater outlets should be favoured over few large. Ideally, the stormwater outlets should be established at regular intervals to reduce the volumes and velocities of flow at outlets. In this regard, discharge via mitre drains should be considered where suitable.
    - All outlets must be designed to dissipate the energy of outgoing flows to reduce point source scouring and erosion risks. In this regard, adequately sized concrete stilling basins/sumps must be installed at all outlets and flow from these stilling basins must fall onto suitably designed gabion reno-mattresses with wing walls. The reno-mattresses must extend an appropriate distance downslope to ensure that erosion risks are minimised.
    - The outlet reno-mattresses must be established to reflect the natural slope of the surface it is constructed on and are to be located at the natural ground-level.
    - The outlets and associated outlet protection structures should be aligned parallel to contours wherever possible to reduce the gradient of outflows and remain outside of wetlands and their buffer zones where possible.
    - Where stormwater is planned to be discharged into the existing concrete channel above the artificial stormwater wetland, energy dissipation measures should be installed along this channel wherever possible.

6.6.2 Rehabilitation measures (if erosion / sedimentation)

It is beneficial that measurable sediment deposits causing smothering or burial of grassland vegetation and/or erosion damage caused by the road stormwater system is rehabilitated as soon as possible after being detected. Refer to Section 5.1.3 for basic rehabilitation details.

6.6.3 Monitoring measures

Erosion and/or sedimentation damage below all stormwater outlets should be monitored annually as part of the repair and maintenance of the road stormwater infrastructure.

6.7 Mitigation for Impact O3

6.7.1 Planning and design measures

No specific water filtration measures for incorporation into the stormwater management systems are recommended.

6.7.2 Monitoring measures

Evidence of pollution damage below all stormwater outlets should be monitored annually as part of the repair and maintenance of the road stormwater infrastructure.

7. PLANT RESCUE AND RELOCATION

All of the plant species encountered onsite within areas sampled were pioneer, ruderal or weedy / opportunistic (tolerant) species of low conservation value. A large number of *A. ecklonii* were encountered within the *C. gayana* grassland within the study area. This species is protected in terms of the KwaZulu-Natal Provincial Conservation Ordinance. However, due to the very large numbers of *Aristea ecklonii* within and outside of the study area within the KSIA, and the low biodiversity value of the species (it is a common, widespread species which is not threatened), relocation is not recommended in this case.

8. PLANT PERMIT RECOMMENDATIONS

The destruction of the large numbers of *A. ecklonii* will require a plant destruction permit from the provincial conservation authority Ezemvelo KZN Wildlife in terms of the KwaZulu-Natal Provincial Conservation Ordinance. All members of the family Iridaceae are protected, of which *A. ecklonii* is part. No other protected species were identified within the areas sampled.

9. ALIEN PLANT CONTROL RECOMMENDATIONS

The number and density of alien plants encountered within the study area is relatively low. Annuals herbs like *B. pilosa* have moderate abundances in places but most perennial alien plants are present in very low abundance. Please refer to the species lists above for a list of alien plants species encountered.

The presence of these alien species indicates that regular mowing does not necessarily prevent the invasion of these species and highlights the need for annual alien plant eradication exercises within the KSIA platform / runway grasslands. The low abundance and density of the infestations and small size of the plants identified indicates that mechanical removal by hand pulling or digging up with a spade (or other relevant hand held implement) would be sufficient to remove the entire plants including roots and rhizomes. Plant removal after rains (when the soil is moist / damp) is recommended.

10. CONCLUSION

Site observations and recordings during site walkovers of the study area confirmed that the vegetation of the study area comprises secondary grassland with low grass and forb species diversity. This grasslands assessed are not representative of the primary grassland types of the area and region. All of the species encountered are common species that are considered local ruderals, weeds and/or opportunistic species that often proliferate under disturbed conditions. No species of conservation concern were encountered. A large number of the protected forb, *Aristea ecklonii*, was encountered. However, due to the large number of *A. ecklonii* within and outside of the study area within the KSIA, and the low biodiversity value of the species (it is a common, widespread species which is not threatened), relocation is not recommended in this case. As this species is protected in terms of the KwaZulu-Natal Provincial Conservation Ordinance, a permit to destroy the plants within the study area will be required (see Section 5 below).

The proposed road development stands to have a number of potential direct and indirect impacts to the grasslands assessed. However, considering the small area of grassland to be directly and indirectly impacted, the low intensity of the indirect impacts considering the gentle gradient of the grassland and the intense management regimes, and the fact that the grasslands encountered were of low value in terms of the maintenance of biodiversity, there is high confidence that the proposed development activities will have limited impacts on local floral biodiversity and that all of the anticipated impacts will be of low significance under poor and good mitigation scenarios. There is thus not fatal flaws associated with the proposed development activities. Nevertheless, the applicant is still legally obliged to ensure that all indirect impacts (and direct impacts outside of the road footprint) to the vegetation communities assessed are minimised as far as practically possible as per the 'duty of care' principle.

Furthermore, due to the low biodiversity value of the grassland, and the majority of the forb species being pioneer and/or opportunistic in nature, widespread in distribution and not threatened, plant rescue and relocation is not recommended for conservation purposes. However, some plant rescue (i.e. sod translocation) may assist in reducing the costs of post-development grassland rehabilitation.

Please note that the above statements assume that there will be no impact to the KSIA conservation zone.

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12. ANNEXURE A: DEVELOPMENT PLANS

Please refer to enclosed construction phasing plan.

13. ANNEXURE B: RELEVANT ENVIRONMENTAL LEGISLATION

13.1 National Environmental Management Act No.107 of 1998 (NEMA)

NEMA is South Africa's overarching environmental legislation and has, as its primary objective to provide for co-operative governance by establishing principles for decision making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state and to provide for matters connected therewith (Government Gazette, 1998). The Act provides for the right to an environment that is not harmful to the health and well-being of South African citizens; the equitable distribution of natural resources, sustainable development, environmental protection and the formulation of environmental management frameworks. In addition, there is recognition that development must be socially, environmentally and economically sustainable and that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied (Government Gazette, 1998). Specific principles of NEMA that are of particular relevance to the management and protection of biodiversity are indicated in the table below. Any developments with a potential impact to biodiversity and natural ecosystems therefore typically need to be assessed to ensure that impacts are adequately minimized. Authorizations may also be required before planned activities can commence. A summary of NEMA principles applicable to the management of biodiversity is included below:

Section	Principle
2(4) (a) (i)	The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied.
2(4) (a) (ii)	Pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied.
2(4) (a) (vi)	The development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised.
2(4) (a) (vii)	A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions.
2(4) (e)	Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.
2(4) (o)	The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.
2(4) (p)	The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.
2(4) (r)	Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal habitats including dunes, beaches and estuaries, reefs, wetlands, and similar ecosystems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

13.2 National Environmental Management: Biodiversity Act No. 10 of 2004 (NEM:BA)

The NEM: Biodiversity Act provides for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act (NEMA). The intention of this Act is to protect species and ecosystems and promote the sustainable use of indigenous biological resources. It addresses aspects such as protection of threatened ecosystems and imposes a duty of care relating to listed alien invasive species. The South African National Biodiversity Institute (SANBI) is established by this Act and is responsible for coordinating and implementing programs.

13.2.1 NEM:BA - Invasive Species Regulations

Legislative requirements in terms of Invasive Alien Plants (IAPs) occurring on the property are informed by the Alien and Invasive Species Regulations, 2014 in terms of section 97(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA). Plants are categorized according to the NEM:BA Alien and Invasive Species List 1: National list of Invasive Terrestrial and Fresh-water Plant Species, contained within Government Notice 599 (Government Gazette No. 37886, 1 August 2014) in terms of sections 66(1), 67(1), 70(1)(a), 71(3) and 71A of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004). NEM:BA classifies three categories of invasive alien plants according to Government Notice R. 598 National Environmental Management: Biodiversity Act (No. 10 of 2004): Alien and Invasive Species Regulations, 2014, as contained within Government Gazette No. 37885 (Vol. 590), 1 August 2014. These categories and relevant management requirements are summarized in Table 26 below.

Table 5. Summary of NEM:BA invasive alien plant categories and management requirements.

NEM:BA Category	NEM:BA Management Requirements
1a	Category 1a invasive species are those species listed as such by notice in terms of section 70(1)(a) of the NEM:BA as species which must be combated or eradicated immediately. By law, any specimens of these plants require compulsory eradication from the environment (to be removed and destroyed so they can no longer persist in the environment). No permits will be issued for Category 1a species. If an Invasive Species Management Programme has been developed in terms of section 75(4) of the NEMBA, a person must combat or eradicate the listed invasive species in accordance with such programme.
1b	Category 1b invasive species are those species listed as such by notice in terms of section 70(1)(a) of the NEM:BA as species which must be controlled. By law, any specimens of these plants require compulsory control as part of an invasive species control programme.
2	Category 2 invasive species are regulated by area. These species require a permit to carry out a restricted activity specified in the permit (e.g. import, possess, grow, breed, move, sell, buy or accept as a gift) or an area specified in the permit. No permits will be issued for Category 2 plants to exist in riparian zones. Unless otherwise indicated in the Notice, no person may carry out a restricted activity in respect of a Category 2 Listed Invasive Species without a permit. A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit, must ensure that the specimens of the species do not spread outside of the land or the area specified in the permit or over which they have control. Any species listed as a Category 2 species that occurs outside the specified/permitted area is to be considered a Category 1 b Listed Invasive Species and must be managed accordingly.
3	Category 3 invasive species are regulated by activity and are as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of NEM:BA. No permits will be issued for Category 3 plants to exist in riparian zones and any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas will be considered to be a Category 1b Listed Invasive Species and must be controlled in accordance with an invasive plant control programme.

13.2.2 Threatened or Protected Species (TOPS) in terms of NEMBA

Threatened or Protected Species (TOPS) are regulated in terms of the National Environmental Management: Biodiversity Act No. 10 of 2004 (NEMBA). TOPS are listed in the NEMBA: PUBLICATION OF LISTS OF CRITICALLY ENDANGERED, ENDANGERED, VULNERABLE AND PROTECTED SPECIES (GOVERNMENT GAZETTE, 23 FEBRUARY 2007). The TOPS regulations apply only to those species that are listed as threatened or protected in terms of the Biodiversity Act. *Provincial legislation still applies to all species not listed as threatened or protected.* A person may not carry out ANY restricted activity involving a TOPS specimen, without a TOPS permit. There are NO exemptions from any of the provisions of the TOPS regulations, to any person, organization or organ of state. Restricted activity involving a TOPS specimen means:

(i) hunting, catching, capturing or killing by any means, method or device whatsoever, including searching, pursuing, driving, lying in wait, luring, alluring, discharging a missile or injuring with intent to hunt, catch, capture or kill any such specimen;
(ii) gathering, collecting or plucking;
(iii) picking parts of, or cutting, chopping off, uprooting, damaging or destroying;
(iv) importing into the Republic, including introducing from the sea;
(v) exporting from the Republic, including re-exporting from the Republic;
(vi) having in possession or exercising physical control over;
(vii) growing, breeding or in any other way propagating, or causing it to multiply;
(viii) conveying, moving or otherwise translocating;
(ix) selling or otherwise trading in, buying, receiving, giving, donating or accepting as a gift, or in any way acquiring or disposing of; or
(x) any other prescribed activity which involves a TOPS specimen without the relevant TOPS permits.

13.3 Nature Conservation Ordinance No. 15 of 1974

This piece of legislation makes extensive provision for protected areas (including private nature reserves) and protection of flora and fauna (including marine and freshwater fish). The administration of the whole of this Ordinance has under Proclamation 107 of 1994, published in Government Gazette 15813 of 17 June 1994, been assigned to the Province of KwaZulu-Natal with effect from 17 June 1994. Schedule 12 of the Ordinance lists Specially Protected Plants that are regulated in terms of activities that can take place with respect to harvesting, selling, importing, trading and handling of these plant species. On application by a landowner wishing to develop his land in such a manner that such development may cause damage or destruction to specially protected indigenous plants, a permit for the relocation of such plants may be granted.

APPENDIX D3

GEOTECHNICAL REPORT

Report on the Geotechnical Investigation Carried Out for the King Shaka International Airport Emergency Access Roads in La Mercy, KwaZulu-Natal

31 October 2018

Project Number:	18013
Report Number:	18013-R01

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iX ENGINEERS (PTY) LTD

REPORT ON THE GEOTECHNICAL INVESTIGATION CARRIED OUT FOR THE KING SHAKA INTERNATIONAL AIRPORT EMERGENCY ACCESS ROADS IN LA MERCY, KWAZULU-NATAL

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APPENDICES

Appendix A: Figures 1 through 3

Appendix B: In Situ CBR Dynamic Cone Penetrometer (Light) Tests

Appendix C: Test Pit Logs

Appendix D: Laboratory Test Results

SHRIRAM GEOTECHNICAL CONSULTING (PTY) LTD

iX ENGINEERS (PTY) LTD

REPORT ON THE GEOTECHNICAL INVESTIGATION CARRIED OUT FOR THE KING SHAKA INTERNATIONAL AIRPORT EMERGENCY ACCESS ROADS IN LA MERCY, KWAZULU-NATAL

1 INTRODUCTION AND TERMS OF REFERENCE

Mr Rahul Shriram from Shriram Geotechnical Consulting (Pty) Ltd was requested to submit a quotation to iX Engineers (Pty) Ltd to carry out a geotechnical investigation for the emergency access roads proposed to be constructed at the King Shaka International Airport in La Mercy, KwaZulu-Natal by Mr John Bohler from iX Engineers (Pty) Ltd on 26 January 2018. Mr Shriram submitted a quotation to Mr Bohler via email on 1 February 2018. This quotation was subsequently accepted via email from Mr Bohler on 19 February 2018. Mr Bohler emailed Mr Shriram a revised scope of work on 16 April 2018. A quotation for the revised scope of work was submitted to Mr Bohler by Mr Shriram on 17 April 2018. This revised quotation was accepted by Mr Bohler.

The aim of the geotechnical investigation was to assess the ground conditions in terms of usage and for subgrade treatment guidelines to be provided.

This report presents the findings of the investigation and provides guidelines pertaining to materials usage and subgrade treatment.

2 INFORMTION SUPPLIED

Portions of the revised route of the emergency access roads were provided to Shriram Geotechnical Consulting (Pty) Ltd by Mr Bohler via email on 13 April 2018. The images provided were included in the text of the email and included the locations at which field testing was required. No layout drawings showing the final route alignment were provided.

Mr Bohler and Mr Shriram attended a site meeting on 8 June 2018 during which the field test positions were set out. These positions were confirmed via email on 28 August 2018.

3 SITE DESCRIPTION

King Shaka International Airport is situated in La Mercy, KwaZulu-Natal, at the approximate coordinates 29°37'6.76"S 31° 6'15.27"E (terminal building). Two emergency access roads which lead to the runway are proposed to be constructed. The first road extends from Watson Highway, north of the airport, to the northern limit of the runway and measures approximately 1.1km. The second road is proposed to be constructed from Mdloti Street (M65), south of the airport, to the southern limit of the runway and measures approximately 250m. The roads will traverse the airside and landside of the airport.

The areas investigated for the northern road are overall generally gently sloped from the north towards the south on the landside and becomes flat on the airside. The route proposed follows an existing degraded gravel road on the landside. A portion of the route proposed on the airside follows a beaten down track with grassed terrain occurring up- and down-chainage of it.

The southern road is generally flat on the airside and landside with the exception of a short portion towards airside boundary where a steep gradient exists between the internal airport perimeter road and open fields. The route proposed follows a grassed track on the landside and extends over grassed fields on the airside.

The overall topography of the site suggests that the site was subjected to extensive earthworks in the past.

The locality of the site is shown in the Locality Plan, Figure 1, contained in Appendix A.

4 FIELDWORK

The field work was carried out between 22 August and 11 September 2018 and comprised of the following:

- In Situ CBR Dynamic Cone Penetrometer tests; and
- Test pits.

The locations of the test positions are shown on Figure 2a and Figure 2b, contained in Appendix A.

All depths and measurements are referenced from existing ground level at the time of the investigation unless otherwise stated.

4.1 In Situ CBR Dynamic Cone Penetrometer (Light) tests

A total of 9 No. in Situ CBR (ICBR) Dynamic Cone Penetrometer (DCP) tests, designated DCP1 to DCP9 were carried. The ICBR DCP tests were generally advanced to a minimum depth of 1.00m or earlier refusal as summarised in Table 1 below.

The test results show inferred shear strength parameters and CBR (ICBR) values associated with the in situ soils and is provided in Appendix B.

Table 1

Summary of ICBR DCP Tests

Location	DCP Number	Final Depth (mm)	Refusal
Northern Emergency Access Road - Landside	DCP1	940	No
	DCP2	80	No
Northern Emergency Access Road - Airside	DCP3	1011	No
	DCP4	1025	No
	DCP5	1073	No
Southern Emergency Access Road - Airside	DCP6	1038	No
	DCP7	979	No
Southern Emergency Access Road - Landside	DCP8	1019	No
	DCP9	335	Yes

4.2 Test Pits

A total of 9 No. test pits were excavated by hand through to a minimum depth of 1.00m or earlier refusal. The materials exposed in the test pits were profiled[1] and sampled by an engineering geologist.

The test pits are summarised in Table 2 below and detailed logs of the test pits are provided in Appendix C.

Table 2

Summary of Test Pits

Location	DCP Number	Final Depth (m)	Refusal
Northern Emergency Access Road - Landside	TP1	1.10	No
	TP2	1.05	No
Northern Emergency Access Road - Airside	TP3	1.00	No
	TP4	1.10	No
	TP5	1.00	No
Southern Emergency	TP6	1.00	No

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[1] Geoterminology Workshop (2002) – Guidelines for Soil and Rock Logging, SAIEG-AEG-SAICE (Geotech Div) pp47

Location	DCP Number	Final Depth (m)	Refusal
Access Road - Airside	TP7	1.05	No
Southern Emergency Access Road - Landside	TP8	1.05	No
	TP9	1.00	No

5 GEOLOGY

The 1:250 000 Geological Map of Durban, Geological Series 2930, indicates that the site investigated is underlain by soils of the Berea Formation as well as shale and siltstone of the Vryheid Formation. The regional geology is shown in Figure 3, included in Appendix A.

The in situ materials indicated on the Geological Map of Durban and/or their weathered products were not encountered during the field investigation. Fill resembling soils belonging to the Berea Formation were however encountered in TP1. The site was generally found to be underlain by colluvium, or topsoil, and fill which was likely placed when shaping the site during the construction of the airport. The existing gravel road situated on the landside north of the airport was found to be underlain by apparently compacted soils.

Test pits TP1 and TP2 were excavated through the existing gravel road. This road was found to be poorly maintained. A degraded gravel wearing course comprised of sandy fine to course gravel occurred in the upper 5cm of TP2. The gravel wearing course was underlain by brownish orange and brownish red silty sands and clayey sands which were apparently compacted in the upper 0.40 (TP1) to 0.60m (TP2). These materials occurred from surface level in TP1, where the gravel wearing course was absent.

Elsewhere on the site, a colluvial or topsoil layer generally comprised of brown and dark brown of silty and clayey variants of sand with gravelly clays occurring in TP6.

The colluvial/topsoil layer was underlain by fill. The fill encountered was highly variable comprised silty and clayey sands and gravels with clay rich layers occurring in areas. These fill layers cannot be described as well defined soil units due to the inconsistent physical characteristics and soil compositions encountered as shown on the test pit profiles (Appendix C).

6 GROUNDWATER

Groundwater seepage was not encountered in any of the test pits. However, during periods of high rainfall, shallow groundwater seepage could be expected to proliferate particularly where highly permeable soils exist and at the interface between fill layers.

7 LABORATORY TESTING

In order to classify the materials on site and to assess their suitability for use, laboratory testing was conducted on selected materials encountered in the test pits. The following tests were scheduled:

- Road indicator tests (Particle size analysis and Atterberg limit determination);
- Modified AASHTO moisture-density (modified AASHTO) tests; and
- California Bearing Ratio, or CBR, strength tests.

The test results are summarised in Table 3 below, and the detailed result sheets are contained in Appendix D.

Table 3

Summary of Results of Particle Size Distribution Analysis, Atterberg Limit Determinations and Moisture / Density and CBR Tests

TP No.	Depth (m)	Description	Particle Size %				Atterberg Limits			GM	Modified AASHTO		CBR Values (%) Compaction MDD (%)						Swell (%)	Classification
			Clay	Silt	Sand	Gravel	LL	PI	LS %		MDD / Proctor (kg/m^3)	OMC %	90	93	95	97	98	100	100	
TP1	0.00-0.40	Dry to slightly moist brownish orange dense intact silty clayey SAND with occasional gravels. Fill likely of Berea Formation origin.	35		65	0	21	6	3.0	0.68	2009	10.9	1	3	7	15	22	47	0.1	A-2-4(0), G10
TP1	0.40-1.10	Moist brownish red medium dense becoming loose at depth intact clayey SAND. Fill, likely of Berea Formation origin.	29		69	2	CBD	SP	1.5	0.80	2028	9.6	5	7	9	11	12	15	0.2	A-2-4(0), G9
TP2	0.05-0.30	Slightly moist medium brown occasionally mottled orange brown medium dense intact silty SAND. Fill.	12		84	2	CBD	NP	0.0	0.96	1845	9.9	8	14	21	30	36	52	0.0	A-2-4(0), G8
TP2	0.30-1.05	Slightly moist to moist orange brown medium dense becoming loose with depth intact silty SAND with zones of clayey SAND. Fill.	15		85	0	CBD	NP	0.0	0.87	1925	7.6	6	12	21	36	48	82	0.0	A-2-4(0), G8

TP No.	Depth (m)	Description	Particle Size %				Atterberg Limits			GM	Modified AASHTO		CBR Values (%) Compaction MDD (%)						Swell (%)	Classification
			Clay	Silt	Sand	Gravel	LL	PI	LS %		MDD / Proctor (kg/m^3)	OMC %	90	93	95	97	98	100	100	
TP3	0.15-0.55	Moist to very moist light orange mottled and streaked dark brown very loose intact slightly clayey and silty SAND with some sandy CLAY nodules. Fill.	8		91	1	CBD	NP	0.0	1.01	1831	6.3	8	10	11	13	14	16	0.0	A-3(0), G8
TP3	0.55-1.00	Moist reddish brown to orange brown soft intact clayey silty SAND. Fill.	22		78	0	19	3	2.0	0.81	1976	8.7	4	7	11	17	22	34	0.2	A-2-4(0), G9
TP4	0.40-1.10	Moist light orange brown mottled to blotched brownish red loose intact clayey silty SAND. Fill.	21		79	0	CBD	SP	1.0	0.82	2001	8.5	10	16	22	31	36	49	0.0	A-2-4(0), G7
TP5	0.10-0.80	Slightly moist to moist orange mottled ant blotched brownish yellow, light orange and brownish red loose to medium dense intact clayey SAND with minor gravels and cobbles of mixed origin. Fill.	25		75	0	CBD	SP	1.5	0.78	2011	9.4	5	9	15	23	30	47	0.1	A-2-4(0), G9

TP No.	Depth (m)	Description	Particle Size %				Atterberg Limits			GM	Modified AASHTO		CBR Values (%) Compaction MDD (%)						Swell (%)	Classification
			Clay	Silt	Sand	Gravel	LL	PI	LS %		MDD / Proctor (kg/m³)	OMC %	90	93	95	97	98	100	100	
TP6	0.15-0.40	Slightly moist light brownish yellow medium dense intact clayey sandy GRAVEL with abundant cobbles. Apparently poorly compacted fill.	14		15	71	24	11	5.5	2.36	2145	8.6	11	13	15	17	18	20	0.0	A-2-6(0), G8
TP7	0.20-1.05	Moist red speckled and mottled deep yellow and dark grey soft becoming very soft with depth clayey and silty SAND with minor gravels of mixed origin. Fill.	34		58	8	22	6	3.0	0.91	1951	10.0	1	1	2	2	2	3	2.4	A-2-4(0), <G10
TP8	0.20-0.65	Slightly moist yellowish orange brown mottled blue grey dense intact clayey sandy GRAVEL with zones of sandy gravelly CLAY and occasional cobble up to 12cm across. Fill.	24		41	35	19	7	3.5	1.56	2139	7.9	5	5	6	7	7	8	0.1	A-2-4(0), G10

TP No.	Depth (m)	Description	Particle Size %				Atterberg Limits			GM	Modified AASHTO		CBR Values (%) Compaction MDD (%)						Swell (%)	Classification
			Clay	Silt	Sand	Gravel	LL	PI	LS %		MDD / Proctor (kg/m³)	OMC %	90	93	95	97	98	100	100	
TP9	0.25-0.75	Slightly moist yellowish orange brown mottled blue grey dense intact clayey sandy GRAVEL with occasional cobble up to 12cm across. Fill.	22		27	51	21	7	4.5	1.89	2229	7.7	5	9	13	19	22	31	0.3	A-2-4(0), G9

L - Liquid Limit
PI - Plasticity Index
LS - Linear Shrinkage
SP - Slightly Plastic

GM - Grading Modulus
MDD - Maximum Dry Density
OMC - Optimum Moisture Content
CBD - Could not be determined

Classification in Terms of: USPRA[2]
TRH 14 (1985)[3]

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[2] US Public Roads Administration Classification (Modified from Allen 1945)

[3] TRH 14 (1985) – Technical Recommendations for Highways, Guidelines for Road Construction Materials, Committee of State Road Authorities.

8 MATERIALS CLASSIFICATION AND USAGE

The materials making up the existing roadbed have been classified in terms of their suitability for use in road construction on the basis of field observations and laboratory testing. The classification and recommended usage is summarised in Table 4 below.

Due to the isolated work areas (northern access road – landside, northern access road – airside, southern access road – airside, southern access road – landside) and operational constraints the materials classification and usage has been provided based on the work areas, and not necessarily the similarity in materials encountered.

Table 4

Materials Classification and Usage

Material Type, Location & Test Pit Number	Description	Classification Details	Recommended Use and Subgrade Treatment
Fill (average thickness of 525mm, in range of 250mm to 750mm) Northern Emergency Access Road – Landside TP1 & TP2	Brown and orange variants of silty clayey SAND.	PI = NP to 6; Silt & clay = 12 to 35; GM = 0.68 to 0.96; CBR = 1 to 6 @ 90% MDD; CBR = 3 to 14 @ 93% MDD; CBR = 7 to 21 @ 95% MDD; CBR = 12 to 48 @ 98% MDD; CBR = 15 to 82 @ 100% MDD Classifies as A-2-4(0) in terms of USPRA. TRH14:1985 classification of G8 to G10 in quality	Excellent to good subgrade material in terms of USPRA. Generally suitable for use as subgrade material of quality G10.

Material Type, Location & Test Pit Number	Description	Classification Details	Recommended Use and Subgrade Treatment
Fill (average thickness of 563mm, in range of 400mm to 700mm) Northern Emergency Access Road – Airside TP3 , TP4 and TP5	Orange, orange brown and reddish brown clayey and silty SAND.	PI = NP to 3; Silt & clay = 8 to 25; GM = 0.78 to 1.01; CBR = 4 to 10 @ 90% MDD; CBR = 7 to 16 @ 93% MDD; CBR = 11 to 22 @ 95% MDD; CBR = 14 to 36 @ 98% MDD; CBR = 16 to 49 @ 100% MDD Classifies as A3(0) to A-2-4(0) in terms of USPRA. TRH14:1985 classification of G7 to G9 in quality.	Excellent to good subgrade material in terms of USPRA. Generally suitable for use as subgrade material of quality G9.
Fill (average thickness of 550mm, in range of 250mm to 850mm) Southern Emergency Access Road – Airside TP6 & TP7	Red and brownish yellow silty and clayey SAND and sandy GRAVEL.	PI = 6 to 11; Silt & clay = 14 to 34; GM = 0.91 to 2.36; CBR = 1 to 11 @ 90% MDD; CBR = 1 to 13 @ 93% MDD; CBR = 2 to 15 @ 95% MDD; CBR = 2 to 18 @ 98% MDD; CBR = 3 to 20 @ 100% MDD Classifies as A-2-4(0) to A-2-6(0) in terms of USPRA. TRH14:1985 classification of G8 to <G10 in quality.	Generally fair to poor subgrade material in terms of USPRA. TP6: Generally suitable for use as subgrade material of quality G8. TP7: Not suitable for use as subgrade.
Fill (average thickness of 475mm, in range of 450mm to 500mm) Southern Emergency Access Road – Landside TP8 & TP9	Yellowish orange brown clayey sandy GRAVEL.	PI = 7; Silt & clay = 22 to 24; GM = 1.56 to 1.89; CBR = 5 @ 90% MDD; CBR = 5 to 9 @ 93% MDD; CBR = 6 to 13 @ 95% MDD; CBR = 7 to 22 @ 98% MDD; CBR = 8 to 31 @ 100% MDD Classifies as A-2-4(0) in terms of USPRA. TRH14:1985 classification of G9 to G10 in quality.	Excellent to good subgrade material in terms of USPRA Generally suitable for use as subgrade material of quality G10.

9 MATERIALS ASSESSMENT

The existing gravel road appears not to have been maintained and as a result, the gravel wearing course has been thinned or completely eroded in places. Where encountered, the gravel wearing course was found to be 50mm thick.

The materials underlying the gravel wearing course, and those present from ground level where the gravel wearing course has been completely eroded away, appears to have been compacted in order to serve as a base layer. These materials generally comprise silty clayey sands but behaved as clays when inspected on site. They generally classify in the range of G8 to G10 in terms of TRH 14 and are of excellent to good subgrade material.

All other areas investigated were found to be underlain by fill of varying composition (silty and clayey sands and gravels with clay rich layers occurring in areas). These soils vary from G7 to less than G10 quality and are not suitable for use in structural pavement layers but may be used as subgrade materials (in certain areas) as suggested in Table 4.

10 SUBGRADE TREATMENT

It is understood that the 440mm deep excavations will be created along the path of the emergency access roads, from which depth the structural pavement layers will be constructed.

The ICBR values recorded on site are variable (Appendix B) and were found to be relatively higher in some areas. These areas generally correspond to those underlain by gravelly soils. The possibility of the higher ICBR values being attributed to the individual gravels acting as obstructions or “barriers” during DCP testing must therefore not be ruled out.

It will suffice to treat the subgrade as follows:

- Excavate to top of in situ subgrade level.
- Rip the fill to a minimum 200mm depth (or as determined by the Engineer), obtain a moisture content within ±2% of the Mod AASHTO Optimum Moisture Content (OMC) by wetting or drying and recompact to minimum 93% MDD. Provided this is adhered to the following minimum CBRs may be adopted (based on the laboratory test results) for the subgrade for the design of respective lengths of road:

  - Northern Access Road – Landside: 3
  - Northern Access Road – Airside: 7
  - Southern Access Road – Airside: 1
  - Southern Access Road – Landside: 5

- Where materials of clayey consistency and/or of less than G10 quality in terms of TRH 14 are encountered, they should be removed and replaced with more gravelly material in the range of G8/G9 quality. One such area exists in the vicinity of TP7. Clayey soils will usually be able to be practically identified during construction by its instability (heaving) under compaction and it not being able to be compacted to the recommended 93% MDD. Definitive identification will require laboratory testing. The depth of undercut should be determined by the Engineer but in general a 300mm undercut is likely to be acceptable for lightly trafficked roads. In instances where heavier wheel loads are anticipated, then a much deeper undercut to provide a stable base may be necessary, subject to the pavement type and depth selected by the designer.

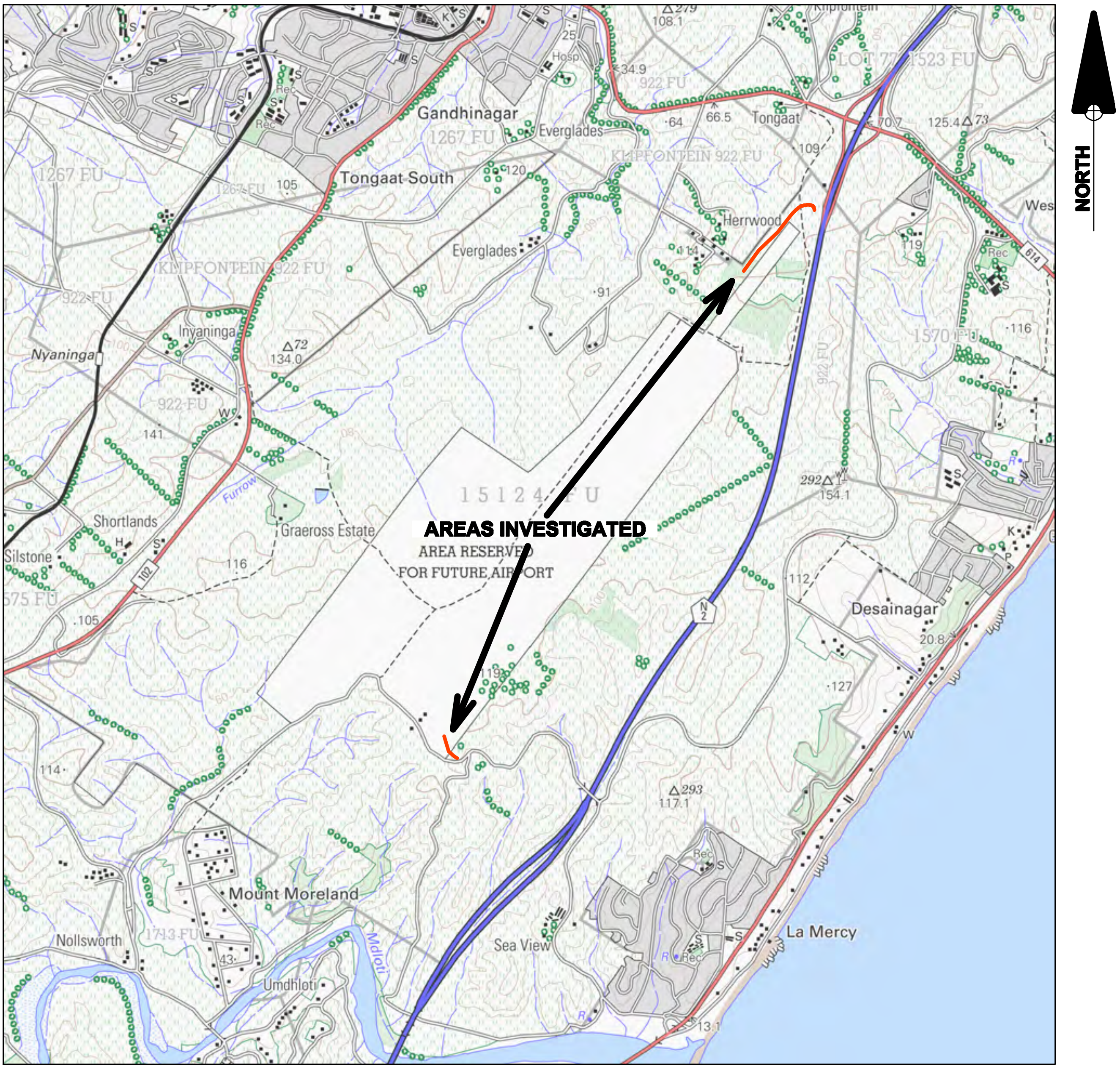
- The subsequent road layers should then be constructed according to appropriate road design, which will take the type and volume of traffic and design life into account. The majority of the materials required for the pavement formation layers will need to be imported to the site.

11 CONCLUSION

This report sets out the results of the geotechnical investigation for the emergency access roads proposed to be constructed at the King Shaka International Airport in La Mercy, KwaZulu-Natal and provides guidelines pertaining to materials usage and subgrade treatment.

The ground conditions described in this report refer specifically to those encountered in the test pits and In Situ CBR Dynamic Cone Penetrometer tests put down on site. It is therefore quite possible that conditions at variance with those discussed above can be encountered elsewhere. It is therefore important that Shriram Geotechnical (Pty) Ltd carry out periodic inspections of the open excavations, particularly of the exposed foundation inverts, before any construction is carried out. Any change from the anticipated ground conditions could then be taken into account to avoid unnecessary expense and damage to the finished structure. In this regard it is important that the construction phase of the project be treated as an augmentation of the geotechnical investigation.

Appendix A: Figures 1 through 3



0m 500m 1km 2km

Graphic Scale
1 / 50 000

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CLIENT

IX Engineers (Pty) Ltd

PROJECT

Geotechnical Investigation for the KSIA Emergency Access Roads

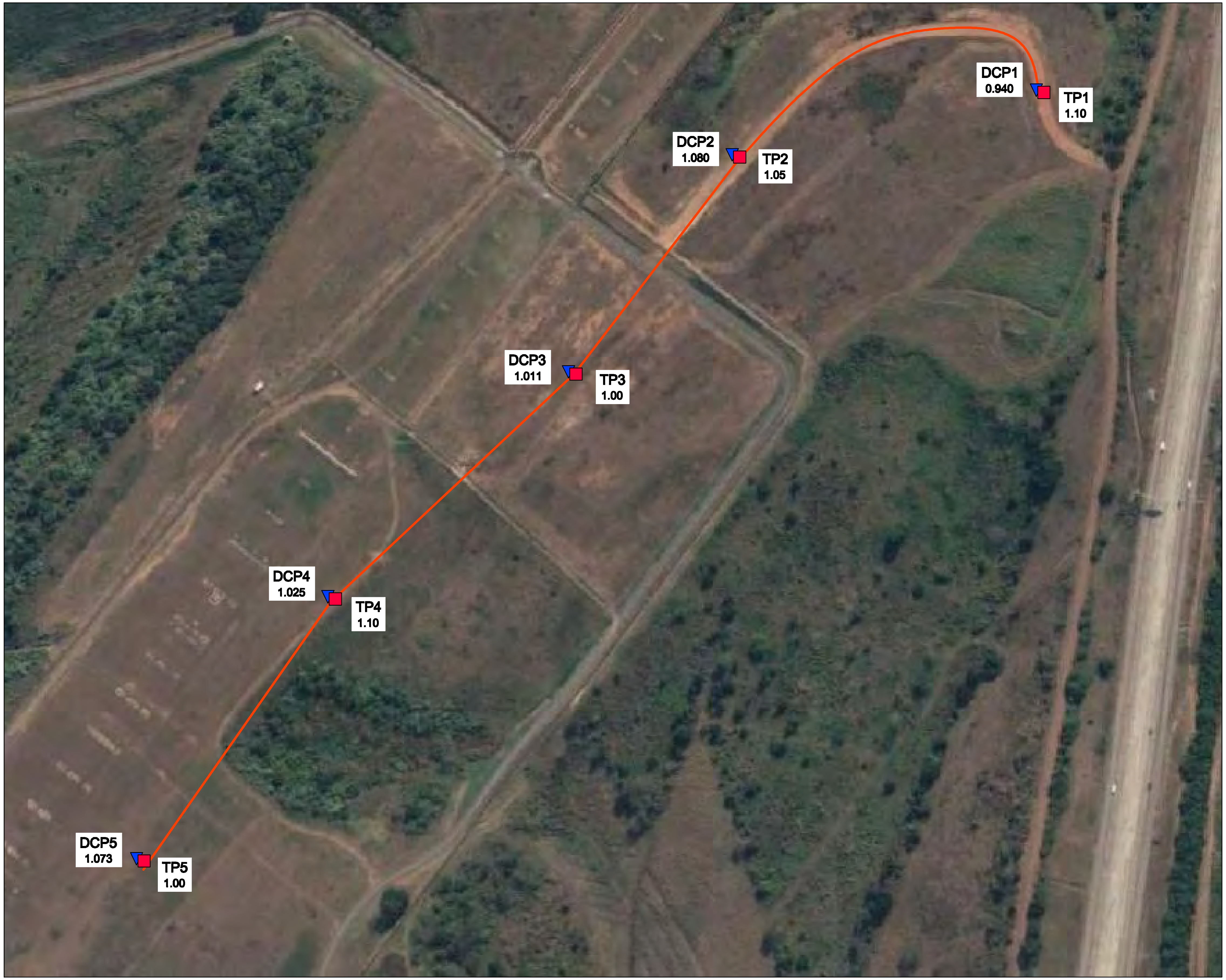
DRAWING DESCRIPTION

Locality Plan

SCALE ON A4 **1 / 50 000**		DATE CREATED **21-10-2018**	
PROJECT REF. NUMBER **18013**	REVISION **00**	DRG. SIZE **A4**	FIG. No. **1**

REFERENCE LIST

1:50 000 Topographical Series : 2931CA Verulam



LEGEND

TP1 1.10	🟥	Approximate position of Test Pit showing final depth or depth to refusal ( ) in metres below ground level
DCP 1 0.940	▼	Approximate position of CBR Dynamic Cone Penetrometer Test showing final depth or depth to refusal ( ) in metres below ground level

0m 20m 40m 60m 80m 100m

Graphic Scale
1 / 2500

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CLIENT

IX Engineers (Pty) Ltd

PROJECT

Geotechnical Investigation for the KSIA Emergency Access Roads

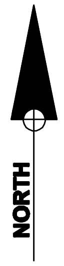
DRAWING DESCRIPTION

Site Plan showing:
1. **Test Pits**
2. **CBR Dynamic Cone Penetrometer Tests**

SCALE ON A4		DATE CREATED	
1 / 1000		21-10-2018	
PROJECT REF. NUMBER	REVISION	DRG. SIZE	FIG. No.
18013	00	A3	2a

REFERENCE LIST

Site Plan background from Google Earth



LEGEND

TP6 1.00	🟥	Approximate position of Test Pit showing final depth or depth to refusal ( ) in metres below ground level
DCP 6 1.038	▼	Approximate position of CBR Dynamic Cone Penetrometer Test showing final depth or depth to refusal ( ) in metres below ground level

0m 10m 20m 30m 40m 50m

Graphic Scale
1 / 1000

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BLUFF 4036

CLIENT

IX Engineers (Pty) Ltd

PROJECT

Geotechnical Investigation for the KSIA Emergency Access Roads

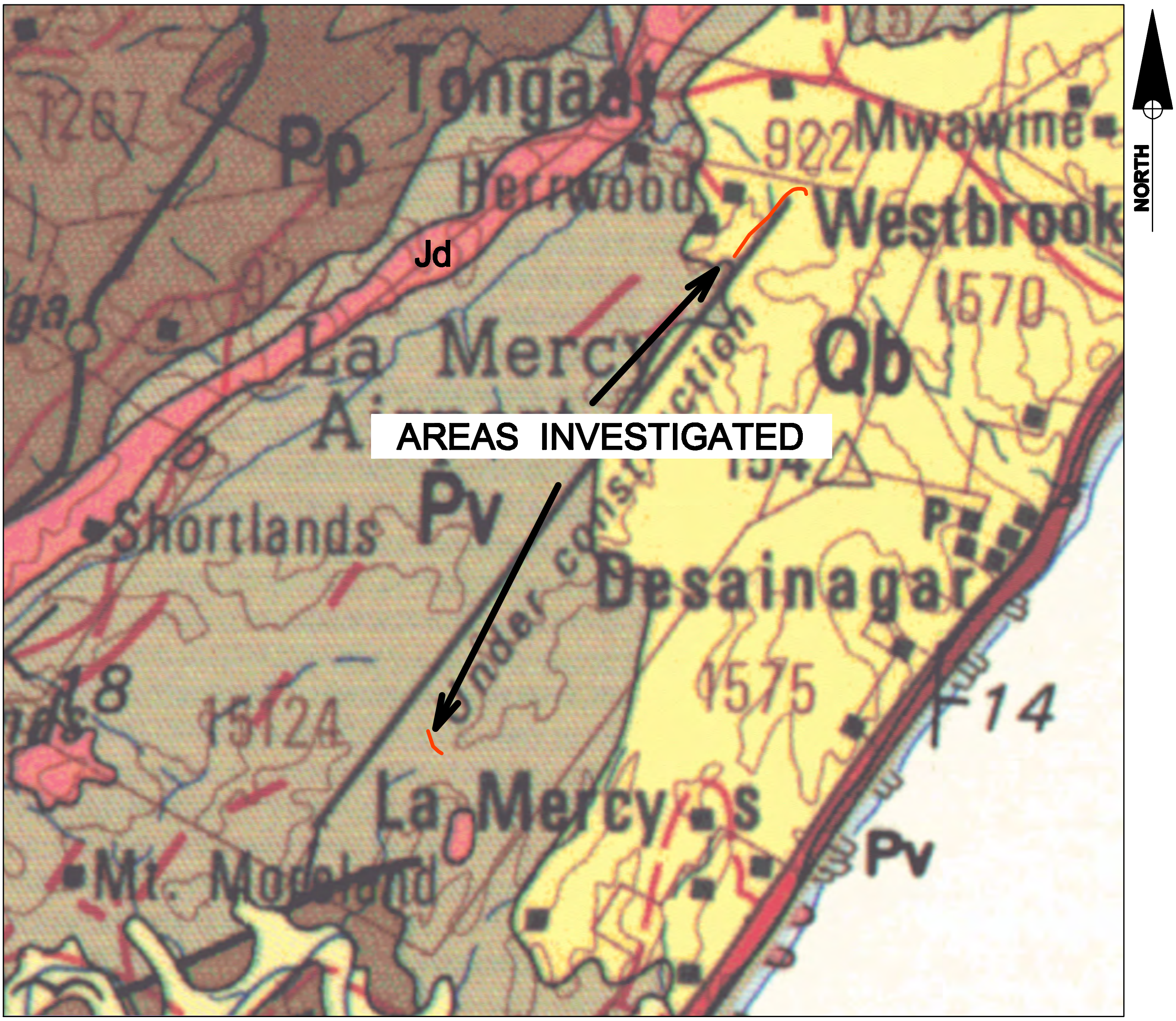
DRAWING DESCRIPTION

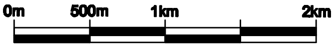
Site Plan showing:
1. **Test Pits**
2. **CBR Dynamic Cone Penetrometer Tests**

SCALE ON A4		DATE CREATED	
1 / 1000		21-10-2018	
PROJECT REF. NUMBER	REVISION	DRG. SIZE	FIG. No.
18013	00	A3	2b

REFERENCE LIST

Site Plan background from Google Earth





Graphic Scale
1 / 50 000

LEGEND

⌒⌒	Alluvium
Qb	Sand, basal conglomerate - Berea Formation
Jd	Dolerite - Karoo Supergroup
Pv	Subordinate grey shale and siltstone; sporadic coal - Vryheid Formation
Pp	Shale, Siltstone - Pietermaritzburg Formation

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CLIENT

iX Engineers (Pty) Ltd

PROJECT

Geotechnical Investigation for the KSIA Emergency Access Roads

DRAWING DESCRIPTION

Geology Plan

SCALE ON A4			DATE CREATED	
1 / 50 000			21-10-2018	
PROJECT REF. NUMBER	REVISION		DRG. SIZE	FIG. No.
18013	00		A4	3

REFERENCE LIST
1:250 000 Geological Series 2930 Durban

Appendix B: In Situ CBR Dynamic Cone Penetrometer (Light) Tests

DCP TEST RESULTS

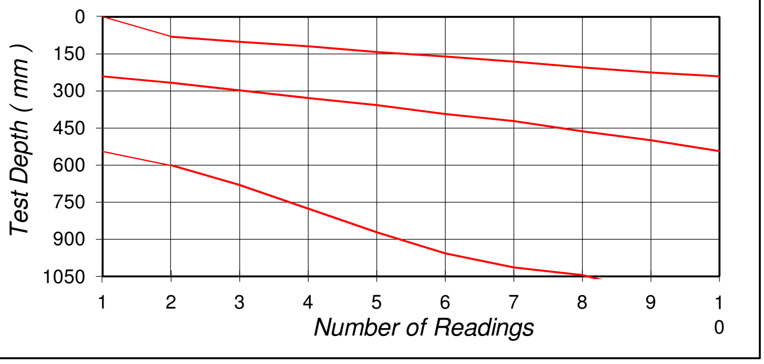
FOUNDATION INVESTIGATION - DCP

Client: **iX Engineers (Pty) Ltd** *Date:* **11-09-2018**
Contract: **KSIA Emergency Access Roads**
Description: **Geotechnical Investigation**
Test no: **DCP5**

DCP Readings

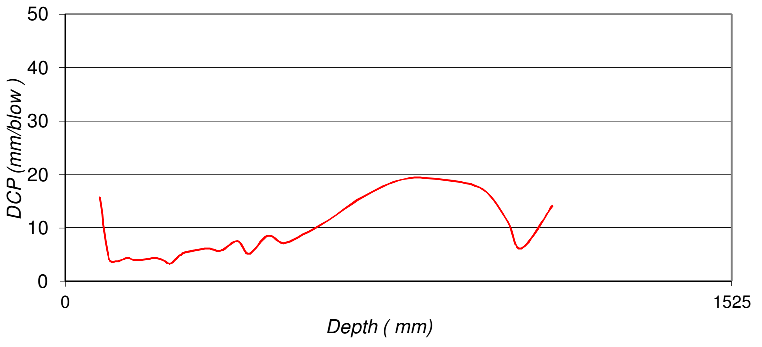
Blows per reading: **5**

no.	mm	no.	mm	no.	mm	no.	mm	no.	mm
1	**79**	11	**296**	21	**775**	31		41	
2	**100**	12	**327**	22	**870**	32		42	
3	**119**	13	**356**	23	**956**	33		43	
4	**141**	14	**394**	24	**1012**	34		44	
5	**161**	15	**420**	25	**1043**	35		45	
6	**182**	16	**463**	26	**1114**	36		46	
7	**204**	17	**499**	27		37		47	
8	**224**	18	**543**	28		38		48	
9	**241**	19	**600**	29		39		49	
10	**267**	20	**679**	30		40		50	

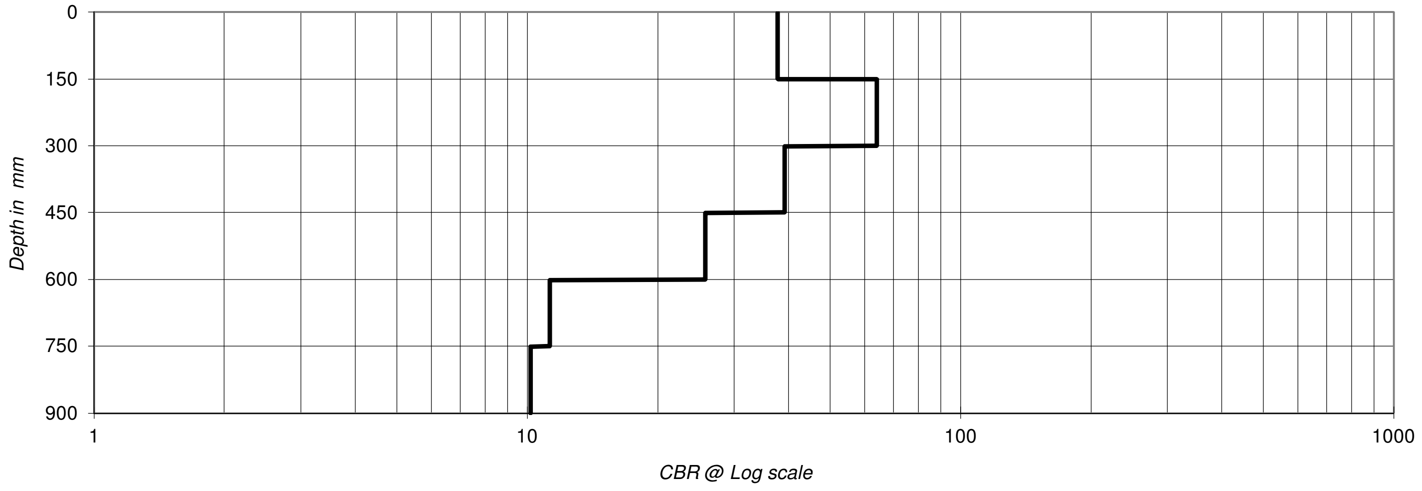


DCP number (mm / Blow) DN

DN	mm	DN	mm	DN	mm	DN	mm	DN	mm
16	79	5.8	296	19	775				
4.2	100	6.2	327	19	870				
3.8	119	5.8	356	17	956				
4.4	141	7.6	394	11	1012				
4	161	5.2	420	6.2	1043				
4.2	182	8.6	463	14	1114				
4.4	204	7.2	499						
4	224	8.8	543						
3.4	241	11	600						
5.2	267	16	679						



Layer - Strength diagram



no.	Depth (mm) From	-	To	DN	In situ CBR	Blows/mm 150mm	300mm
1	1	-	150	6.7	**38**	22	**27.8**
2	151	-	300	4.5	**64**	33	
3	301	-	450	6.6	**39**	23	**19.7**
4	451	-	600	9.1	**26**	17	
5	601	-	750	17	**11**	9	**8.4**
6	751	-	900	19	**10**	8	

REMARKS. Max. penetration depth = 1114 mm

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DCP TEST RESULTS

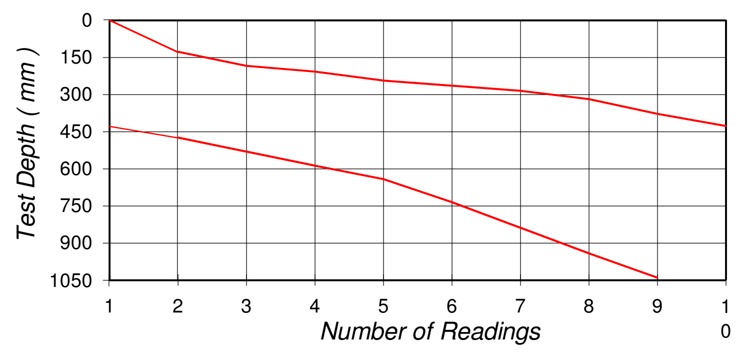
FOUNDATION INVESTIGATION - DCP

Client: **iX Engineers (Pty) Ltd** *Date:* **11-09-2018**
Contract: **KSIA Emergency Access Roads**
Description **Geotechnical Investigation**
Test no: **DCP6**

DCP Readings

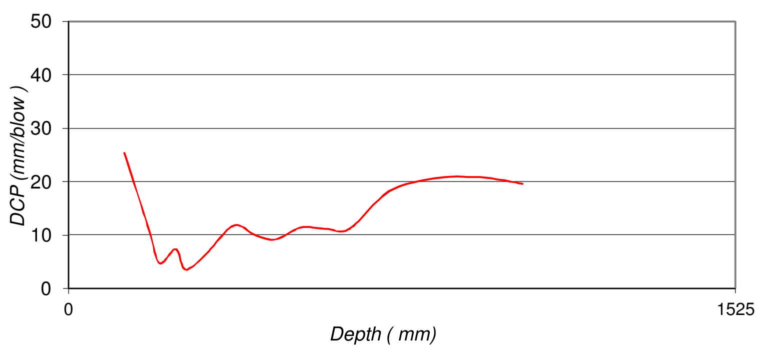
Blows per reading: **5**

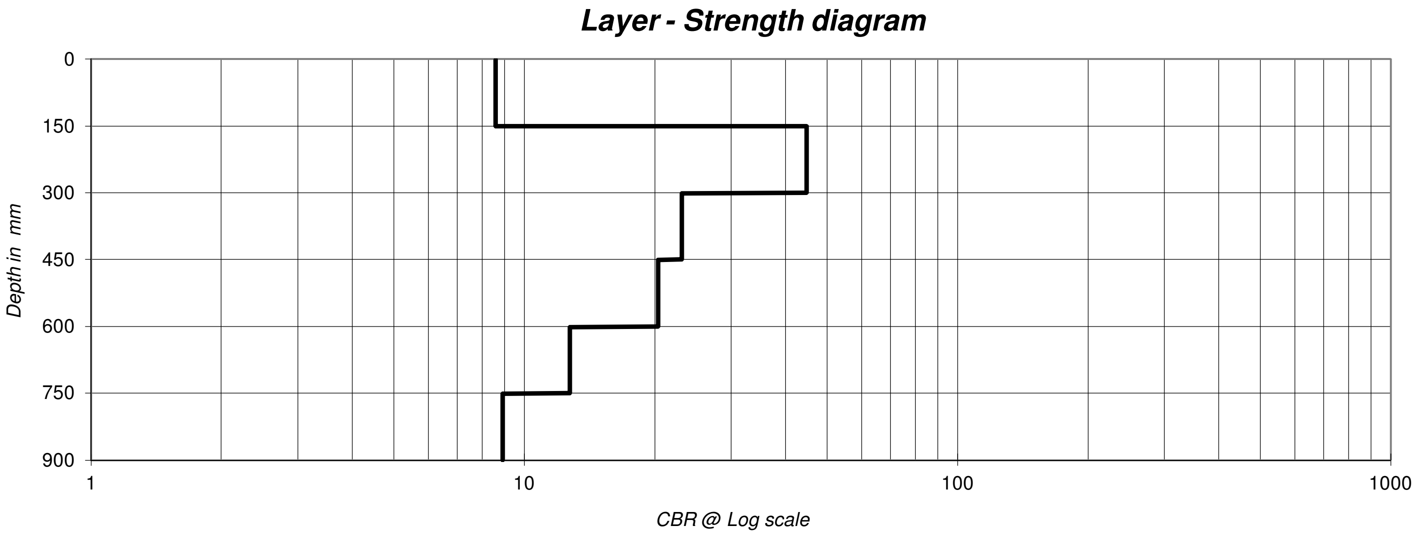
no.	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*
1	**127**	11	**530**	21		31		41	
2	**183**	12	**586**	22		32		42	
3	**207**	13	**642**	23		33		43	
4	**244**	14	**733**	24		34		44	
5	**263**	15	**836**	25		35		45	
6	**284**	16	**940**	26		36		46	
7	**318**	17	**1038**	27		37		47	
8	**377**	18		28		38		48	
9	**427**	19		29		39		49	
10	**473**	20		30		40		50	



DCP number (mm / Blow) DN

DN	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*
25	127	11	530						
11	183	11	586						
4.8	207	11	642						
7.4	244	18	733						
3.8	263	21	836						
4.2	284	21	940						
6.8	318	20	1038						
12	377								
10	427								
9.2	473								





	Depth (mm)				*In situ*	*Blows/mm*	
no.	*From*	-	*To*	*DN*	*CBR*	150mm	300mm
1	1	-	150	21	**9**	7	**16.2**
2	151	-	300	5.9	**45**	25	
3	301	-	450	9.9	**23**	15	**14.4**
4	451	-	600	11	**20**	14	
5	601	-	750	16	**13**	10	**8.4**
6	751	-	900	21	**9**	7	

REMARKS Max. penetration depth = 1038 mm

DCP TEST RESULTS

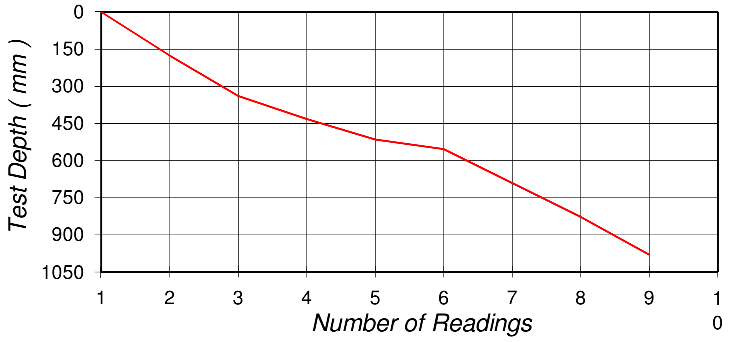
FOUNDATION INVESTIGATION - DCP

Client: **iX Engineers (Pty) Ltd** *Date:* **11-09-2018**
Contract: **KSIA Emergency Access Roads**
Description **Geotechnical Investigation**
Test no: **DCP7**

DCP Readings

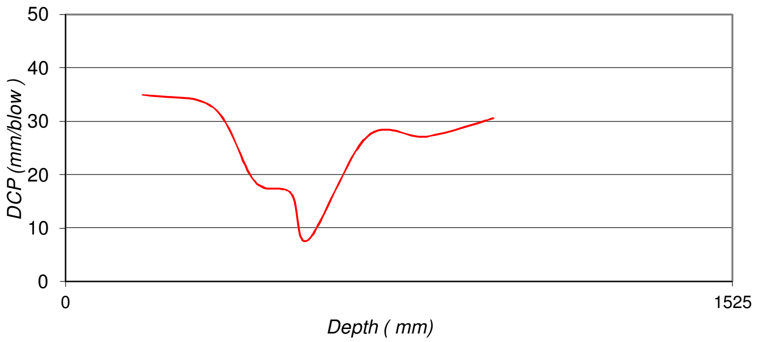
Blows per reading: **5**

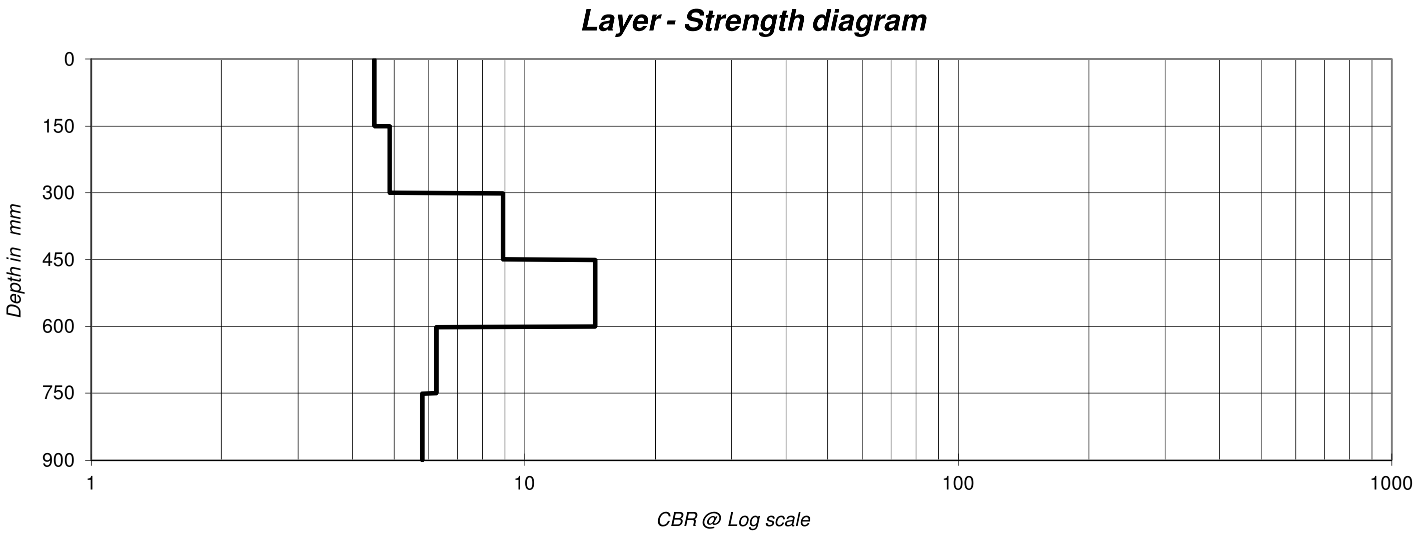
no.	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*
1	**175**	11		21		31		41	
2	**338**	12		22		32		42	
3	**432**	13		23		33		43	
4	**515**	14		24		34		44	
5	**554**	15		25		35		45	
6	**690**	16		26		36		46	
7	**826**	17		27		37		47	
8	**979**	18		28		38		48	
9		19		29		39		49	
10		20		30		40		50	



DCP number (mm / Blow) DN

DN	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*
35	175								
33	338								
19	432								
17	515								
7.8	554								
27	690								
27	826								
31	979								





	Depth (mm)				*In situ*	*Blows/mm*	
no.	*From*	*-*	*To*	*DN*	*CBR*	150mm	300mm
1	1	-	150	35	**5**	4	**4.4**
2	151	-	300	33	**5**	5	
3	301	-	450	21	**9**	7	**8.9**
4	451	-	600	14	**15**	11	
5	601	-	750	27	**6**	6	**5.4**
6	751	-	900	29	**6**	5	

REMARKS Max. penetration depth = 979 mm

DCP TEST RESULTS

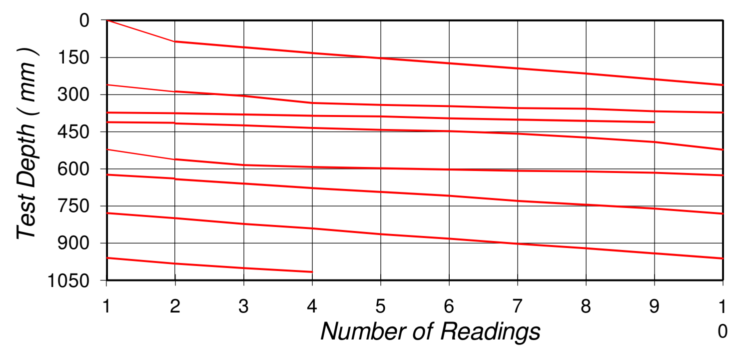
FOUNDATION INVESTIGATION - DCP

Client: **iX Engineers (Pty) Ltd**
Date: **11-09-2018**
Contract: **KSIA Emergency Access Roads**
Description: **Geotechnical Investigation**
Test no: **DCP8**

DCP Readings

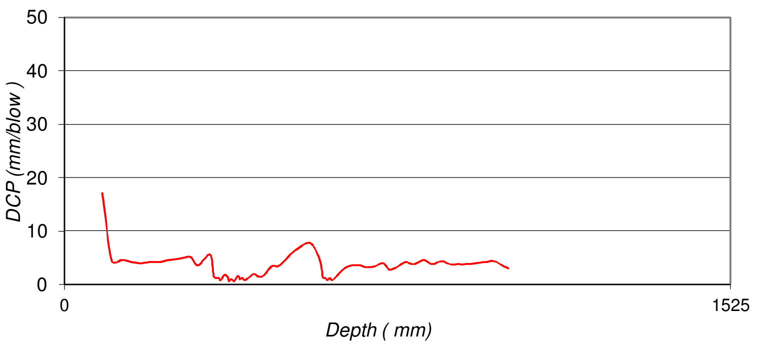
Blows per reading: **5**

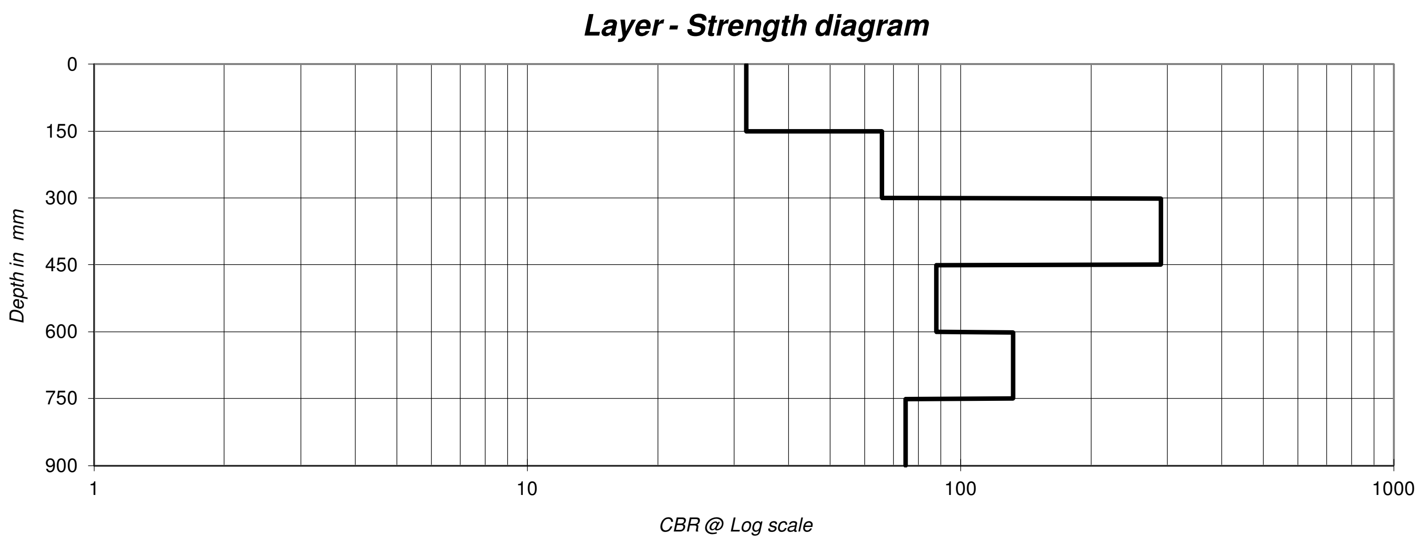
no.	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*
1	**86**	11	**305**	21	**385**	31		41	
2	**108**	12	**333**	22	**388**	32		42	
3	**131**	13	**341**	23	**396**	33		43	
4	**152**	14	**347**	24	**401**	34		44	
5	**172**	15	**353**	25		35		45	
6	**193**	16	**357**	26		36		46	
7	**214**	17	**366**	27		37		47	
8	**237**	18	**373**	28		38		48	
9	**261**	19	**376**	29		39		49	
10	**287**	20	**381**	30		40		50	



DCP number (mm / Blow) DN

DN	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*
17	86	3.6	305	0.8	385	1.6		0.8	
4.4	108	5.6	333	0.6	388	1.4		1.2	
4.6	131	1.6	341	1.6	396	1.8		0.8	
4.2	152	1.2	347	1	401	3.4		1	
4	172	1.2	353			3.6		1.8	
4.2	193	0.8	357	1.2		6		3	
4.2	214	1.8	366	0.8		7.8		3.6	
4.6	237	1.4	373	1		4.6		3.6	
4.8	261	0.6	376	1.4		1.4		3.2	
5.2	287	1	381	2		1.2		3.4	





no.	*Depth (mm)* *From*	-	*To*	*DN*	*In situ* *CBR*	*Blows/mm* 150mm	300mm
1	1	-	150	7.7	**32**	20	**26.8**
2	151	-	300	4.4	**66**	34	
3	301	-	450	1.4	**290**	108	**75.1**
4	451	-	600	3.5	**88**	43	
5	601	-	750	2.6	**132**	58	**48.0**
6	751	-	900	4	**75**	38	

REMARKS. Max. penetration depth = 1016 mm

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DCP TEST RESULTS

FOUNDATION INVESTIGATION - DCP

Client: **iX Engineers (Pty) Ltd** *Date:* **11-09-2018**

Contract: **KSIA Emergency Access Roads**

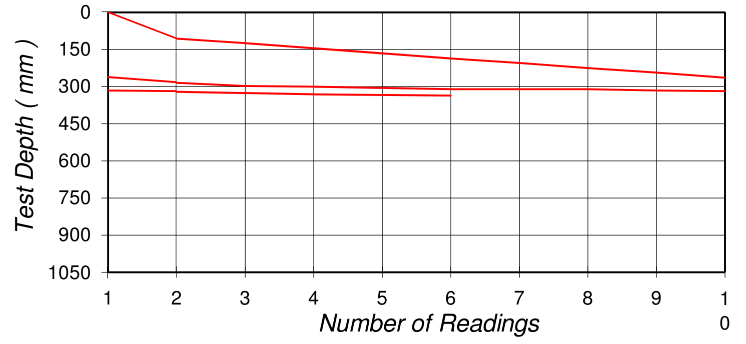
Description **Geotechnical Investigation**

Test no: **DCP9**

DCP Readings

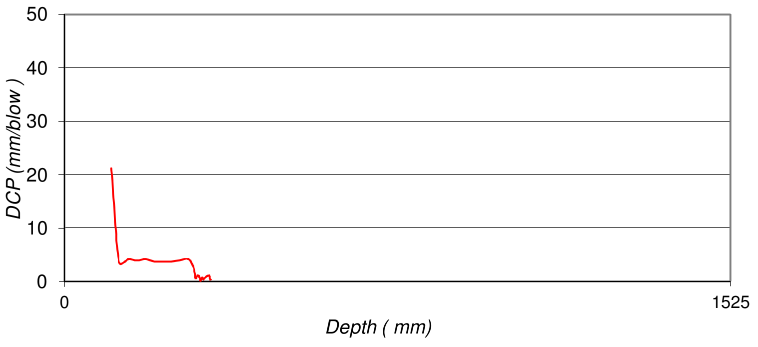
Blows per reading: **5**

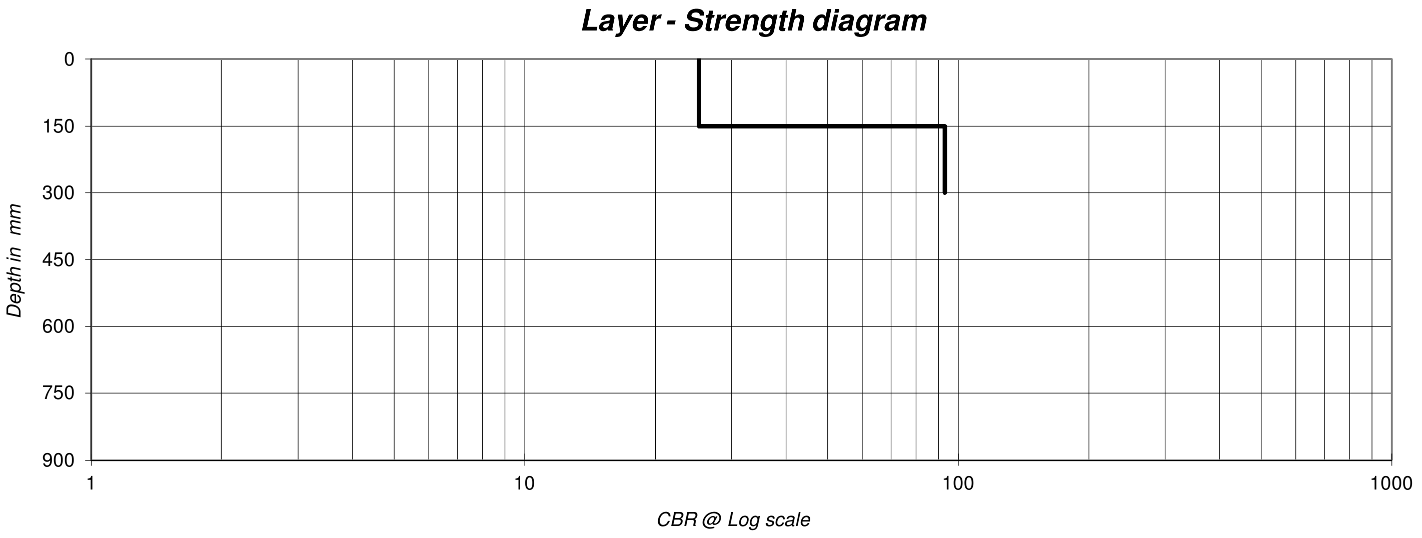
no.	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*
1	**106**	11	**296**	21	**331**	31		41	
2	**124**	12	**299**	22		32		42	
3	**145**	13	**305**	23		33		43	
4	**165**	14	**309**	24		34		44	
5	**186**	15	**310**	25		35		45	
6	**205**	16	**311**	26		36		46	
7	**224**	17	**315**	27		37		47	
8	**243**	18	**317**	28		38		48	
9	**263**	19	**320**	29		39		49	
10	**284**	20	**325**	30		40		50	



DCP number (mm / Blow) DN

DN	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*
21	106	2.4	296	1.2	331				
3.6	124	0.6	299						
4.2	145	1.2	305	0.4					
4	165	0.8	309	0.4					
4.2	186	0.2	310						
3.8	205	0.2	311						
3.8	224	0.8	315						
3.8	243	0.4	317						
4	263	0.6	320						
4.2	284	1	325						





	Depth (mm)				*In situ*	*Blows/mm*	
no.	*From*	-	*To*	*DN*	*CBR*	150mm	300mm
1	1	-	150	9.2	**25**	16	**30.4**
2	151	-	300	3.4	**93**	45	
3	301	-	450				
4	451	-	600				
5	601	-	750				
6	751	-	900				

REMARKS **Refusal at 335 mm**

DCP TEST RESULTS

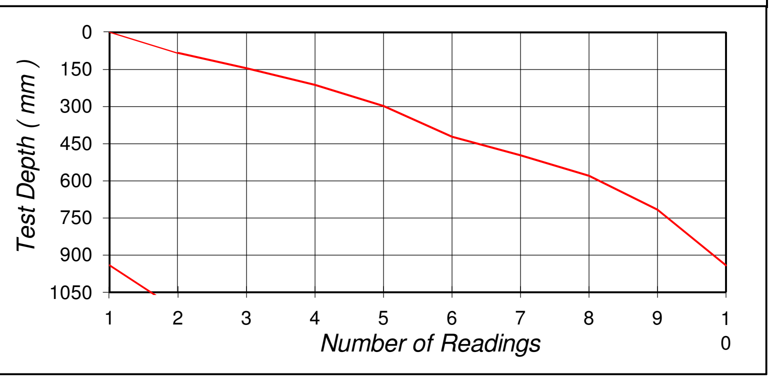
FOUNDATION INVESTIGATION - DCP

Client: **iX Engineers (Pty) Ltd**
Date: **11-09-2018**
Contract: **KSIA Emergency Access Roads**
Description **Geotechnical Investigation**
Test no: **DCP1**

DCP Readings

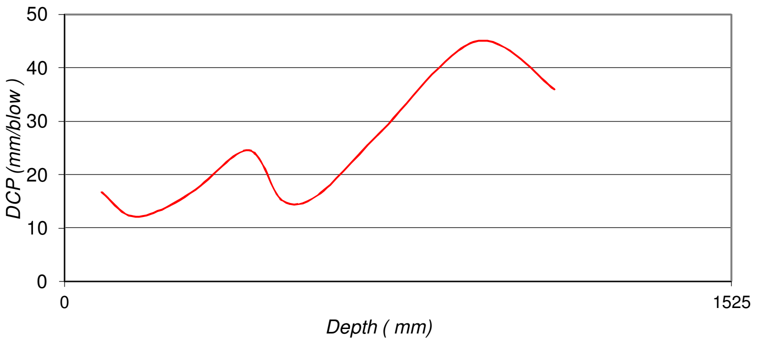
Blows per reading: **5**

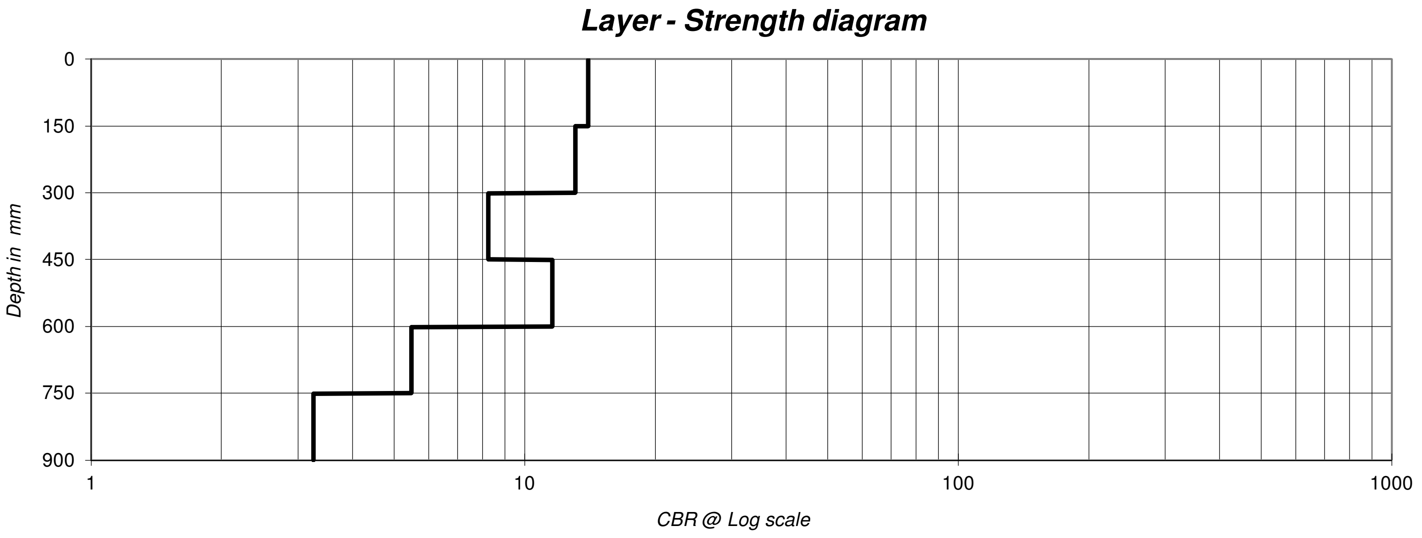
no.	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*
1	**84**	11		21		31		41	
2	**146**	12		22		32		42	
3	**212**	13		23		33		43	
4	**298**	14		24		34		44	
5	**421**	15		25		35		45	
6	**497**	16		26		36		46	
7	**578**	17		27		37		47	
8	**715**	18		28		38		48	
9	**940**	19		29		39		49	
10	**1120**	20		30		40		50	



DCP number (mm / Blow) DN

DN	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*
17	84								
12	146								
13	212								
17	298								
25	421								
15	497								
16	578								
27	715								
45	940								
36	1120								





	Depth (mm)				*In situ*	*Blows/mm*	
no.	*From*	-	*To*	*DN*	*CBR*	150mm	300mm
1	1	-	150	15	**14**	10	**10.0**
2	151	-	300	15	**13**	10	
3	301	-	450	22	**8**	7	**7.9**
4	451	-	600	17	**12**	9	
5	601	-	750	30	**5**	5	**4.2**
6	751	-	900	45	**3**	3	

REMARKS. Max. penetration depth = 1120 mm

DCP TEST RESULTS

FOUNDATION INVESTIGATION - DCP

Client: **iX Engineers (Pty) Ltd** *Date:* **11-09-2018**

Contract: **KSIA Emergency Access Roads**

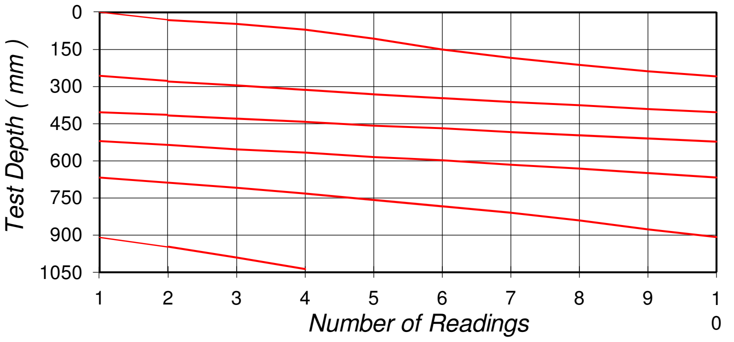
Description **Geotechnical Investigation**

Test no: **DCP2**

DCP Readings

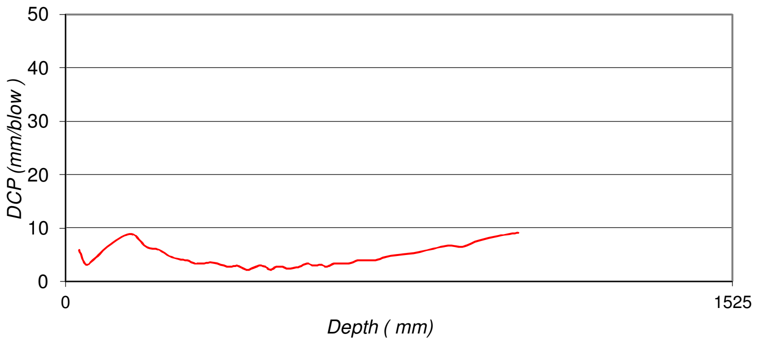
Blows per reading: **5**

no.	mm	no.	mm	no.	mm	no.	mm	no.	mm
1	**30**	11	**295**	21	**443**	31	**583**	41	**782**
2	**46**	12	**312**	22	**457**	32	**597**	42	**810**
3	**69**	13	**330**	23	**468**	33	**614**	43	**841**
4	**105**	14	**347**	24	**482**	34	**631**	44	**875**
5	**150**	15	**362**	25	**496**	35	**648**	45	**908**
6	**183**	16	**376**	26	**508**	36	**668**	46	**947**
7	**213**	17	**391**	27	**521**	37	**688**	47	**990**
8	**237**	18	**404**	28	**535**	38	**708**	48	**1036**
9	**258**	19	**415**	29	**552**	39	**731**	49	
10	**278**	20	**428**	30	**567**	40	**756**	50	

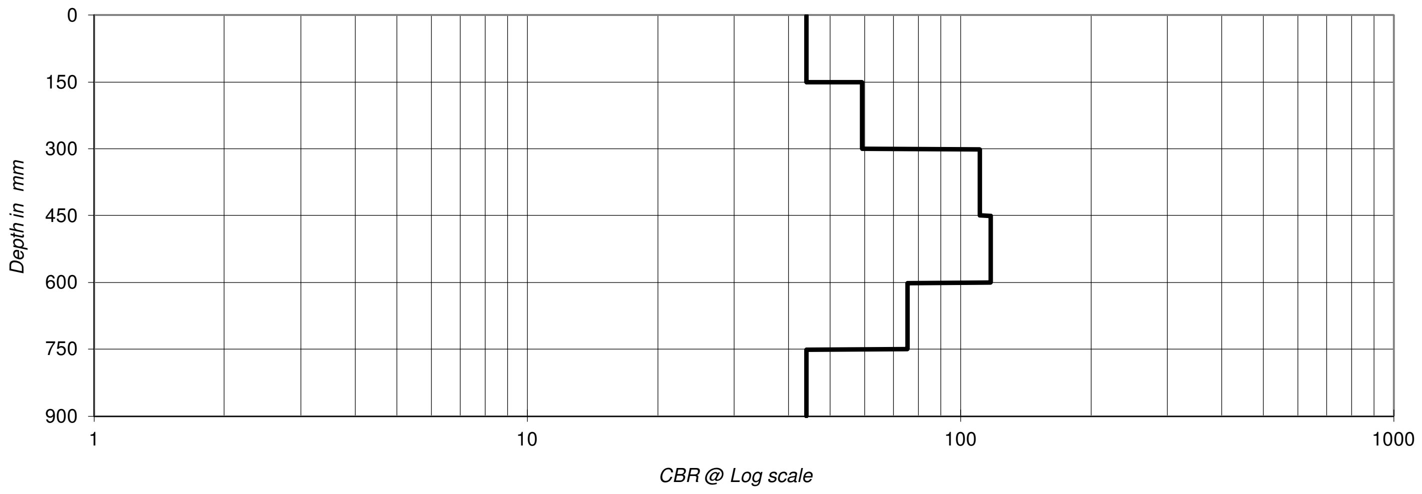


DCP number (mm / Blow) DN

DN	mm	DN	mm	DN	mm	DN	mm	DN	mm
6	30	3.4	295	3	443	3.2	583	5.2	782
3.2	46	3.4	312	2.8	457	2.8	597	5.6	810
4.6	69	3.6	330	2.2	468	3.4	614	6.2	841
7.2	105	3.4	347	2.8	482	3.4	631	6.8	875
9	150	3	362	2.8	496	3.4	648	6.6	908
6.6	183	2.8	376	2.4	508	4	668	7.8	947
6	213	3	391	2.6	521	4	688	8.6	990
4.8	237	2.6	404	2.8	535	4	708	9.2	1036
4.2	258	2.2	415	3.4	552	4.6	731		
4	278	2.6	428	3	567	5	756		



Layer - Strength diagram



	Depth (mm)				In situ	Blows/mm	
no.	From	-	To	DN	CBR	150mm	300mm
1	1	-	150	6	**44**	25	**28.2**
2	151	-	300	4.8	**59**	31	
3	301	-	450	2.9	**111**	51	**52.2**
4	451	-	600	2.8	**117**	53	
5	601	-	750	4	**75**	38	**31.5**
6	751	-	900	6	**44**	25	

REMARKS Max. penetration depth = 1036 mm

DCP TEST RESULTS

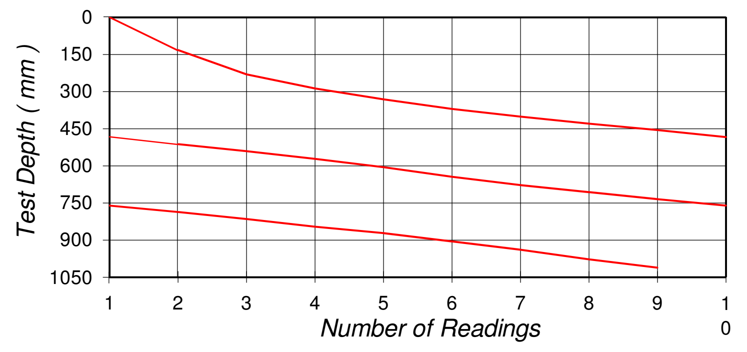
FOUNDATION INVESTIGATION - DCP

Client: **iX Engineers (Pty) Ltd** *Date:* **11-09-2018**
Contract: **KSIA Emergency Access Roads**
Description **Geotechnical Investigation**
Test no: **DCP3**

DCP Readings

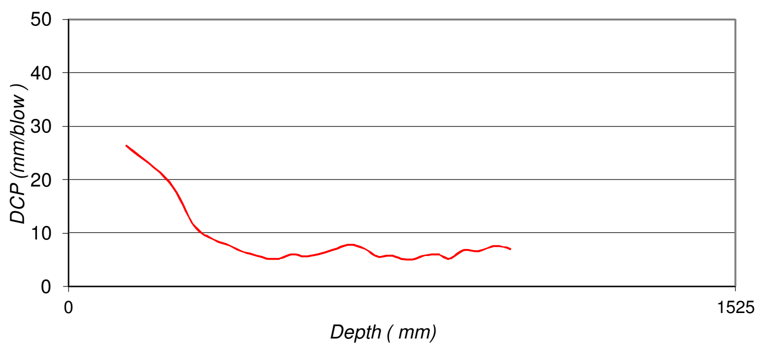
Blows per reading: **5**

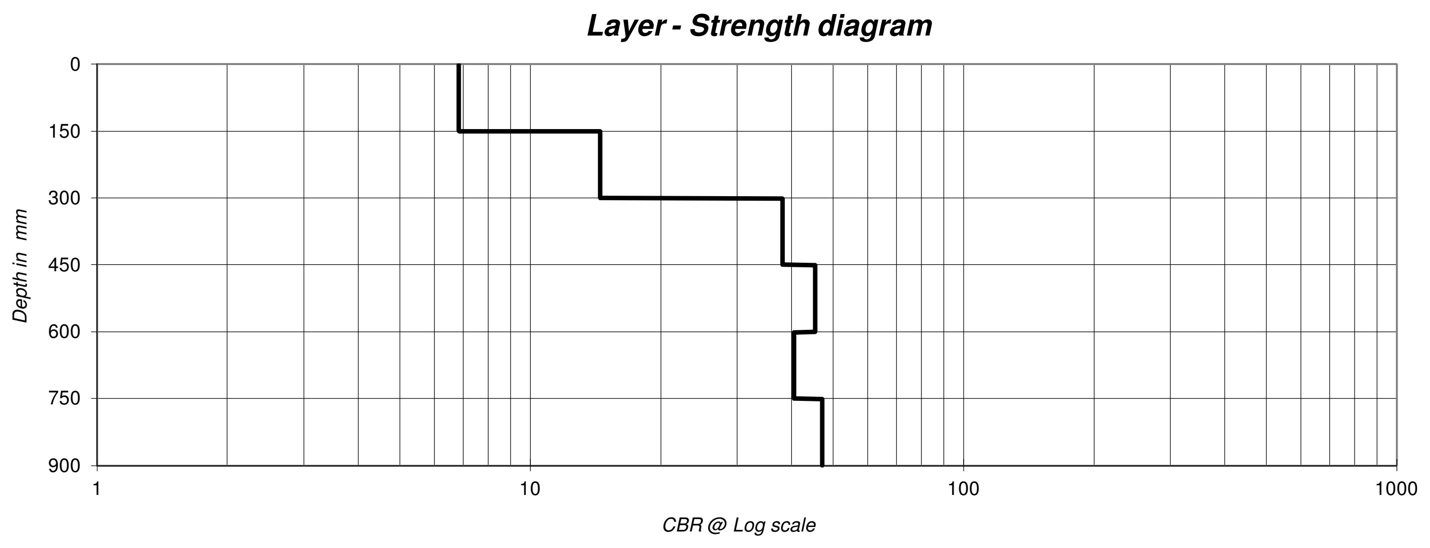
no.	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*
1	**132**	11	**540**	21	**845**	31		41	
2	**230**	12	**570**	22	**871**	32		42	
3	**287**	13	**604**	23	**905**	33		43	
4	**331**	14	**643**	24	**938**	34		44	
5	**369**	15	**678**	25	**976**	35		45	
6	**401**	16	**706**	26	**1011**	36		46	
7	**430**	17	**735**	27		37		47	
8	**456**	18	**761**	28		38		48	
9	**482**	19	**786**	29		39		49	
10	**512**	20	**815**	30		40		50	



DCP number (mm / Blow) DN

DN	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*
26	132	5.6	540	6	845				
20	230	6	570	5.2	871				
11	287	6.8	604	6.8	905				
8.8	331	7.8	643	6.6	938				
7.6	369	7	678	7.6	976				
6.4	401	5.6	706	7	1011				
5.8	430	5.8	735						
5.2	456	5.2	761						
5.2	482	5	786						
6	512	5.8	815						





no.	*Depth (mm)* *From*	*-*	*To*	*DN*	*In situ* *CBR*	*Blows/mm* 150mm	300mm
1	1	-	150	25	**7**	6	**8.2**
2	151	-	300	14	**14**	11	
3	301	-	450	6.7	**38**	22	**24.0**
4	451	-	600	5.9	**45**	26	
5	601	-	750	6.4	**41**	23	**24.9**
6	751	-	900	5.7	**47**	26	

REMARKS Max. penetration depth = 1011 mm

DCP TEST RESULTS

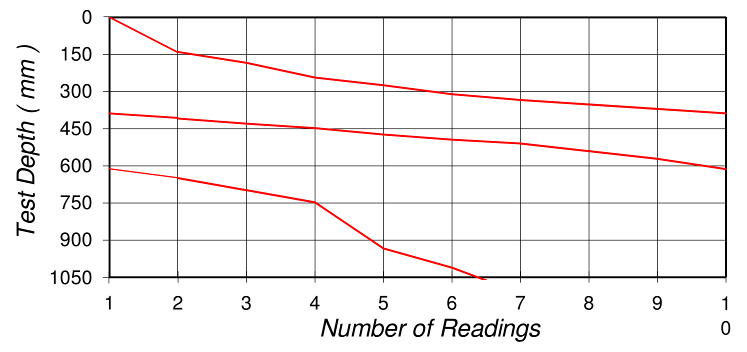
FOUNDATION INVESTIGATION - DCP

Client: **iX Engineers (Pty) Ltd** *Date:* **11-09-2018**
Contract: **KSIA Emergency Access Roads**
Description **Geotechnical Investigation**
Test no: **DCP4**

DCP Readings

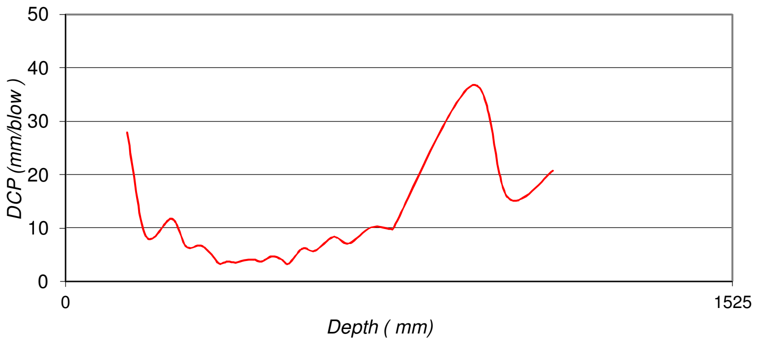
Blows per reading: **5**

no.	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*	*no.*	*mm*
1	**140**	11	**429**	21	**748**	31		41	
2	**183**	12	**448**	22		32		42	
3	**242**	13	**472**	23		33		43	
4	**275**	14	**493**	24		34		44	
5	**309**	15	**510**	25		35		45	
6	**334**	16	**541**	26		36		46	
7	**351**	17	**570**	27		37		47	
8	**370**	18	**612**	28		38		48	
9	**388**	19	**648**	29		39		49	
10	**408**	20	**699**	30		40		50	

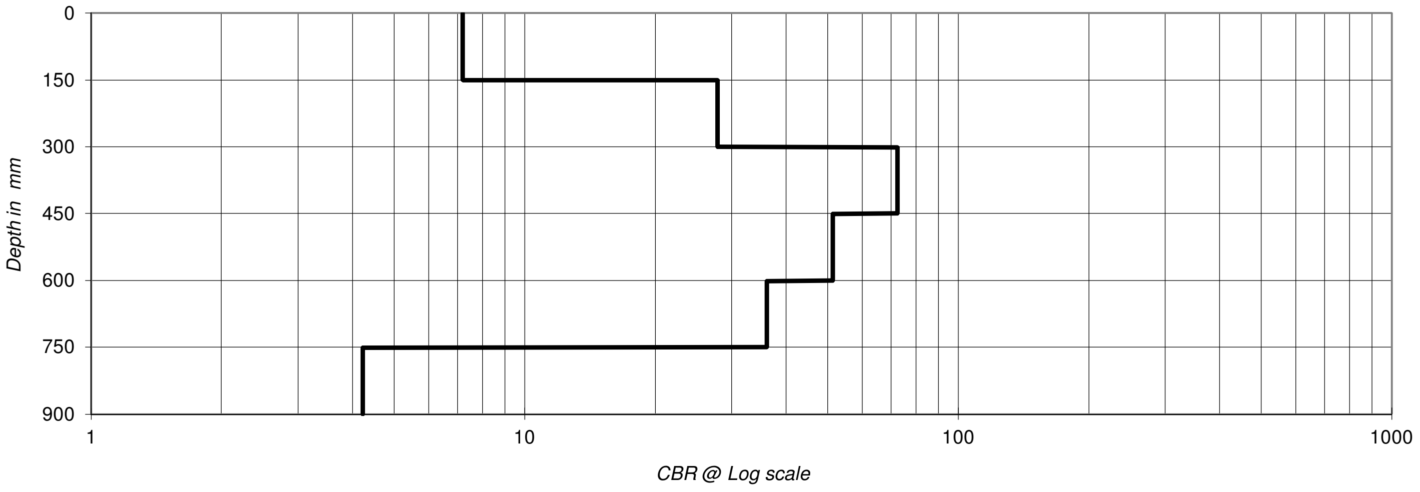


DCP number (mm / Blow) DN

DN	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*	*DN*	*mm*
28	140	4.2	429	9.8	748				
8.6	183	3.8	448						
12	242	4.8	472	37					
6.6	275	4.2	493	16					
6.8	309	3.4	510	21					
5	334	6.2	541						
3.4	351	5.8	570						
3.8	370	8.4	612						
3.6	388	7.2	648						
4	408	10	699						



Layer - Strength diagram



	Depth (mm)				*In situ*	*Blows/mm*	
no.	*From*	-	*To*	*DN*	*CBR*	150mm	300mm
1	1	-	150	24	**7**	6	**11.8**
2	151	-	300	8.6	**28**	18	
3	301	-	450	4.1	**72**	37	**32.4**
4	451	-	600	5.3	**51**	28	
5	601	-	750	7	**36**	21	**12.8**
6	751	-	900	37	**4**	4	

REMARKS Max. penetration depth = 1115 mm

Appendix C: Test Pit Logs

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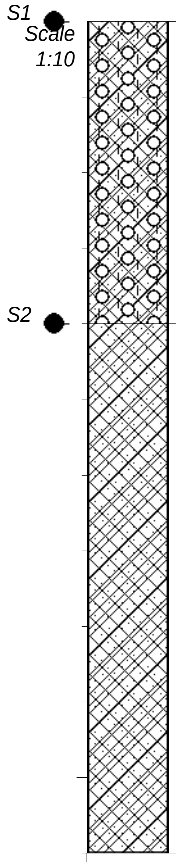
Bluff 4036

iX Engineers (Pty) Ltd
Geotechnical Investigation for the
KSIA Emergency Access Roads

HOLE No: TP1
Sheet 1 of 1

JOB NUMBER: 18013



0.00

Dry to slightly moist brownish orange dense intact silty clayey SAND with occasional gravels. Fill likely of Berea Formation origin.
Note: Apparently compacted.
Note: Behaves as clay however classifies as sand based on composition.

0.40

Moist brownish red medium dense becoming loose at depth intact clayey SAND. Fill, likely of Berea Formation origin.
Note: Steel/wire encountered at 0.80m.
Note: Behaves as clay however classifies as sand based on composition.

1.10

NOTES

1) Final depth of test pit at 1.10m. No refusal encountered.

2) No groundwater seepage encountered.

3) No sidewall collapse.

4) Samples taken:
S1 0.00-0.40m
S2 0.40-1.10m

CONTRACTOR : N/A
MACHINE : By hand
DRILLED BY :
PROFILED BY : R. Shriram

TYPE SET BY : R. Shriram
SETUP FILE : SGC1.SET

INCLINATION :
DIAM :
DATE :
DATE : 22 Aug to 11 Sept 2018

DATE : 01/11/2018 05:17
TEXT : ..eldwork\18013DotPlot.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: TP1

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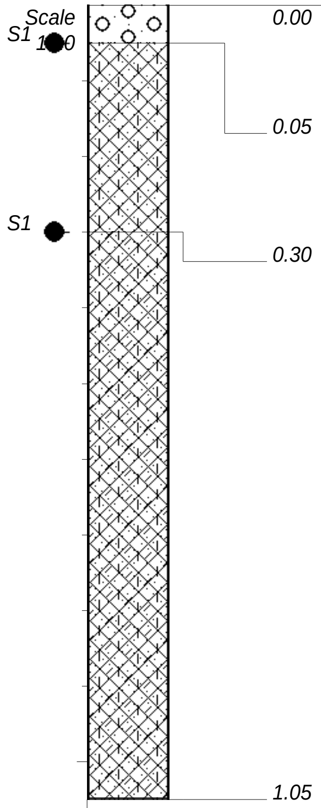
HOLE No: TP2
Sheet 1 of 1

JOB NUMBER: 18013



0.00

Slightly moist orange brown mottled blue grey dense intact sandy fine to coarse GRAVEL. Degraded gravel wearing course./Fill.
Note: Absent in places.

0.05

Slightly moist medium brown occasionally mottled orange brown medium dense intact silty SAND. Fill.
Note: Apparently compacted.

0.30

Slightly moist to moist orange brown medium dense becoming loose with depth intact silty SAND with zones of clayey SAND. Fill.
Note: Apparently compacted in upper 30cm.

1.05

NOTES

1) Final depth of test pit at 1.05m. No refusal encountered.

2) No groundwater seepage encountered.

3) No sidewall collapse.

4) Samples taken:
S1 0.05-0.30m
S1 0.30-1.05m

CONTRACTOR : N/A
MACHINE : By hand
DRILLED BY :
PROFILED BY : R. Shriram

TYPE SET BY : R. Shriram
SETUP FILE : SGC1.SET

INCLINATION :
DIAM :
DATE :
DATE : 22 Aug to 11 Sept 2018

DATE : 01/11/2018 05:17
TEXT : ..eldwork\18013DotPlot.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: TP2

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Geotechnical Investigation for the
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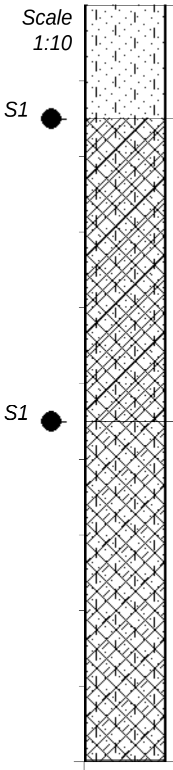
HOLE No: TP3
Sheet 1 of 1

JOB NUMBER: 18013

Scale
1:10



0.00	Moist brown mottled orange brown very loose intact silty SAND. Colluvium/topsoil.
0.15	Moist to very moist light orange mottled and streaked dark brown very loose intact slightly clayey and silty SAND with some sandy CLAY nodules. Fill.
0.55	Moist reddish brown to orange brown soft intact clayey silty SAND. Fill. Note: Increase in sand content with depth.
1.00	

NOTES

1) Final depth of test pit at 1.00m. No refusal encountered.

2) No groundwater seepage encountered.

3) No sidewall collapse.

4) Samples taken:
S1 0.15-0.55m
S1 0.55-1.00m

CONTRACTOR : N/A
MACHINE : By hand
DRILLED BY :
PROFILED BY : R. Shriram

TYPE SET BY : R. Shriram
SETUP FILE : SGC1.SET

INCLINATION :
DIAM :
DATE :
DATE : 22 Aug to 11 Sept 2018

DATE : 01/11/2018 05:17
TEXT : ..eldwork\18013DotPlot.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: TP3

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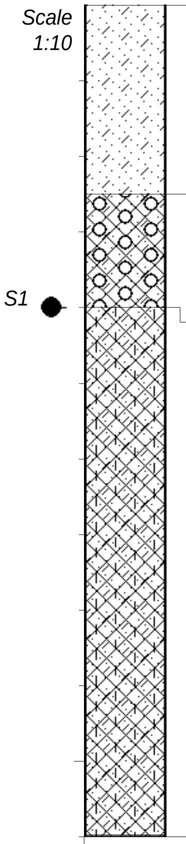
HOLE No: TP4
Sheet 1 of 1

JOB NUMBER: 18013



0.00	Moist dark brown speckled orange brown very loose intact clayey SAND. Colluvium/topsoil.
0.25	Moist reddish brown mottled light orange loose to medium dense intact clayey SAND with occasional fine to medium gravels. Fill. Note: Layer thickness varies across test pit.
0.40	Moist light orange brown mottled to blotched brownish red loose intact clayey silty SAND. Fill.
1.10	

NOTES

1) Final depth of test pit at 1.10m. No refusal encountered.

2) No groundwater seepage encountered.

3) No sidewall collapse.

4) Samples taken:
S1 0.40-1.10m

CONTRACTOR : N/A
MACHINE : By hand
DRILLED BY :
PROFILED BY : R. Shriram

TYPE SET BY : R. Shriram
SETUP FILE : SGC1.SET

INCLINATION :
DIAM :
DATE :
DATE : 22 Aug to 11 Sept 2018

DATE : 01/11/2018 05:17
TEXT : ..eldwork\18013DotPlot.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: TP4

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Geotechnical Investigation for the
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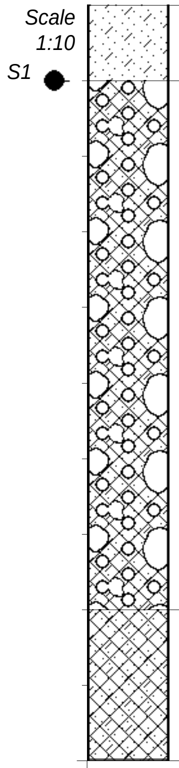
HOLE No: TP5
Sheet 1 of 1

JOB NUMBER: 18013



0.00	Moist dark brown very loose intact clayey SAND. Colluvium/topsoil.
0.10	Slightly moist to moist orange mottled ant blotched brownish yellow, light orange and brownish red loose to medium dense intact clayey SAND with minor gravels and cobbles of mixed origin. Fill. Note: Layer composition is highly variable.
0.80	Moist brownish red loose intact clayey SAND. Fill.
1.00	

NOTES

1) Final depth of test pit at 1.00m. No refusal encountered.

2) No groundwater seepage encountered.

3) No sidewall collapse.

4) Samples taken:
S1 0.10-0.80m

CONTRACTOR : N/A
MACHINE : By hand
DRILLED BY :
PROFILED BY : R. Shriram
TYPE SET BY : R. Shriram
SETUP FILE : SGC1.SET

INCLINATION :
DIAM :
DATE :
DATE : 22 Aug to 11 Sept 2018
DATE : 01/11/2018 05:17
TEXT : ..eldwork\18013DotPlot.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: TP5

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Geotechnical Investigation for the
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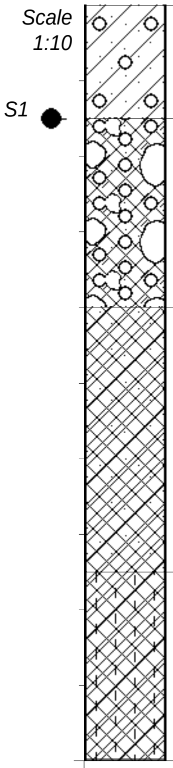
HOLE No: TP6
Sheet 1 of 1

JOB NUMBER: 18013

Scale
1:10



0.00	Moist brown to orange brown speckled orange very stiff intact sandy gravelly CLAY. Colluvium/topsoil.
0.15	Slightly moist light brownish yellow medium dense intact clayey sandy GRAVEL with abundant cobbles. Apparently poorly compacted fill.
0.40	Slightly moist to moist dark brown soft intact CLAY with lenses up to 20cm thick of very moist orangey medium brown soft intact sandy CLAY. Fill. Note: Highly variable in composition.
0.75	Moist orange red speckled light yellow grey very soft intact silty CLAY. Fill.
1.00	

NOTES

1) Final depth of test pit at 1.00m. No refusal encountered.

2) No groundwater seepage encountered.

3) No sidewall collapse.

4) Samples taken:
S1 0.15-0.40m

CONTRACTOR : N/A
MACHINE : By hand
DRILLED BY :
PROFILED BY : R. Shriram

TYPE SET BY : R. Shriram
SETUP FILE : SGC1.SET

INCLINATION :
DIAM :
DATE :
DATE : 22 Aug to 11 Sept 2018

DATE : 01/11/2018 05:17
TEXT : ..eldwork\18013DotPlot.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: TP6

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Geotechnical Investigation for the
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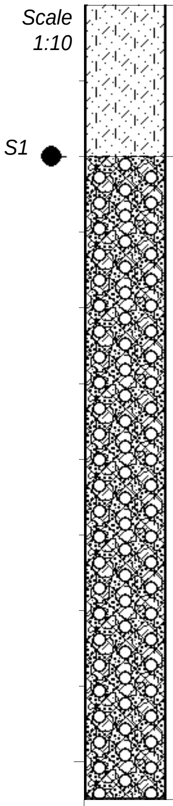
HOLE No: TP7
Sheet 1 of 1

JOB NUMBER: 18013

Scale
1:10



0.00

Moist dark brown loose intact slightly silty and clayey SAND. Colluvium/topsoil.

0.20

Moist red speckled and mottled deep yellow and dark grey soft becoming very soft with depth clayey and silty SAND with minor gravels of mixed origin. Fill.
Note: Concrete fragments and wire encountered.
Note: Minimum 35cm across concrete block encountered at 0.70m.
Note: Sand content increases and gravel content decreases with depth.

1.05

NOTES

1) Final depth of test pit at 1.05m. No refusal encountered.

2) No groundwater seepage encountered.

3) No sidewall collapse.

4) Samples taken:
S1 0.20-1.05m

CONTRACTOR : N/A
MACHINE : By hand
DRILLED BY :
PROFILED BY : R. Shriram

TYPE SET BY : R. Shriram
SETUP FILE : SGC1.SET

INCLINATION :
DIAM :
DATE :
DATE : 22 Aug to 11 Sept 2018

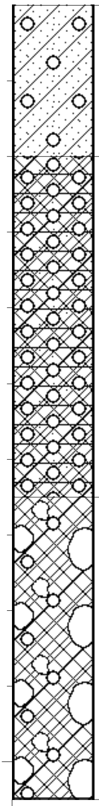
DATE : 01/11/2018 05:17
TEXT : ..eldwork\18013DotPlot.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: TP7

Scale 1:10

S1 ●



0.00

Slightly moist to moist dark brown mottled orange medium dense intact gravelly clayey SAND/ Colluvium/topsoil.
Note: Borders gravelly sandy clay.

0.20

Slightly moist yellowish orange brown mottled blue grey dense intact clayey sandy GRAVEL with zones of sandy gravelly CLAY and occasional cobble up to 12cm across. Fill.
Note: Gravels comprise fine to coarse angular shale.
Note: Apparently compacted.

0.65

Slightly moist yellow brown mottled grey and blue grey firm intact gravelly CLAY with occasional cobbles up to 15cm across. Fill.

1.05

NOTES

1) Final depth of test pit at 1.10m. No refusal encountered.

2) No groundwater seepage encountered.

3) No sidewall collapse.

4) Samples taken:
S1 0.08-1.10m

CONTRACTOR : N/A
MACHINE : By hand
DRILLED BY :
PROFILED BY : R. Shriram

TYPE SET BY : R. Shriram
SETUP FILE : SGC1.SET

INCLINATION :
DIAM :
DATE :
DATE : 22 Aug to 11 Sept 2018

DATE : 01/11/2018 05:17
TEXT : ..eldwork\18013DotPlot.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: TP8

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iX Engineers (Pty) Ltd
Geotechnical Investigation for the
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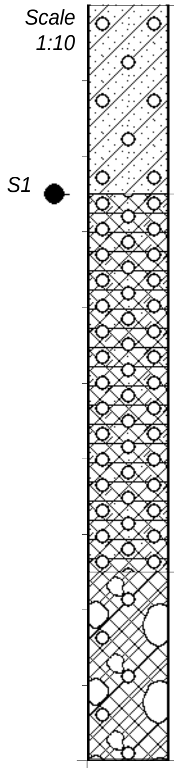
HOLE No: TP9
Sheet 1 of 1

JOB NUMBER: 18013

Scale
1:10



0.00

Slightly moist to moist dark brown mottled orange medium dense intact gravelly clayey SAND/ Colluvium/topsoil.
Note: Borders gravelly sandy clay.

0.25

Slightly moist yellowish orange brown mottled blue grey dense intact clayey sandy GRAVEL with occasional cobble up to 12cm across. Fill.
Note: Gravels comprise fine to coarse angular shale.
Note: Apparently compacted.

0.75

Slightly moist yellow brown mottled grey and blue grey firm intact gravelly CLAY with occasional cobbles up to 15cm across. Fill.

1.00

NOTES

1) Final depth of test pit at 1.00m. No refusal encountered.

2) No groundwater seepage encountered.

3) No sidewall collapse.

4) Samples taken:
S1 0.25-0.75m

CONTRACTOR : N/A
MACHINE : By hand
DRILLED BY :
PROFILED BY : R. Shriram

TYPE SET BY : R. Shriram
SETUP FILE : SGC1.SET

INCLINATION :
DIAM :
DATE :
DATE : 22 Aug to 11 Sept 2018

DATE : 01/11/2018 05:17
TEXT : ..eldwork\18013DotPlot.doc

ELEVATION :
X-COORD :
Y-COORD :

HOLE No: TP9

Appendix D: Laboratory Test Results

SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09585/07

25 WESTMEAD ROAD - WESTMEAD P.O.BOX 15318 WESTMEAD 3608 KWAZULU - NATAL

TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

T0213

Client : SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD

Address : P.O. BOX 21055
: BLUFF
: 4036

Client Reference :

Order No. :

Attention :

Facsimile : 086-435 2053

E-mail : rahul@shriram.co.za

Date Received : 03/10/2018

Date Tested : 02/10/2018 -

Date Reported : 18/10/2018

Project : KSIA EMERGENCY ACCESS ROADS

Project No. : 2018-D-5122

Report Status :

Page : 1 of 22

Herewith please find the test report(s) pertaining to the above project. All tests were conducted in accordance with prescribed test method(s). Information herein consists of the following:

Test(s) conducted / Item(s) measured	Qty.	Test Method(s)	Authorized By**	Page(s)
Moisture Density Relationship	12.000	SANS 3001: GR30	K Govender	2-16
Atterberg Limits <0.425mm	12.000	SANS 3001: GR10-GR12	K Govender	14-22
Sieve Analysis 0.075mm	12.000	SANS 3001: GR1	K Govender	14-22
California Bearing Ratio (CBR)	12.000	SANS 3001: GR40	K Govender	14-22

Any test results contained in this report and marked with * in the table above are "not SANAS accredited" and are not included in the schedule of accreditation for this laboratory.

Any information contained in this test report pertain only to the areas and/or samples tested. Documents may only be reproduced or published in their full context.

While every care is taken to ensure that all tests are carried out in accordance with recognised standards, neither Soilco Materials Investigations (PTY) LTD nor its employess shall be liable in any way whatsoever for any error made in the execution or reporting of tests or any erroneous conclusions drawn therefrom or for any consequences thereof.

All interpretations, Interpolations, Opinions and/or Classifications contained in this report falls outside our scope of accreditation.

The following parameters, where applicable, were excluded from the classification procedure: Chemical modifications, Additional fines, Fractured Faces, Soluble Salts, pH, Conductivity, Coarse Sand Ratio, Durability (COLTO: G4-G9).

The following parameters, where applicable, were assumed: Rock types were assumed to be of an Arenaceous nature with Siliceous cementing material.

Unless otherwise requested or stated, all samples will be discarded after a period of 3 months.

Deviations in Test Methods:

For Soilco : K Govender
Technical Signatory

Client : SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD
Project : KSIA EMERGENCY ACCESS ROADS
Project No: 2018-D-5122

Date Received: 02/10/2018
Date Reported: 17/10/2018

MOISTURE DENSITY RELATIONSHIP

Laboratory Number		1
Field Number		
Client Reference		TP1
Depth (m)		0.00 - 0.40
Position		
Coordinates	X	
	Y	
Description		Dk.R.Br.Sty.Sand
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

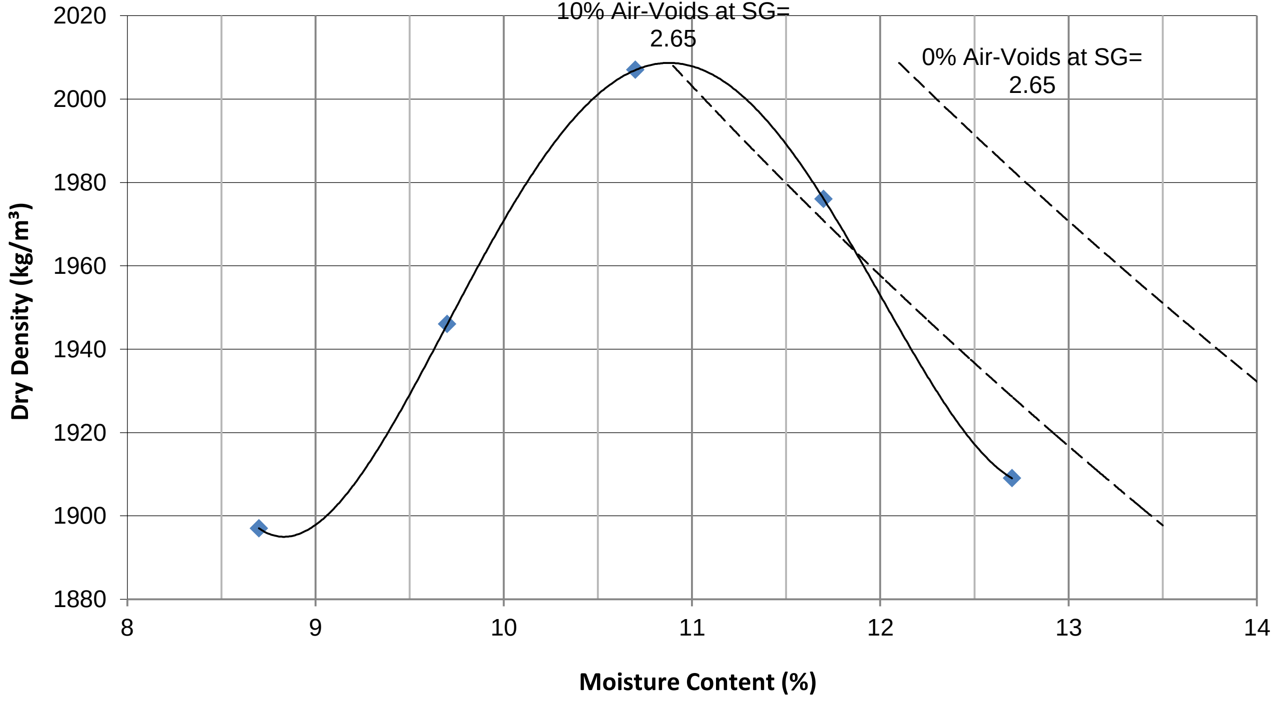
Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	1897	1946	2007	1976	1909	
Moisture Content	%	8.7	9.7	10.7	11.7	12.7	

Max. Dry Density	kg/m³	2009
Optimum Moisture	%	10.9

NB! Air-Void curves might be based on assumend Specific Gravity values.



Client :	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received:	02/10/2018
Project :	KSIA EMERGENCY ACCESS ROADS	Date Reported:	17/10/2018
Project No:	2018-D-5122	Page No. :	3 of 22

MOISTURE DENSITY RELATIONSHIP

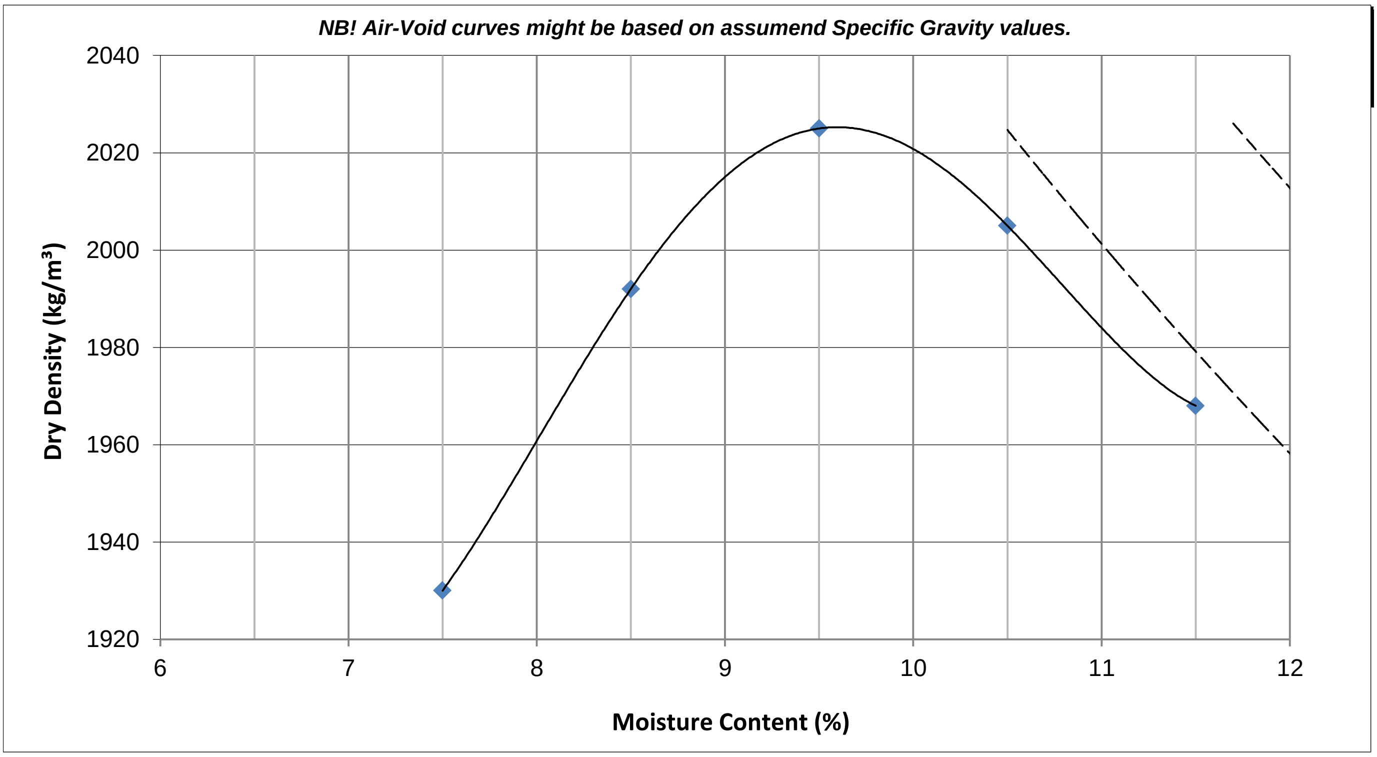
Laboratory Number		2
Field Number		
Client Reference		TP1
Depth (m)		0.40 - 1.10
Position		
Coordinates	X	
	Y	
Description		Dk.R.Br.Sty.Sand
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	1930	1992	2025	2005	1968	
Moisture Content	%	7.5	8.5	9.5	10.5	11.5	

Max. Dry Density	kg/m³	2025
Optimum Moisture	%	9.6



Client : SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD
Project : KSIA EMERGENCY ACCESS ROADS
Project No: 2018-D-5122

Date Received: 02/10/2018
Date Reported: 17/10/2018
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MOISTURE DENSITY RELATIONSHIP

Laboratory Number		3
Field Number		
Client Reference		TP2
Depth (m)		0.05 - 0.30
Position		
Coordinates	X	
	Y	
Description		Br.Sty.Sand
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

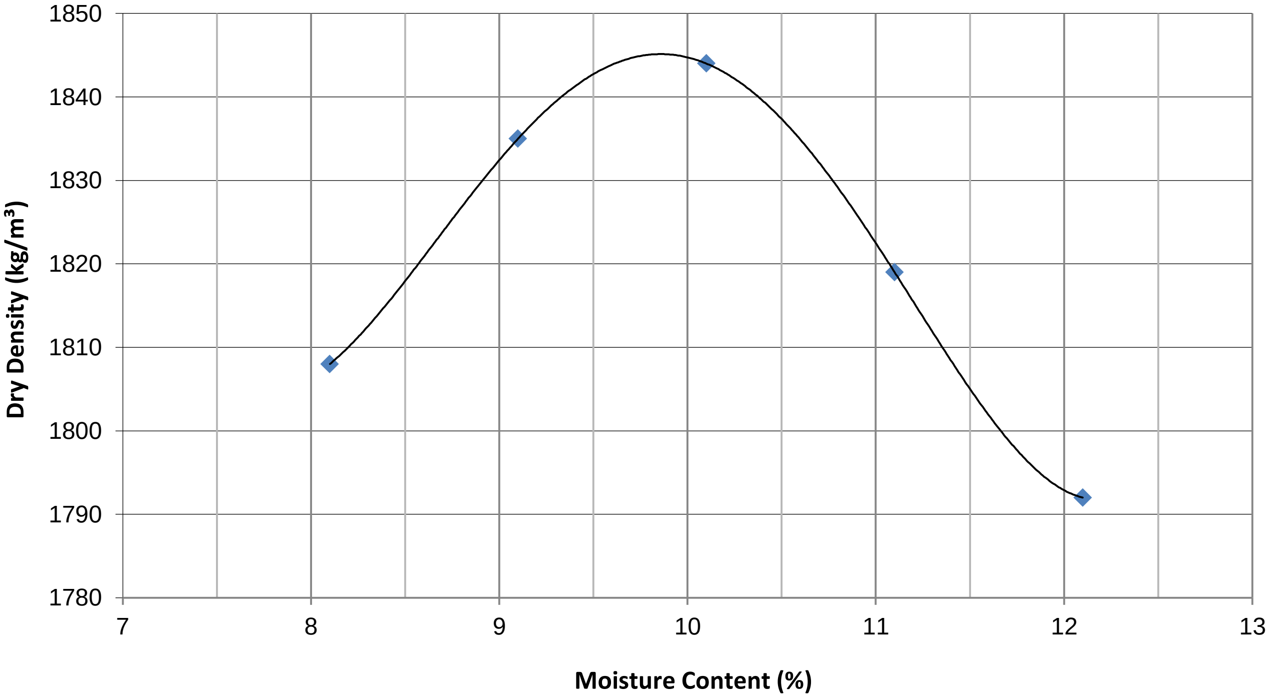
Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	1808	1835	1844	1819	1792	
Moisture Content	%	8.1	9.1	10.1	11.1	12.1	

Max. Dry Density	kg/m³	1845
Optimum Moisture	%	9.9

NB! Air-Void curves might be based on assumend Specific Gravity values.



Client : SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD
Project : KSIA EMERGENCY ACCESS ROADS
Project No: 2018-D-5122

Date Received: 02/10/2018
Date Reported: 17/10/2018

MOISTURE DENSITY RELATIONSHIP

Laboratory Number		4
Field Number		
Client Reference		TP2
Depth (m)		0.30 - 1.05
Position		
Coordinates	X	
	Y	
Description		Dk.O.Br.Sty.Sand
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

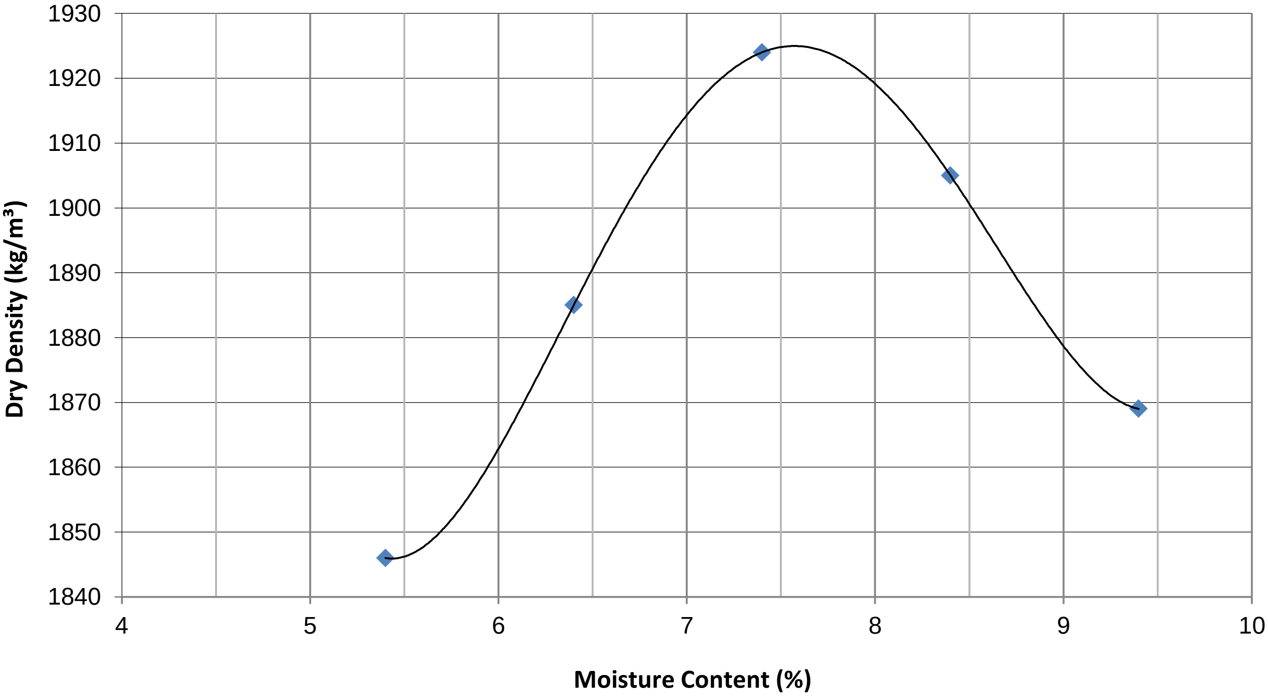
Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	1846	1885	1924	1905	1869	
Moisture Content	%	5.4	6.4	7.4	8.4	9.4	

Max. Dry Density	kg/m³	1925
Optimum Moisture	%	7.6

NB! Air-Void curves might be based on assumend Specific Gravity values.



Client : SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD
Project : KSIA EMERGENCY ACCESS ROADS
Project No: 2018-D-5122
Date Received: 02/10/2018
Date Reported: 17/10/2018
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MOISTURE DENSITY RELATIONSHIP

Laboratory Number		5
Field Number		
Client Reference		TP3
Depth (m)		0.15 - 0.55
Position		
Coordinates	X	
	Y	
Description		R.O.Sty.Sand
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

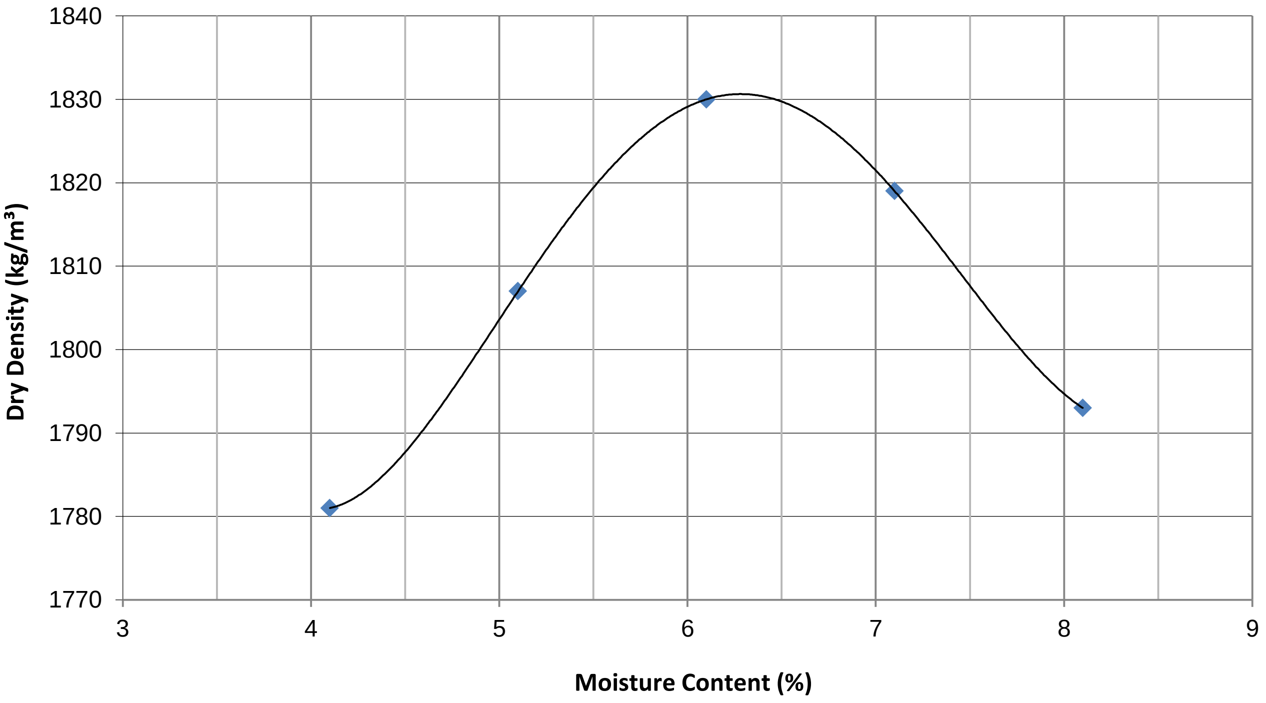
Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	1781	1807	1830	1819	1793	
Moisture Content	%	4.1	5.1	6.1	7.1	8.1	

Max. Dry Density	kg/m³	1831
Optimum Moisture	%	6.3

NB! Air-Void curves might be based on assumend Specific Gravity values.



Client :	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received:	02/10/2018
Project :	KSIA EMERGENCY ACCESS ROADS	Date Reported:	17/10/2018
Project No:	2018-D-5122	Page No. :	7 of 22

MOISTURE DENSITY RELATIONSHIP

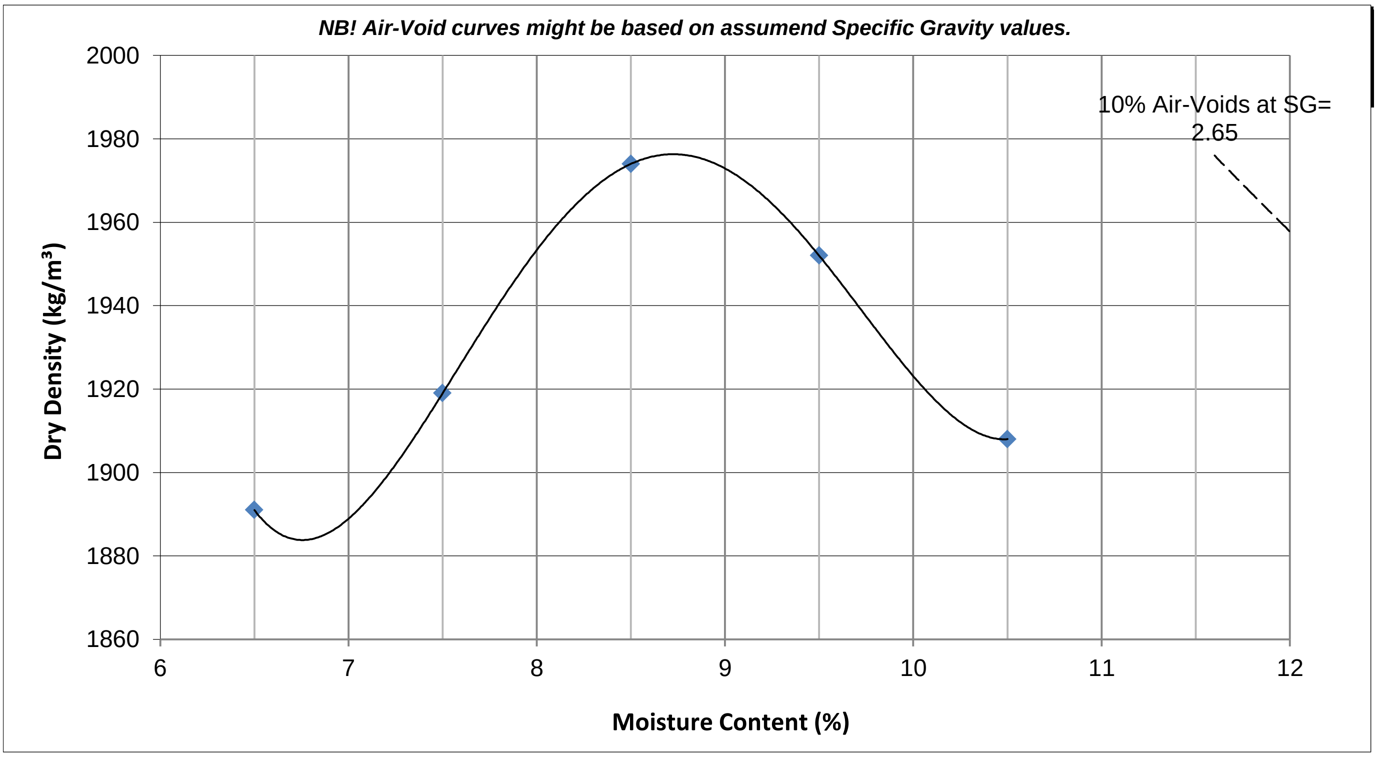
Laboratory Number		6
Field Number		
Client Reference		TP3
Depth (m)		0.55 - 1.00
Position		
Coordinates	X	
	Y	
Description		Dk.R.Sty.Sand
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	1891	1919	1974	1952	1908	
Moisture Content	%	6.5	7.5	8.5	9.5	10.5	

Max. Dry Density	kg/m³	1976
Optimum Moisture	%	8.7



Client :	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received:	02/10/2018
Project :	KSIA EMERGENCY ACCESS ROADS	Date Reported:	17/10/2018
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MOISTURE DENSITY RELATIONSHIP

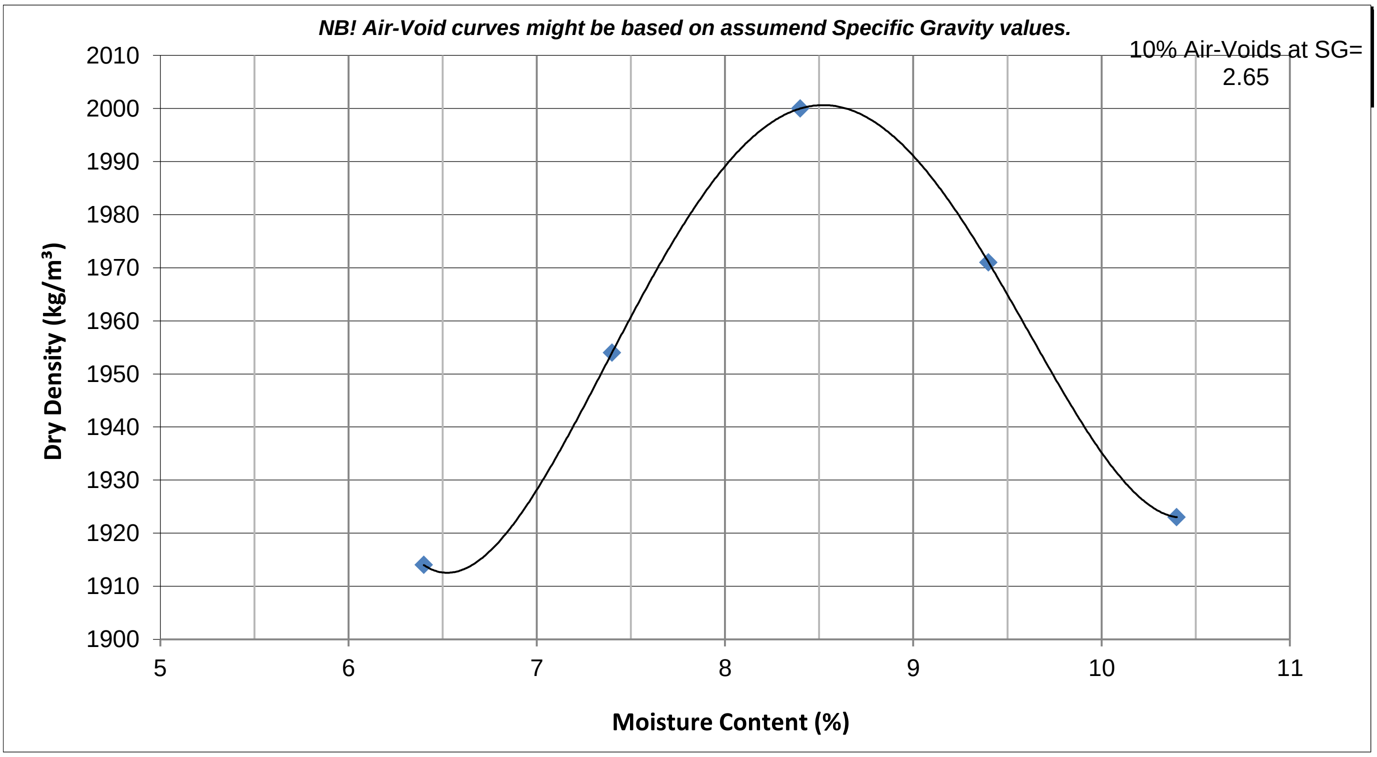
Laboratory Number		7
Field Number		
Client Reference		TP4
Depth (m)		0.40 - 1.10
Position		
Coordinates	X	
	Y	
Description		Y.O.Sty.Sand
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	1914	1954	2000	1971	1923	
Moisture Content	%	6.4	7.4	8.4	9.4	10.4	

Max. Dry Density	kg/m³	2001
Optimum Moisture	%	8.5



Client :	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received:	02/10/2018
Project :	KSIA EMERGENCY ACCESS ROADS	Date Reported:	17/10/2018
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MOISTURE DENSITY RELATIONSHIP

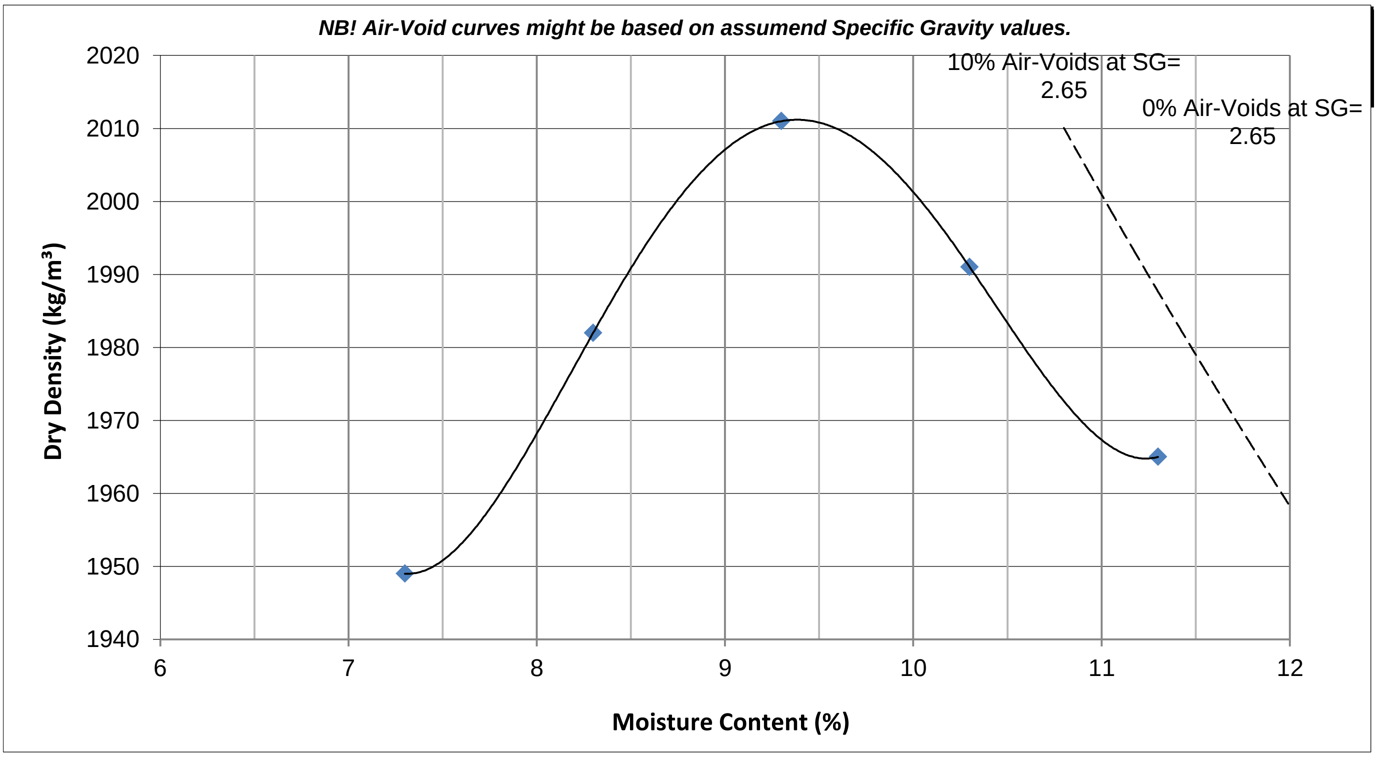
Laboratory Number		8
Field Number		
Client Reference		TP5
Depth (m)		0.10 - 0.80
Position		
Coordinates	X	
	Y	
Description		Dk.R.Br.Sty.Sand
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	1949	1982	2011	1991	1965	
Moisture Content	%	7.3	8.3	9.3	10.3	11.3	

Max. Dry Density	kg/m³	2011
Optimum Moisture	%	9.4



Client :	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received:	02/10/2018
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MOISTURE DENSITY RELATIONSHIP

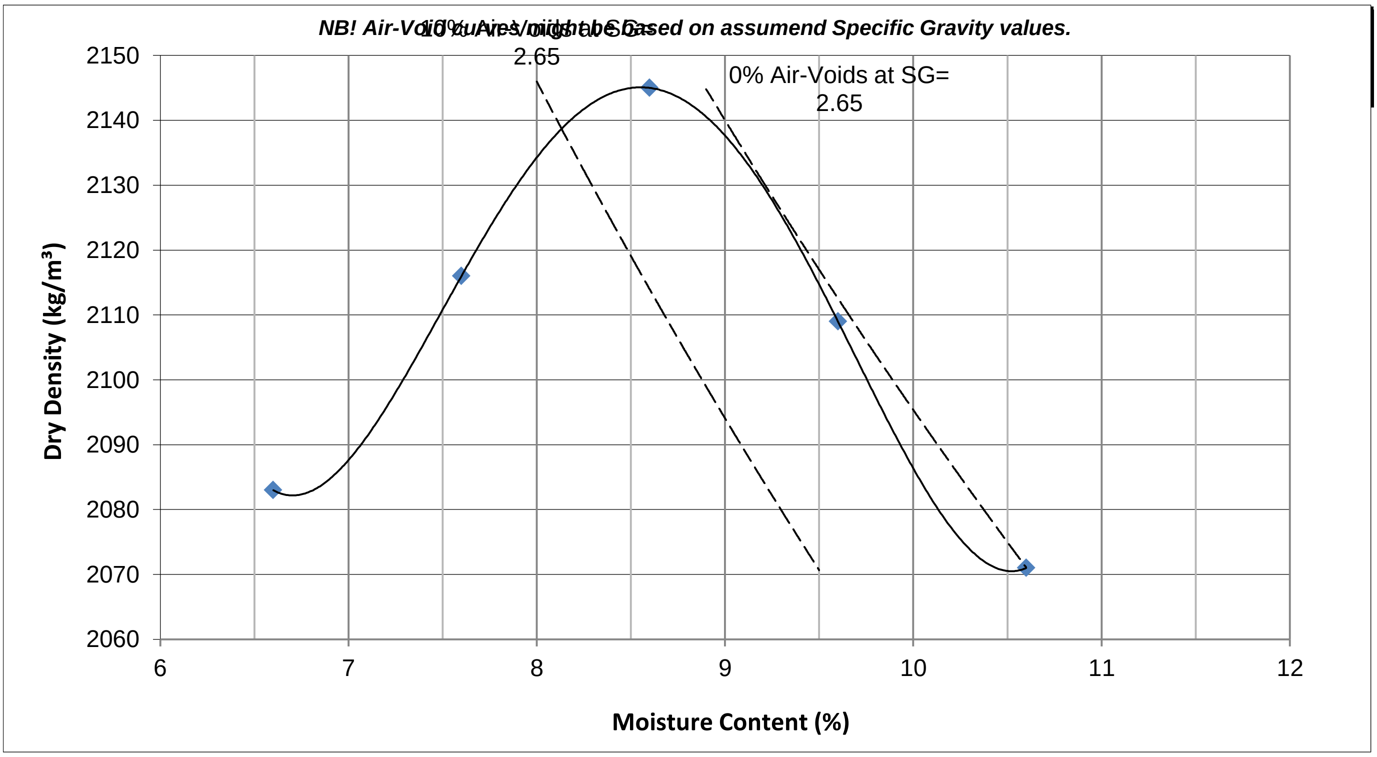
Laboratory Number		9
Field Number		
Client Reference		TP6
Depth (m)		0.15 - 0.40
Position		
Coordinates	X	
	Y	
Description		Lt.Br.Cly.Wth.Shale
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	2083	2116	2145	2109	2071	
Moisture Content	%	6.6	7.6	8.6	9.6	10.6	

Max. Dry Density	kg/m³	2145
Optimum Moisture	%	8.6



Client :	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received:	02/10/2018
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MOISTURE DENSITY RELATIONSHIP

Laboratory Number		10
Field Number		
Client Reference		TP7
Depth (m)		0.20 - 1.05
Position		
Coordinates	X	
	Y	
Description		Dk.R.O.Pa.R.Wth.Sandstone
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

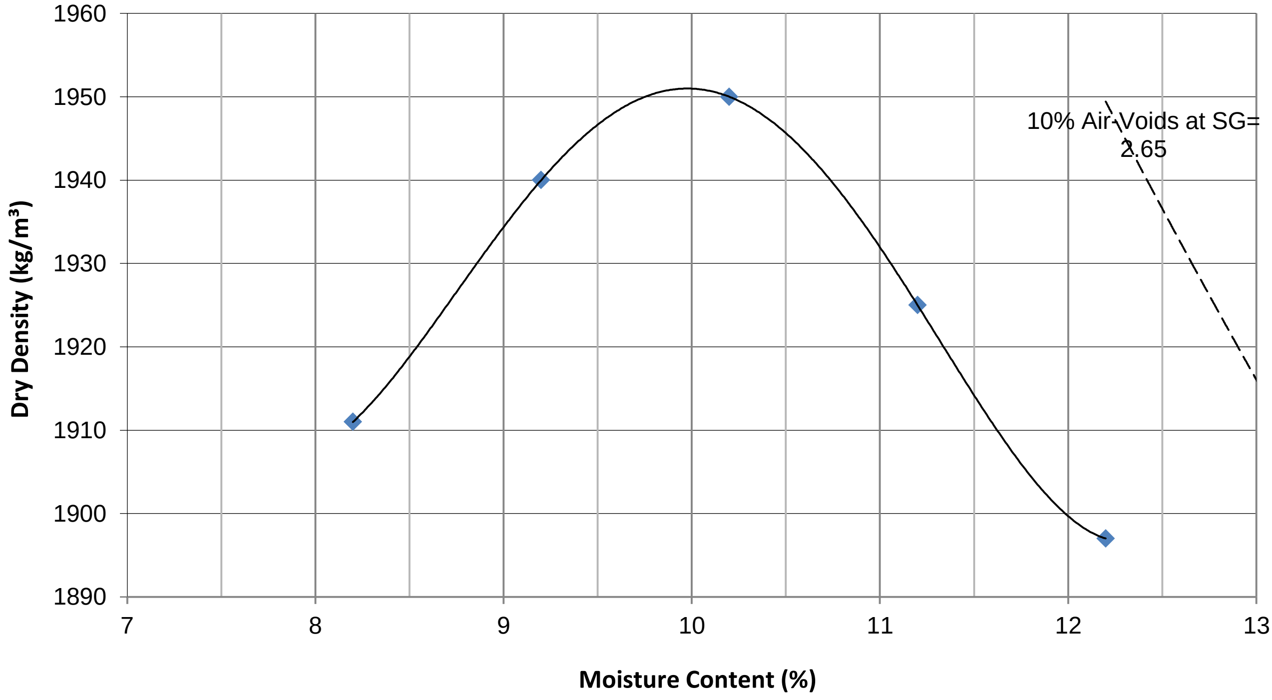
Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	1911	1940	1950	1925	1897	
Moisture Content	%	8.2	9.2	10.2	11.2	12.2	

Max. Dry Density	kg/m³	1951
Optimum Moisture	%	10.0

NB! Air-Void curves might be based on assumend Specific Gravity values.



Client :	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received:	02/10/2018
Project :	KSIA EMERGENCY ACCESS ROADS	Date Reported:	17/10/2018
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MOISTURE DENSITY RELATIONSHIP

Laboratory Number		11
Field Number		
Client Reference		TP8
Depth (m)		0.20 - 0.65
Position		
Coordinates	X	
	Y	
Description		Lt.Br.Sty.Sand + Gravel
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

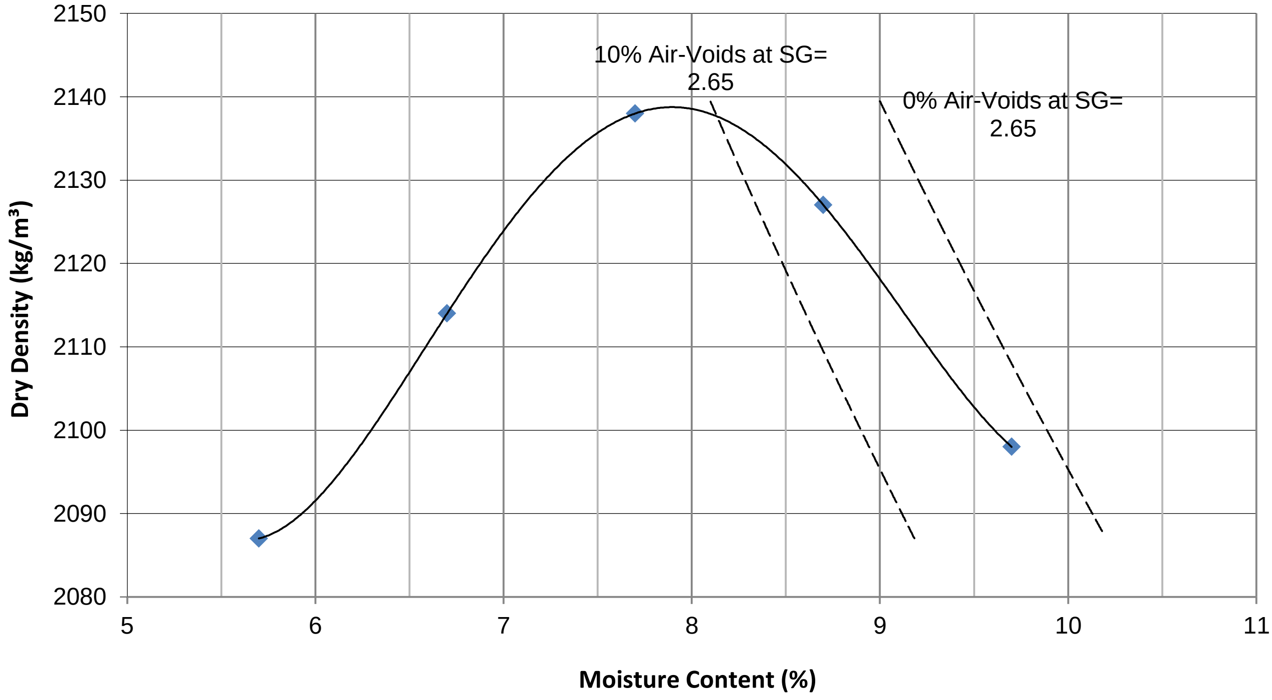
Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	2087	2114	2138	2127	2098	
Moisture Content	%	5.7	6.7	7.7	8.7	9.7	

Max. Dry Density	kg/m³	2139
Optimum Moisture	%	7.9

NB! Air-Void curves might be based on assumend Specific Gravity values.



Client :	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received:	02/10/2018
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MOISTURE DENSITY RELATIONSHIP

Laboratory Number		12
Field Number		
Client Reference		TP9
Depth (m)		0.25 - 0.75
Position		
Coordinates	X	
	Y	
Description		Dk.Br.Sty.Cly.Sand
Additional Information		
Calcrete / Crushed		
Stabilizing Agent		

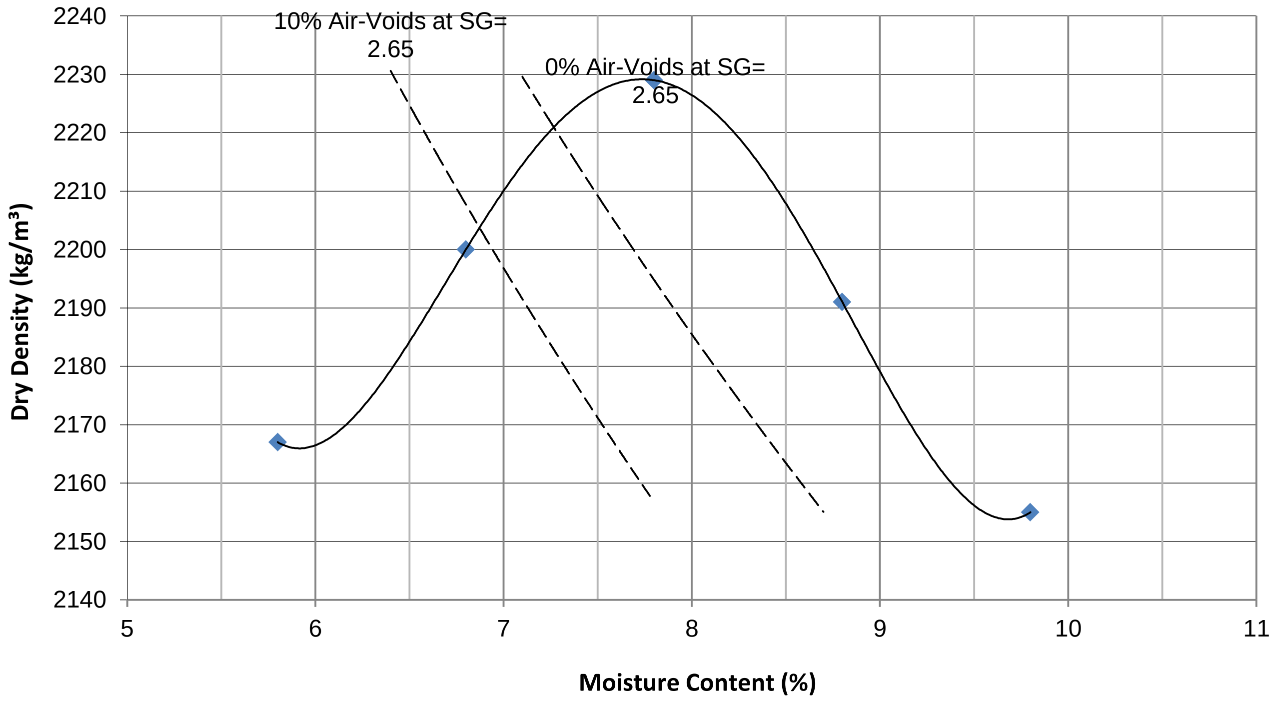
Maximum Dry Density & Optimum Moisture Content - SANS 3001: GR30

Compactive Effort:	

Dry Density	kg/m³	2167	2200	2229	2191	2155	
Moisture Content	%	5.8	6.8	7.8	8.8	9.8	

Max. Dry Density	kg/m³	2229
Optimum Moisture	%	7.7

NB! Air-Void curves might be based on assumend Specific Gravity values.



Client : SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD
Project : KSIA EMERGENCY ACCESS ROADS
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MATERIALS TEST REPORT

Laboratory Number		1	2	3	4
Field Number					
Client Reference		TP1	TP1	TP2	TP2
Depth (m)		0.00 - 0.40	0.40 - 1.10	0.05 - 0.30	0.30 - 1.05
Position					
Coordinates	X				
	Y				
Description		Dk.R.Br.Sty.Sand	Dk.R.Br.Sty.Sand	Br.Sty.Sand	Dk.O.Br.Sty.Sand
Additional information					
Calcrete/Crushed					
Stabilizing Agent					

Sieve Analysis (Wet preparation) **SANS 3001: GR1**

		1	2	3	4
Percentage Passing	100 mm	100	100	100	100
	75 mm	100	100	100	100
	63 mm	100	100	100	100
	50 mm	100	100	100	100
	37.5 mm	100	100	100	100
	28 mm	100	100	100	100
	20 mm	100	100	100	100
	14 mm	100	99	100	100
	5 mm	100	98	99	100
	2 mm	100	98	98	100
	1 mm	100	98	98	100
	0.425 mm	97	93	94	98
	0.075 mm	35	29	12	15
Grading Modulus		0.68	0.80	0.96	0.87

Soil Mortar Analysis

Coarse Sand	2.0-0.425	3	5	4	2
Coarse Fine Sand	0.425-0.250	19	23	23	20
Medium Fine Sand	0.250-0.150	35	36	51	53
Fine Fine Sand	0.150-0.075	8	7	10	11
Silt and Clay	<0.075	35	29	12	15

Atterberg Limits **SANS 3001: GR10-GR12**

Liquid Limit	%	21	CBD	CBD	CBD
Plasticity Index	%	6	SP	NP	NP
Linear Shrinkage	%	3	1.5	0.0	0.0

Maximum Dry Density & Optimum Moisture Content **SANS 3001: GR30**

Max. Dry Density	kg/m^3	2009	2025	1845	1925
Optimum Moisture	%	10.9	9.6	9.9	7.6

CBR SANS 3001: GR40 UCS ITS

Test Type			CBR (%)	UCS (kPa)	ITS (kPa)	CBR (%)	UCS (kPa)	ITS (kPa)	CBR (%)	UCS (kPa)	ITS (kPa)	CBR (%)	UCS (kPa)	ITS (kPa)
Interpolated Data	@100%	Mod. AASHTO	47			15			52			82		
	@ 98%		22			12			36			48		
	@ 97%		15			11			30			36		
	@ 95%		7			9			21			21		
	@ 93%		3			7			14			12		
	@ 90%		1			5			8			6		
Value @ Mod. AASHTO effort														
Swell (%) @ Mod. AASHTO effort			0.1			0.2			0.0			0.0		

Classifications

HRB	A-2-4(0)	A-2-4(0)	A-2-4(0)	A-2-4(0)
COLTO	N/A	G9	G8	G8
TRH14	N/A	G9	G8	G8

Client	:	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received	:	02/10/2018
Project	:	KSIA EMERGENCY ACCESS ROADS	Date Reported	:	17/10/2018
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MATERIALS TEST REPORT

Laboratory Number		5	6	7	8
Field Number					
Client Reference		TP3	TP3	TP4	TP5
Depth (m)		0.15 - 0.55	0.55 - 1.00	0.40 - 1.10	0.10 - 0.80
Position					
Coordinates	X				
	Y				
Description		R.O.Sty.Sand	Dk.R.Sty.Sand	Y.O.Sty.Sand	Dk.R.Br.Sty.Sand
Additional information					
Calcrete/Crushed					
Stabilizing Agent					

Sieve Analysis (Wet preparation) **SANS 3001: GR1**

Percentage Passing	100 mm	100	100	100	100
	75 mm	100	100	100	100
	63 mm	100	100	100	100
	50 mm	100	100	100	100
	37.5 mm	100	100	100	100
	28 mm	100	100	100	100
	20 mm	100	100	100	100
	14 mm	100	100	100	100
	5 mm	99	100	100	100
	2 mm	99	100	100	100
	1 mm	99	100	100	100
	0.425 mm	92	97	97	97
	0.075 mm	8	22	21	25
Grading Modulus		1.01	0.81	0.82	0.78

Soil Mortar Analysis

Coarse Sand	2.0-0.425	7	3	3	3
Coarse Fine Sand	0.425-0.250	39	25	22	20
Medium Fine Sand	0.250-0.150	41	43	47	44
Fine Fine Sand	0.150-0.075	5	7	7	8
Silt and Clay	<0.075	8	22	21	25

Atterberg Limits **SANS 3001: GR10-GR12**

Liquid Limit	%	CBD	19	CBD	CBD
Plasticity Index	%	NP	3	SP	SP
Linear Shrinkage	%	0.0	2	1.0	1.5

Maximum Dry Density & Optimum Moisture Content **SANS 3001: GR30**

Max. Dry Density	kg/m^3	1831	1976	2001	2011
Optimum Moisture	%	6.3	8.7	8.5	9.4

CBR SANS 3001: GR40 UCS ITS

Test Type			CBR (%)	UCS (kPa)	ITS (kPa)	CBR (%)	UCS (kPa)	ITS (kPa)	CBR (%)	UCS (kPa)	ITS (kPa)	CBR (%)	UCS (kPa)	ITS (kPa)
Interpolated Data	@100%	Mod. AASHTO	16			34			49			47		
	@ 98%		14			22			36			30		
	@ 97%		13			17			31			23		
	@ 95%		11			11			22			15		
	@ 93%		10			7			16			9		
	@ 90%		8			4			10			5		
Value @ Mod. AASHTO effort														
Swell (%) @ Mod. AASHTO effort			0.0			0.2			0.0			0.1		

Classifications

HRB	A-3(0)	A-2-4(0)	A-2-4(0)	A-2-4(0)
COLTO	G8	G9	G7	G9
TRH14	G8	G9	G7	G9

Client : SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD
Project : KSIA EMERGENCY ACCESS ROADS
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MATERIALS TEST REPORT

Laboratory Number		9	10	11	12
Field Number					
Client Reference		TP6	TP7	TP8	TP9
Depth (m)		0.15 - 0.40	0.20 - 1.05	0.20 - 0.65	0.25 - 0.75
Position					
Coordinates	X				
	Y				
Description		Lt.Br.Cly.Wth.Shale	Dk.R.O.Pa.R.Wth. Sandstone	Lt.Br.Sty.Sand + Gravel	Dk.Br.Sty.Cly.Sand
Additional information					
Calcrete/Crushed					
Stabilizing Agent					

Sieve Analysis (Wet preparation) **SANS 3001: GR1**

Percentage Passing	100 mm	94	100	100	100
	75 mm	83	100	100	100
	63 mm	79	100	97	100
	50 mm	76	100	92	98
	37.5 mm	71	100	90	98
	28 mm	66	100	89	93
	20 mm	58	100	88	88
	14 mm	52	99	85	82
	5 mm	37	95	73	59
	2 mm	29	92	65	49
	1 mm	29	92	65	49
	0.425 mm	21	83	55	40
	0.075 mm	14	34	24	22
Grading Modulus		2.36	0.91	1.56	1.89

Soil Mortar Analysis

Coarse Sand	2.0-0.425	28	10	15	18
Coarse Fine Sand	0.425-0.250	8	13	12	9
Medium Fine Sand	0.250-0.150	9	31	23	18
Fine Fine Sand	0.150-0.075	8	10	13	11
Silt and Clay	<0.075	48	37	37	44

Atterberg Limits **SANS 3001: GR10-GR12**

Liquid Limit	%	24	22	19	21
Plasticity Index	%	11	6	7	7
Linear Shrinkage	%	5.5	3	3.5	4.5

Maximum Dry Density & Optimum Moisture Content **SANS 3001: GR30**

Max. Dry Density	kg/m^3	2145	1951	2139	2229
Optimum Moisture	%	8.6	10	7.9	7.7

CBR SANS 3001: GR40 UCS ITS

Test Type			CBR (%)	UCS (kPa)	ITS (kPa)	CBR (%)	UCS (kPa)	ITS (kPa)	CBR (%)	UCS (kPa)	ITS (kPa)	CBR (%)	UCS (kPa)	ITS (kPa)
Interpolated Data	@100%	Mod. AASHTO	20			3			8			31		
	@ 98%		18			2			7			22		
	@ 97%		17			2			7			19		
	@ 95%		15			2			6			13		
	@ 93%		13			1			5			9		
	@ 90%		11			1			5			5		
Value @ Mod. AASHTO effort														
Swell (%) @ Mod. AASHTO effort			0.0			2.4			0.1			0.3		

Classifications

HRB	A-2-6(0)	A-2-4(0)	A-2-4(0)	A-2-4(0)
COLTO	G8	N/A	N/A	G9
TRH14	G8	N/A	G10	G9

Client	:	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received	:	02/10/2018
Project	:	KSIA EMERGENCY ACCESS ROADS	Date Reported	:	17/10/2018
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CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		1 ◆	2 ■
Field Number			
Client Reference		TP1	TP1
Depth (m)		0.00 - 0.40	0.40 - 1.10
Position			
Coordinates	X		
	Y		
Description		Dk.R.Br.Sty. Sand	Dk.R.Br.Sty. Sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation) **SANS 3001: GR1**

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	99
	5 mm	100	98
	2 mm	100	98
	1 mm	100	98
	0.425 mm	97	93
	0.250 mm	78	71
	0.150 mm	43	35
	0.075 mm	35	29
Grading Modulus		0.68	0.80

Soil Mortar Analysis

Coarse Sand	3	5
Coarse Fine Sand	19	23
Medium Fine Sand	35	36
Fine Fine Sand	8	7
Silt and Clay	35	29

Atterberg Limits SANS 3001: GR10-GR12

Liquid Limit (%)	21	CBD
Plasticity Index (%)	6	SP
Linear Shrinkage (%)	3.0	1.5

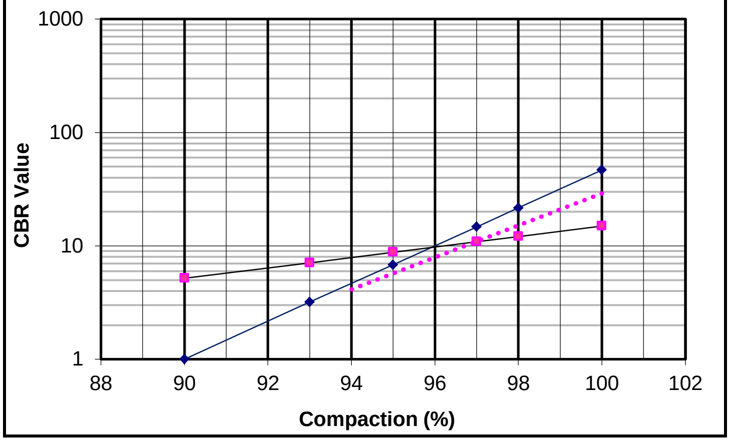
Laboratory No.		1 ◆	2 ■

Maximum Dry Density & Optimum Moisture Content **SANS 3001: GR30**

MDD	kg/m^3	2009	2025
OMC	%	10.9	9.6

California Bearing Ratio

Compaction Data							
Moisture	%	10.9			9.6		
Dry Density	kg/m^3	2021	1899	1832	2027	1904	1851
Compaction	%	100.0	94.0	90.6	100.0	93.9	91.3
Penetration Data							
CBR at	2.50 mm	19	11	1	29	4	6
	5.00 mm	25	11	1	27	4	5
	7.50 mm	28	11	1	25	4	5
Swell	%	0.1	0.2	0.2	0.2	0.6	1.3
Final Moisture (%)		13.6	15.4	17.1	13.9	16	16.6

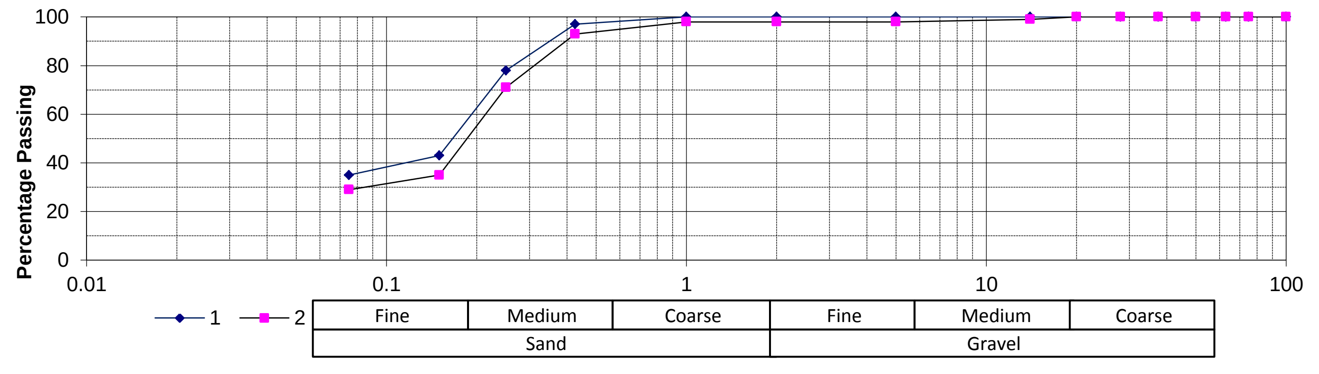


Interpolated CBR Data

CBR Mod. AASHTO	@	100%	47	15
	@	98%	22	12
	@	97%	15	11
	@	95%	7	9
	@	93%	3	7
	@	90%	1	5
	@	SANS3001 Midpoint	15	11

Classifications

HRB (AASHTO)	A-2-4(0)	A-2-4(0)
COLTO	N/A	G9
TRH14	N/A	G9



Client	:	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received	:	02/10/2018
Project	:	KSIA EMERGENCY ACCESS ROADS	Date Reported	:	17/10/2018
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CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		3 ◆	4 ■
Field Number			
Client Reference		TP2	TP2
Depth (m)		0.05 - 0.30	0.30 - 1.05
Position			
Coordinates	X		
	Y		
Description		Br.Sty.Sand	Dk.O.Br.Sty. Sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation) **SANS 3001: GR1**

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	99	100
	2 mm	98	100
	1 mm	98	100
	0.425 mm	94	98
	0.250 mm	72	78
	0.150 mm	22	26
	0.075 mm	12	15
Grading Modulus		0.96	0.87

Soil Mortar Analysis

Coarse Sand	4	2
Coarse Fine Sand	23	20
Medium Fine Sand	51	53
Fine Fine Sand	10	11
Silt and Clay	12	15

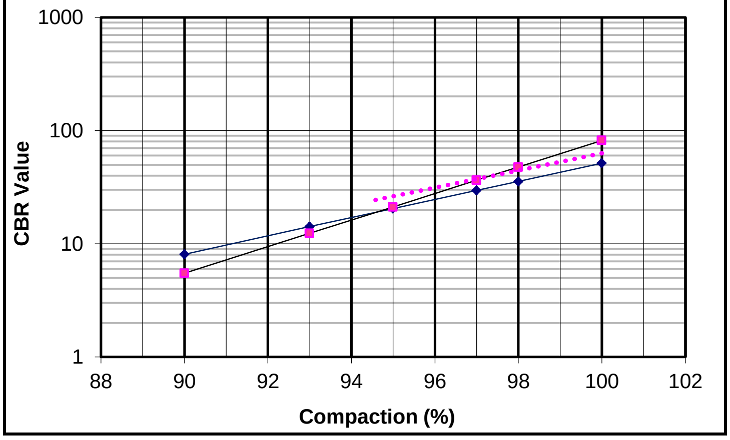
Atterberg Limits SANS 3001: GR10-GR12

Liquid Limit (%)	CBD	CBD
Plasticity Index (%)	NP	NP
Linear Shrinkage (%)	0.0	0.0

Laboratory No.		3 ◆	4 ■
Maximum Dry Density & Optimum Moisture Content			**SANS 3001: GR30**
MDD	kg/m^3	1845	1925
OMC	%	9.9	7.6

California Bearing Ratio

		Compaction Data						
Moisture	%	9.9			7.6			
Dry Density	kg/m^3	1857	1756	1686	1944	1838	1821
Compaction	%	100.0	94.6	90.8	100.0	94.5	93.7
		Penetration Data						
CBR at	2.50 mm	45	21	9	63	24	15
	5.00 mm	30	27	13	26	25	14
	7.50 mm	15	14	13	17	14	9
Swell	%	0	0	0	0	0	0
Final Moisture (%)		13.8	15.5	18.3	12.2	13.7	14.9

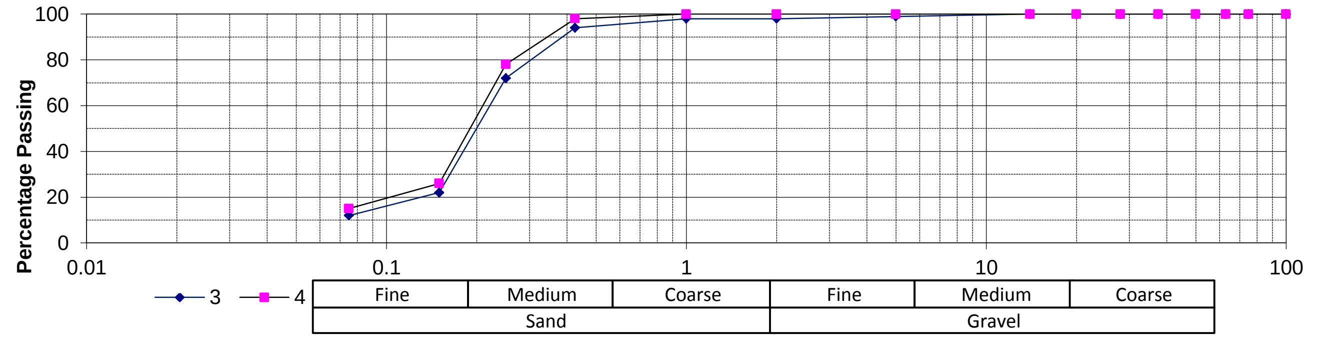


Interpolated CBR Data

CBR	@	100%	Mod. AASHTO	52	82
	@	98%		36	48
	@	97%		30	36
	@	95%		21	21
	@	93%		14	12
	@	90%		8	6
	@	SANS3001 Midpoint		31	40

Classifications

HRB (AASHTO)	A-2-4(0)	A-2-4(0)
COLTO	G8	G8
TRH14	G8	G8



Client : SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD
Project : KSIA EMERGENCY ACCESS ROADS
Project No. : 2018-D-5122

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CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		5 ◆	6 ■
Field Number			
Client Reference		TP3	TP3
Depth (m)		0.15 - 0.55	0.55 - 1.00
Position			
Coordinates	X		
	Y		
Description		R.O.Sty.Sand	Dk.R.Sty.Sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation) **SANS 3001: GR1**

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	99	100
	2 mm	99	100
	1 mm	99	100
	0.425 mm	92	97
	0.250 mm	53	72
	0.150 mm	13	29
	0.075 mm	8	22
Grading Modulus		1.01	0.81

Soil Mortar Analysis

Coarse Sand	7	3
Coarse Fine Sand	39	25
Medium Fine Sand	41	43
Fine Fine Sand	5	7
Silt and Clay	8	22

Atterberg Limits SANS 3001: GR10-GR12

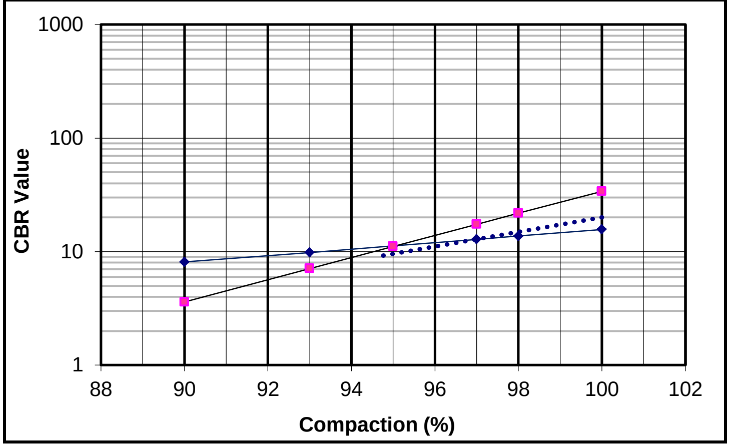
Liquid Limit (%)	CBD	19
Plasticity Index (%)	NP	3
Linear Shrinkage (%)	0.0	2.0

D

Laboratory No.		5 ◆	6 ■
Maximum Dry Density & Optimum Moisture Content			**SANS 3001: GR30**
MDD	kg/m^3	1831	1976
OMC	%	6.3	8.7

California Bearing Ratio **SANS 3001: GR40**

Compaction Data							
Moisture	%	6.3			8.7		
Dry Density	kg/m^3	1832	1733	1665	1978	1868	1765
Compaction	%	100.0	94.6	90.9	100.0	94.4	89.2
Penetration Data							
CBR at	2.50 mm	20	9	9	31	11	3
	5.00 mm	18	10	12	35	8	3
	7.50 mm	12	9	9	32	7	2
Swell	%	0	0	0	0.2	0.3	0.4
Final Moisture (%)		6.9	17.1	18.2	13.6	15.8	17.8

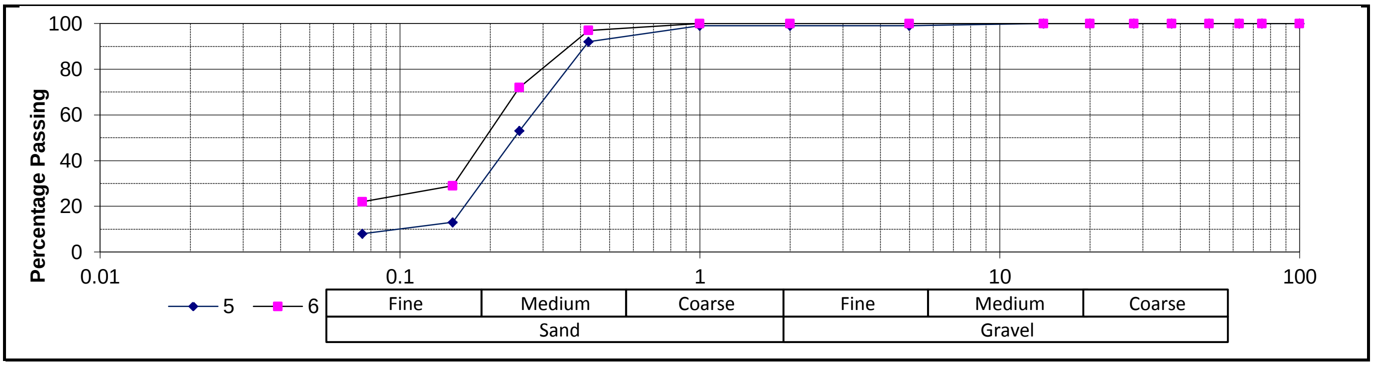


Interpolated CBR Data

CBR	@	100%	Mod. AASHTO	16	34
	@	98%		14	22
	@	97%		13	17
	@	95%		11	11
	@	93%		10	7
	@	90%		8	4
	@	SANS3001 Midpoint		13	18

Classifications

HRB (AASHTO)	A-3(0)	A-2-4(0)
COLTO	G8	G9
TRH14	G8	G9



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CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		7 ◆	8 ■
Field Number			
Client Reference		TP4	TP5
Depth (m)		0.40 - 1.10	0.10 - 0.80
Position			
Coordinates	X		
	Y		
Description		Y.O.Sty.Sand	Dk.R.Br.Sty. Sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation) **SANS 3001: GR1**

Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	100	100
	50 mm	100	100
	37.5 mm	100	100
	28 mm	100	100
	20 mm	100	100
	14 mm	100	100
	5 mm	100	100
	2 mm	100	100
	1 mm	100	100
	0.425 mm	97	97
	0.250 mm	75	77
	0.150 mm	28	33
	0.075 mm	21	25
Grading Modulus		0.82	0.78

Soil Mortar Analysis

Coarse Sand	3	3
Coarse Fine Sand	22	20
Medium Fine Sand	47	44
Fine Fine Sand	7	8
Silt and Clay	21	25

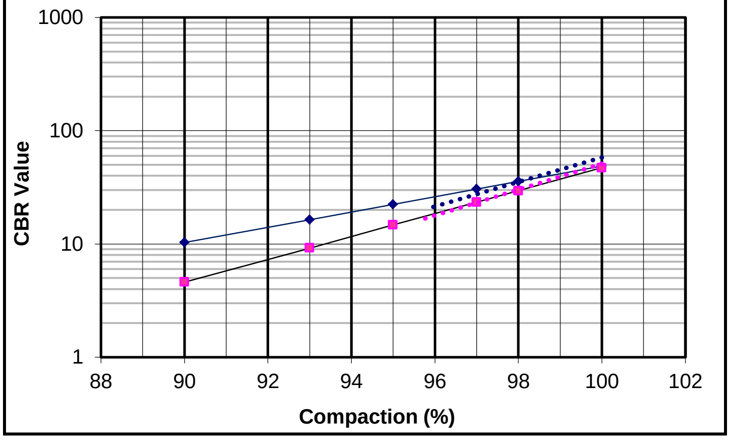
Atterberg Limits SANS 3001: GR10-GR12

Liquid Limit (%)	CBD	CBD
Plasticity Index (%)	SP	SP
Linear Shrinkage (%)	1.0	1.5

Laboratory No.		7 ◆	8 ■
Maximum Dry Density & Optimum Moisture Content			**SANS 3001: GR30**
MDD	kg/m^3	2001	2011
OMC	%	8.5	9.4

California Bearing Ratio **SANS 3001: GR40**

Compaction Data							
Moisture	%	8.5			9.4		
Dry Density	kg/m^3	2010	1928	1815	2012	1924	1812
Compaction	%	100.0	95.9	90.3	100.0	95.6	90.1
Penetration Data							
CBR at	2.50 mm	58	21	11	51	16	5
	5.00 mm	46	22	10	56	14	4
	7.50 mm	33	23	10	51	13	4
Swell	%	0	0	0.1	0.1	0.4	0.4
Final Moisture (%)		12.6	14.5	15	12.7	12.4	19

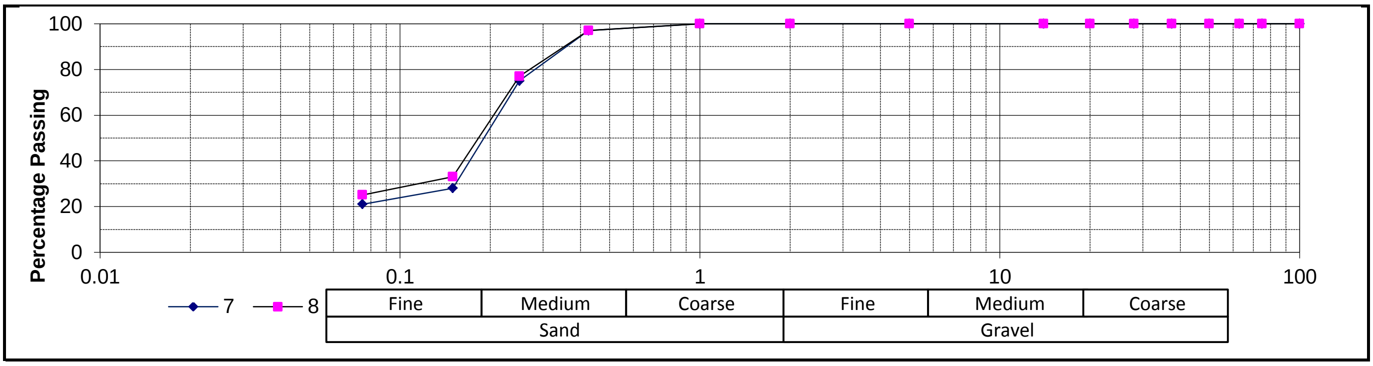


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	49	47
	@ 98%		36	30
	@ 97%		31	23
	@ 95%		22	15
	@ 93%		16	9
	@ 90%		10	5
	@ SANS3001 Midpoint		36	28

Classifications

HRB (AASHTO)	A-2-4(0)	A-2-4(0)
COLTO	G7	G9
TRH14	G7	G9



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Project : KSIA EMERGENCY ACCESS ROADS
Project No. : 2018-D-5122
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CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		9 ◆	10 ■
Field Number			
Client Reference		TP6	TP7
Depth (m)		0.15 - 0.40	0.20 - 1.05
Position			
Coordinates	X		
	Y		
Description		Lt.Br.Cly.Wth. Shale	Dk.R.O.Pa.R.Wth .Sandstone
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation) **SANS 3001: GR1**

Percentage Passing	100 mm	94	100
	75 mm	83	100
	63 mm	79	100
	50 mm	76	100
	37.5 mm	71	100
	28 mm	66	100
	20 mm	58	100
	14 mm	52	99
	5 mm	37	95
	2 mm	29	92
	1 mm	29	92
	0.425 mm	21	83
	0.250 mm	19	71
	0.150 mm	16	43
	0.075 mm	14	34
Grading Modulus		2.36	0.91

Soil Mortar Analysis

Coarse Sand	28	10
Coarse Fine Sand	8	13
Medium Fine Sand	9	31
Fine Fine Sand	8	10
Silt and Clay	48	37

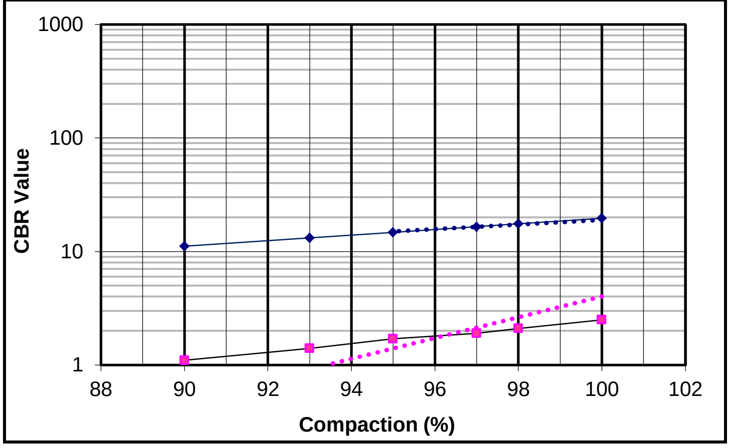
Atterberg Limits SANS 3001: GR10-GR12

Liquid Limit (%)	24	22
Plasticity Index (%)	11	6
Linear Shrinkage (%)	5.5	3.0

Laboratory No.		9 ◆	10 ■
Maximum Dry Density & Optimum Moisture Content			**SANS 3001: GR30**
MDD	kg/m^3	2145	1951
OMC	%	8.6	10

California Bearing Ratio **SANS 3001: GR40**

Compaction Data							
Moisture	%	8.6			10		
Dry Density	kg/m^3	2161	2052	1957	1972	1841	1781
Compaction	%	100.0	95.0	90.6	100.0	93.4	90.3
Penetration Data							
CBR at	2.50 mm	19	15	11	4	1	1
	5.00 mm	24	19	12	5	1	1
	7.50 mm	27	21	12	4	1	1
Swell	%	0	0	0	2.4	3.8	5.9
Final Moisture (%)		11.3	11.5	12.2	18.6	22.4	18.5

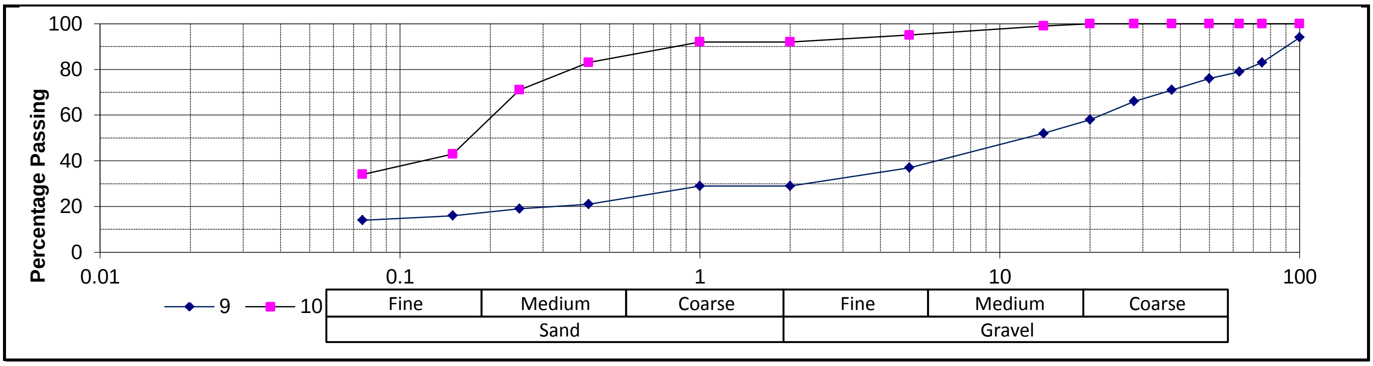


Interpolated CBR Data

CBR	@ 100%	Mod. AASHTO	20	3
	@ 98%		18	2
	@ 97%		17	2
	@ 95%		15	2
	@ 93%		13	1
	@ 90%		11	1
	@ SANS3001 Midpoint		17	2

Classifications

HRB (AASHTO)	A-2-6(0)	A-2-4(0)
COLTO	G8	N/A
TRH14	G8	N/A



SOILCO MATERIALS INVESTIGATIONS (PTY) LTD

CIVIL ENGINEERING MATERIALS TESTING LABORATORY

Reg. No. : 1965/09585/07

25 WESTMEAD ROAD - WESTMEAD P.O.BOX 15318 WESTMEAD 3608 KWAZULU - NATAL
TELEPHONE : 031 7004325 TELEFAX : 031 7001909 email : soilslab@mweb.co.za

sanas Testing Laboratory
T0213

Client :	SHRIRAM GEOTECHNICAL CONSULTING (PTY)LTD	Date Received	:	02/10/2018
Project :	KSIA EMERGENCY ACCESS ROADS	Date Reported	:	17/10/2018
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CALIFORNIA BEARING RATIO (CBR) & ROAD INDICATOR REPORT

Laboratory No.		11 ◆	12 ■
Field Number			
Client Reference		TP8	TP9
Depth (m)		0.20 - 0.65	0.25 - 0.75
Position			
Coordinates	X		
	Y		
Description		Lt.Br.Sty.Sand + Gravel	Dk.Br.Sty.Cly. Sand
Additional information			
Calcrete/Crushed			
Stabilizing Agent			

Sieve Analysis (Wet preparation) **SANS 3001: GR1**

		11	12
Percentage Passing	100 mm	100	100
	75 mm	100	100
	63 mm	97	100
	50 mm	92	98
	37.5 mm	90	98
	28 mm	89	93
	20 mm	88	88
	14 mm	85	82
	5 mm	73	59
	2 mm	65	49
	1 mm	65	49
	0.425 mm	55	40
	0.250 mm	47	36
	0.150 mm	33	27
	0.075 mm	24	22
Grading Modulus		1.6	1.9

Soil Mortar Analysis

	11	12
Coarse Sand	15	18
Coarse Fine Sand	12	9
Medium Fine Sand	23	18
Fine Fine Sand	13	11
Silt and Clay	37	44

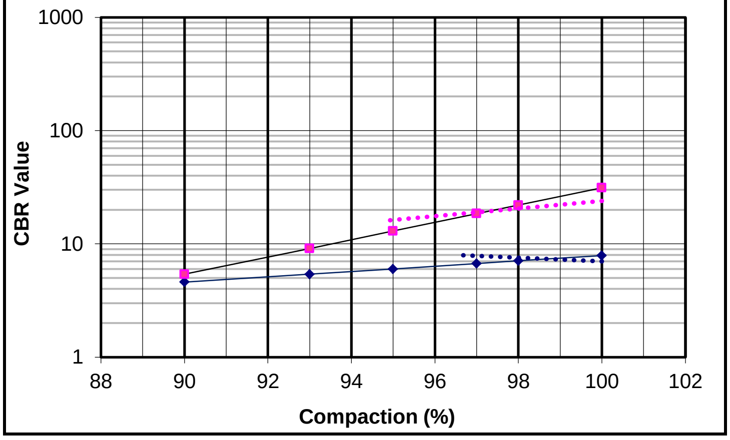
Atterberg Limits SANS 3001: GR10-GR12

	11	12
Liquid Limit (%)	19	21
Plasticity Index (%)	7	7
Linear Shrinkage (%)	3.5	4.5

Laboratory No.		11 ◆	12 ■
Maximum Dry Density & Optimum Moisture Content			**SANS 3001: GR30**
MDD	kg/m^3	2139	2229
OMC	%	7.9	7.7

California Bearing Ratio **SANS 3001: GR40**

Compaction Data							
Moisture	%	7.9			7.8		
Dry Density	kg/m^3	2136	2062	1939	2224	2108	1999
Compaction	%	100.0	96.5	90.8	100.0	94.8	89.9
Penetration Data							
CBR at	2.50 mm	7	8	5	24	16	5
	5.00 mm	9	9	4	33	18	5
	7.50 mm	10	10	4	37	20	5
Swell	%	0.1	0.2	0.2	0.3	0.5	0.5
Final Moisture (%)		9.8	10.6	12.6	9.9	12	14

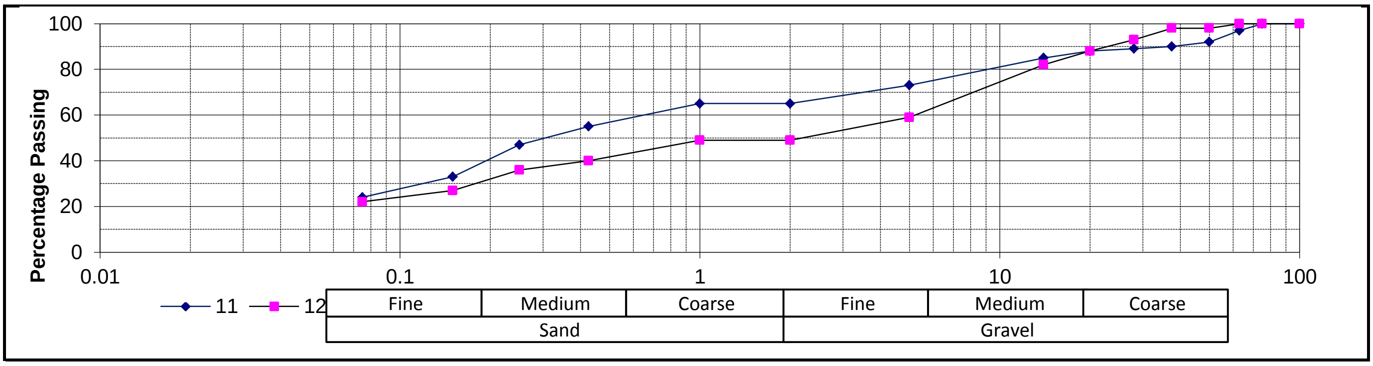


Interpolated CBR Data

				11	12
CBR	@	100%	Mod. AASHTO	8	31
	@	98%		7	22
	@	97%		7	19
	@	95%		6	13
	@	93%		5	9
	@	90%		5	5
	@	SANS3001 Midpoint		7	20

Classifications

	11	12
HRB (AASHTO)	A-2-4(0)	A-2-4(0)
COLTO	N/A	G9
TRH14	G10	G9



APPENDIX E

ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

REF: 2017-162 **DATE: MARCH 2019**

KING SHAKA INTERNATIONAL AIRPORT EMERGENCY ACCESS ROAD ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr)

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Westwood AH
Boksburg North
1459

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GEOMEASURE GROUP
Groundwater, Environmental & Geotechnical Consultants

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ACRONYMS

ACSA	Airports Company of South Africa
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
RE	Resident Engineer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
I&APs	Interested and Affected Parties
SDS	Safety Data Sheets
NEMA	National Environmental Management Act (107 of 1998)
LDV	Light Duty Vehicle
EMPr	Environmental Management Programme
ECO	Environmental Control Officer
EA	Environmental Authorisation
EMS	Environmental Management System
EIA	Environmental Impact Assessment
CIA	Civil Aviation Authority
PPE	Personal Protective Equipment
SAHRA	South African Heritage Resources Agency
EAPSA	Environmental Assessment Practitioners Association of South Africa
SACNASP	South African Council for Natural Scientific Professions

1. INTRODUCTION

Airports Company South Africa (ACSA) was formed in 1993 as a public company under the Airports Act (No. 44 of 1993) and, although majority owned by the South African Government, is legally and financially autonomous and operates under commercial law. Over the years, the company has transformed a fragmented, infrastructural parastatal into a focused, customer driven, efficient and commercially successful business, whose airports have become critical success factors to Brand South Africa. The company currently manages a network of nine airports in South Africa, including the three main international gateways of O.R. Tambo International, Cape Town International and King Shaka International Airports.

The current situation at the King Shaka International Airport (KSIA) is that the emergency road from the end of Runway 06 is not in line with the designated emergency gate (Emergency gate 3) and this affects the necessary response time required for emergency vehicles to react to an incident at the airport.

At Emergency gate 3, ambulances and other emergency LDVs cannot gain access to due to the raised concrete curb being too high. Currently a temporary solution is in place where sandbags are being used to enable these LDVs to mount the curb. This warrants a permanent solution which will provide a hardstanding surface between the M65 and the gate capable of withstanding a carrying capacity of 80 tons. The emergency road proposed will be located at the southern end of the airport property in order to allow access to the runway in an event of an emergency. This road is proposed to be 6m wide and 320m long.

Geomeasure Group (Pty) Ltd has been appointed by the Airports Company of South Africa (ACSA) to undertake an Environmental Authorisation process for two proposed emergency access roads. The application will be submitted to the National Department of Environmental Affairs (DEA) as per the requirements of Section 24(5) of the National Environmental Management Act (Act 107 of 1998).

This Environmental Management Programme (EMPr) will be compiled as per requirements of Appendix 4 of GNR 982, the EMPr offers management and mitigation measures for potential impacts that have been identified to be associated with the development from the pre-planning stage to decommissioning.

2. SCOPE AND OBJECTIVES OF THE EMPr

This EMPr is focused primarily on the planning, construction and operational phases of the proposed development, it is of vital importance that the requirements of the EMPr are clearly understood by the project team and that full compliance is achieved.

The objective of the EMPr is to provide practical, economically viable and sustainable environmental management measures for those aspects of the planning, construction and operation phases of the proposed development that have the potential to impact negatively on the receiving environment. The implementation of the recommendations within the EMPr will minimise the overall negative impacts and ensure that compliance with the applicable legislation and guidelines is achieved.

This EMPr provides a detailed plan specifying actions to be performed in the specific areas of the airport, as well as general principles that should be implemented by the

Airports Company of South Africa (ACSA) to adequately address the environmental management of this site.

3. RESPONSIBILITIES OF THE TEAM

3.1 THE SITE MANAGER

- ✓ To ensure that all staff on site are aware of the EMPr requirements and therefore know their responsibilities;
- ✓ To monitor that the activities undertaken on site comply with the environmental requirements;
- ✓ To ensure compliance with local bylaws;
- ✓ To ensure that there is an emergency procedure in place and that staff is aware of the assembly points and the like;
- ✓ Be familiar with the recommendations and mitigation measures of this EMPr, and
- ✓ implement these measures;
- ✓ Monitor site activities on a daily basis for compliance;
- ✓ Take action to address all EMPr, Method Statements and/or environmental legal non-compliances.

3.2 RESPONSIBILITIES OF CONTRACTOR

- ✓ Familiarize themselves with and understand the content of the Environmental Management Programme;
- ✓ Ensure that contractor's employees understand what is expected during the undertaking of activities on site;
- ✓ Ensure compliance with applicable Occupational, Health and Safety Act (Act 85 of 1993) and Hazardous Substances Act (Act 15 of 1973);
- ✓ Notify the ECO of any activities undertaken which may have a negative impact on the environment;
- ✓ Comply with the ACSA rules and regulations;
- ✓ Comply with rules and regulations, bylaws etc. of the eThekwini Municipality;
- ✓ Ensure that the EMPr is available on site at all times;
- ✓ First aid box, emergency procedure and numbers to be contacted in case of urgency must be made known to all people working on site.

3.3 RESPONSIBILITIES OF ACSA (APPLICANT)

- ✓ Ensure that employees and contractors are fully aware of, and understand the environmental management measures and why it is necessary to comply with them;
- ✓ Ensure that the working environment for the staff is safe and that they are furnished with the appropriate Personal Protective Equipment (PPE);
- ✓ The organization's policies and procedures relating to health, safety and the environment must be made known to the staff on site;
- ✓ Notify the competent authority and other stakeholders in the event of any accidental infringements of the EMPr and to take appropriate remedial action as required by the competent environmental authority.

3.4 RESPONSIBILITIES OF THE ENVIRONMENTAL CONTROL OFFICER (ECO)

The applicant must appoint an independent Environmental Control Officer (ECO) to evaluate and monitor compliance to the EMPr, EMSs, EA, permits and licences through scheduled audits and inspections.

The independent ECO's tasks will include:

- ✓ Develop a compliance checklist which will be used on site to assess compliance with environmental requirements;
- ✓ Prepare an EMPr introduction and environmental awareness training course material/manual and present this course to all stakeholders, prior to them starting any work on site (once-off tool box talks);
- ✓ Keep records of all stakeholders that have attended the awareness training;
- ✓ Conduct monthly audits and inspections of all the working area(s);
- ✓ Compile monthly reports that must include photographic evidence of all observations noted on site. The report must also include recommendations for improvement for all non-compliances identified;
- ✓ Submit the audit report to the applicant as well as authorities once finalized and keep record of such submissions;
- ✓ Report immediately the concerns that require urgent attention to ACSA's Environmental Manager and Project Manager.

4. DETAILS OF THE EAP WHO COMPILED THE REPORT

Full Names	Ms. Vicki King Ms Nokukhanya Gasa
Company Name	Geomeasure Group (Pty) Ltd
Telephone	031 765 1900
Fax	031 765 1935
Email	vicki @geomeasuregroup.co.za khanya@geomeasuregroup.co.za
Years' experience	27 years 9 years
Professional Affiliation	EAPSA and SACNASP
Areas of expertise	EMPs, public participation, EIA, environmental awareness training, facilitation, waste management licence applications

5. IDENTIFICATION OF ENVIRONMENTAL IMPACTS

The following potential environmental impacts have been identified for the construction of the emergency access roads:

5.1 POTENTIAL NEGATIVE IMPACTS DURING CONSTRUCTION

- Soil and groundwater contamination;
- Waste generation;
- Surface excavations, soil stockpiling;
- Soil erosion during rainfall events;
- Possible injury of staff;
- Occurrence of dust;
- Movement of construction vehicles;
- Traffic congestion and disruption during construction;
- Removal of vegetation;
- Transportation of equipment materials and for construction site access;
- Earth moving excavation and infilling;
- Noisy construction activities, such as heavy vehicles, jack hammers, hoists, cranes etc.;
- Refuelling and maintenance of construction vehicles and plant;
- Storage and use of hazardous substances such as fuels, oils, paints, solvents, etc.

5.2 POSITIVE IMPACTS

- Improved access to the “accident scene” during emergencies;
- Decreased reaction time for emergency services;
- Temporary employment opportunities;
- Compliance with the relevant Civil Aviation Authority Regulations (CIA) and ACSA’s safety requirements.

6. ENVIRONMENTAL GUIDELINES AND OBJECTIVES

In order to meet the commitments detailed within the environmental policy, as well as those included within the environmental specifications of this EMPr, the appointed contractor must develop environmental objectives and targets. The objectives and targets must conform to, and comply with, the following criteria:

- The objectives and targets must constitute the overall goals for environmental performance identified in the environmental policy and strategy;
- When establishing objectives and targets, the contractor must take into account the identified environmental aspects and associated environmental impacts, as well as the relevant findings from environmental reviews and/audits;
- Objectives must be reviewed from time to time in view of changed operational circumstances and/or changes in environmental legal requirements, and shall also take into consideration the views of interested and affected parties (I&APs).

6.1 LEGISLATIVE FRAMEWORK

Construction must be according to the best industry practices; this EMPr informs the Contractor of his duties in the fulfilment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by construction activities associated with the project. The Contractor should note that obligations imposed by the approved EMPr are legally binding in terms of environmental statutory legislation and in terms of the additional conditions to the general conditions of contract that pertain to this project.

6.2 APPLICABLE LEGISLATION AND STANDARDS

The Contractor must comply with all South African national and provincial environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation currently applicable to the planning, construction and implementation phases of the project must be complied with. The list of applicable legislation provided below is intended to serve as a guideline only:

- The Constitution of the Republic of South Africa Act 108 of 1996
- National Environmental Management Act 107 of 1998
- National Environmental Management: Protected Areas Act 57 of 2003
- National Environmental Management: Air Quality Act 39 of 2004
- National Environmental Management: Waste Management Act 59 of 2008
- National Forest Act, No 30 of 1998
- Health Act 63 of 1977
- Occupational Health and Safety Act 85 of 1993
- Conservation of Agricultural Resources Act No. 43 of 1983
- Environmental Conservation Act No. 73 of 1989
- National Heritage Resources Act No. 25 of 1999
- National Environmental Management: Biodiversity Act 10 of 2004
- National Water Act 36 of 1998
- Hazardous Substances Act 15 of 1973
- Atmospheric Pollution Prevention Act 45 of 1965
- National Building Regulations and Building Standards Act, No 103 of 1977
- KwaZulu-Natal Heritage Act No. 10 of 1997

The Contractor must establish and maintain procedures to keep track of, document and ensure compliance with environmental legislative changes.

7. GUIDELINES FOR ENVIRONMENTAL MANAGEMENT

7.1 PLANNING PHASE

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
7.1.1 On-site Documentation	The Project Applicant must ensure that a copy of this EMPr and the Environmental Authorisation (EA) are available on site at all times.	Project Applicant	At all times	Duration of the project	ECO
	No worker access must be allowed on site without the relevant permit requirements and personal protective equipment (PPE)	Project Applicant	At all times	Duration of the project	ECO
	A plant destruction permit from the provincial conservation authority Ezemvelo KZN Wildlife in terms of the KwaZulu-Natal Provincial Conservation Ordinance must be obtained for the destruction of the large numbers of A. ecklonii.	Project Applicant	As required	Before construction commences	ECO
7.1.2 Authority Notification	2 weeks written notice must be given to DEA prior to the commencement of any construction activities on site.	Project Applicant/ECO	As required	2 weeks prior to commencement of construction	ECO
7.1.3 Appointment and Duties of Environmental Control Officer	An Environmental Control Officer (ECO) must be appointed 4 weeks prior to the commencement of the construction activities. The name and details of the ECO must be provided to DEA.	Project Applicant	As required	4 weeks prior to commencement of construction	ECO
	The ECO must monitor the site, preferably twice monthly, for the duration of the construction period in terms of this EMPr and environmental authorization.	Project Applicant	Twice monthly	Duration of construction	ECO
	A monthly audit report should be prepared for the Project Applicant, by the ECO.	ECO	Monthly	Duration of construction	ECO
	The ECO must keep records relating to the compliance/ non-compliance with the conditions of the EA and EMPr. Such records must be made available to DEA within 7 days of receipt of written request by DEA for such records.	ECO	As required	Duration of Construction	ECO
	ECO has the responsibility to conduct environmental training to contractors and site managers to ensure that they understand the contents of the EMPr and EA as well as their role in environmental management.	ECO	As required	Duration of construction	ECO
7.1.4 Public Liaison	The Project Applicant must send out correspondence to landowners/neighbours located adjacent to the site notifying them of the	Project Applicant	As required	Prior to commencement of construction	ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	commencement of construction activities. Contact numbers should be also included in the correspondence should landowners wish to make complaints during the construction phase.				
7.1.5 Sensitive area/ working area demarcations	The extent of the construction working area / servitude should be minimised as far as practically possible to ensure that the amount of grassland impacted outside of the road footprint is minimised.	Site Manager	At all times	Prior to commencement of construction	ECO
	The western edge of the KSIA conservation zone must be clearly demarcated using shade cloth prior to construction commencing and considered a no-go area.	Site Manager	At all times	Prior to commencement of construction	ECO
	Once the construction working area has been agreed to by the Environmental Control Officer (ECO), the working area should be clearly demarcated using highly visible material (e.g. danger tape / orange plastic bonnox) prior to construction commencing. This applies to site camps and storage / laydown areas as well.	Site Manager/ ECO	At all times	Prior to commencement of construction	ECO
	The demarcation work must be signed off by the Environmental Control Officer (ECO) before any work commences.	ECO	As required	Prior to commencement of construction	ECO
	Demarcations are to remain until construction and rehabilitation is complete.	Site Manager	At all times	Prior to commencement of construction	ECO
	There must be no impact to the KSIA conservation zone.	Site Manager	At all times	Prior to commencement of construction	ECO
	Access to and from the development area should be either via existing roads or within the construction servitude.	Site Manager	At all times	Prior to commencement of construction	ECO
	Any contractors found working inside the 'No-Go' wetland/river areas (areas outside the construction/ working servitude) should be fined as per a fining schedule/system setup for the project.	Site Manager	As required	Prior to commencement of construction	ECO
7.1.6 Site offices					
7.1.6.1 Location	The site manager and the ECO must decide on the appropriate location of the construction camp/site office prior to moving on to the site (if applicable).	Site Manager/ ECO	As required	Prior to commencement of construction	ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	The site manager must ensure free drainage of run-off from the office/ construction camp to avoid standing water and erosion.	Site Manager	At all times	Prior to commencement of construction	ECO
	The area with the construction camp must occupy a small area as possible.	Site Manager	As required	Prior to commencement of construction	ECO
7.1.6.2 Ablutions	Temporary chemical toilets must be provided at the construction site and must be made available to all staff.	Site Manager	At all times	Prior to commencement of construction	ECO
	Staff must be instructed not to use any other areas within the site for ablutions.	Site Manager	At all times	Prior to commencement of construction	ECO
	A maintenance plan must be created for the servicing of the toilets.	Site Manager	As required	Prior to commencement of construction	ECO
	The construction of long-drop toilets is forbidden.	Site Manager	At all times	Prior to commencement of construction	ECO
	No ablution facilities may be placed close to a water resource.	Site Manager	At all times	Prior to commencement of construction	ECO
7.1.6.3 Stormwater management	Wherever possible, stormwater conveyance outside of the road surface should be via open, grass-lined channels/swales and/or stone-filled infiltration ditches rather than underground piped systems or concrete V-drains.	Site Manager	At all times	Prior to commencement of construction	ECO
	Wherever possible, velocity / energy reduction measures should be established within the open conveyance systems to reduce the velocity at planned outlets.	Site Manager	At all times	Prior to commencement of construction	ECO
	Wherever possible, many stormwater outlets should be favoured over few large. Ideally, the stormwater outlets should be established at regular intervals to reduce the volumes and velocities of flow at outlets. In this regard, discharge via mitre drains should be considered where suitable.	Site Manager	At all times	Prior to commencement of construction	ECO
	All outlets must be designed to dissipate the energy of outgoing flows to reduce point source scouring and erosion risks. In this regard, adequately sized concrete stilling basins/sumps must be installed at all outlets and flow from these stilling basins must fall onto suitably designed gabion reno-mattresses with wing walls. The reno-mattresses must extend an appropriate distance downslope to ensure that erosion risks are minimised.	Site Manager	At all times	Prior to commencement of construction	ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	The outlet reno-mattresses must be established to reflect the natural slope of the surface it is constructed on and are to be located at the natural ground-level.	Site Manager	At all times	Prior to commencement of construction	ECO
	The outlets and associated outlet protection structures should be aligned parallel to contours wherever possible to reduce the gradient of outflows and remain outside of wetlands and their buffer zones where possible.	Site Manager	At all times	Prior to commencement of construction	ECO
	Where stormwater is planned to be discharged into the existing concrete channel above the artificial stormwater wetland, energy dissipation measures should be installed along this channel wherever possible.	Site Manager	At all times	Prior to commencement of construction	ECO
7.1.6.4 Solid Waste Management	Appropriate waste disposal receptacles must be placed within the construction camps/site offices.	Site Manager	At all times	Prior to commencement of construction	ECO
	All contractors must be made aware that they will be required to remove all their waste from site and dispose of legally and that the site manager or the ECO may request to view the safe disposal certificates.	Site Manager/ECO	At all times	Prior to commencement of construction	ECO
	Recycling and the provision of separate waste bins for general and hazardous waste should be encouraged.	Site Manager	At all times	Prior to commencement of construction	ECO
7.1.7 Pollution management	Any sources or potential sources of pollution must be identified by the Project Manager and appropriate measures must be taken to prevent any pollution of the environment.	Site Manager /ECO	As required	Prior to commencement of construction	ECO
7.1.8 Fauna protection	Habitat degradation as well as habitat fragmentation must be minimized through the avoidance of areas not planned for the development	Site Manager/ Contractor	At all times	Prior to commencement of construction	ECO
7.1.9 Hazardous Materials	Potentially hazardous materials must be identified before being brought to the site.	Site Manager	As required	Prior to commencement of construction	ECO
	Safety Data Sheets must be available on site for all hazardous substances.	Site Manager	At all times	Prior to commencement of construction	ECO
	Hazardous substance storage and refueling areas must be bunded and lined (impermeable).	Site Manager	At all times	Prior to commencement of construction	ECO
	These storage areas must be clearly sign posted as such and access must be strictly controlled.	Site Manager	At all times	Prior to commencement of construction	ECO
	Emergency procedures for the handling of such substances during incidents	Site Manager	At all times	Prior to commencement of construction	ECO

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	must be available on site.				
	Staff working with such substances must be trained and be competent to deal with emergency situations.	Site Manager	At all times	Prior to commencement of construction	ECO
	A spill kit must be available on site prior to construction taking place.	Site Manager	At all times	Prior to commencement of construction	ECO
	A first aid kit must be made available on site.	Site Manager	At all times	Prior to commencement of construction	ECO
7.1.10 Worker Conduct	The site manager and any contractors must understand the contents of this EMPr and be proved competent in implementing its requirements.	Site Manager/contractor	At all times	Prior to commencement of construction	ECO
	Construction workers must be made aware of their specific responsibilities in terms of environmental impacts i.e. controlling noise levels, reducing dust.	Site Manager/contractor	At all times	Prior to commencement of construction	ECO
	Construction workers must be made aware that no alcohol or drugs will be allowed on site and no workers under the influence will be permitted on site.	Site Manager/contractor	At all times	Prior to commencement of construction	ECO
	Construction workers must be made aware that firearms or traditional weapons will not be allowed on site.	Site Manager/contractor	At all times	Prior to commencement of construction	ECO
	Construction workers must be made aware that no fires will be permitted on site.	Site Manager/contractor	At all times	Prior to commencement of construction	ECO
	All site vehicles must be inspected and be found to be in an acceptable condition before accessing site.	Site Manager	At all times	Prior to commencement of construction	ECO
7.1.11 Heritage resources	Road alignments, quarries and borrow pits impacting on known heritage sites must be avoided.	Site Manager/contractor	At all times	Prior to commencement of construction	ECO
	In the event of a heritage object being unearthed, construction work that could impact on it should be stopped and the input of specialists in the field should be obtained.	Site Manager/contractor	At all times	Prior to commencement of construction	ECO
	Heritage objects must not be moved or destroyed without the necessary permits from the South African Heritage Resources Agency (SAHRA).	Site Manager/contractor	At all times	Prior to commencement of construction	ECO
	Compliance with the National Heritage Resources Act must be ensured at all times.	Site Manager/contractor	At all times	Prior to commencement of construction	ECO

7.2 CONSTRUCTION PHASE

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
7.2.1 Asphalt, Bitumen and Paving	Overspray of bitumen products outside of the road surface and onto roadside vegetation must be prevented.	Site Manager/contractor	At all times	During construction	Site Manager
	Stone chip/gravel excess must not be left on road/paved area verges. This must be swept / raked into piles and removed to an area approved by the site manager.	Site Manager/contractor	At all times	During construction	Site Manager
	Drums / tanks must be safely and securely stored in the construction camp.	Site Manager/contractor	At all times	During construction	Site Manager
	Water quality from runoff from newly / fresh bitumen surfaces must be monitored by the site manager and remedial actions taken where necessary.	Site Manager/contractor	At all times	During construction	Site Manager
7.2.2 Stormwater management	Ensure that excavated and stockpiled soil material is stored covered on the higher lying areas of the site and not in any storm water run-off channels or any other areas where it is likely to cause erosion or where water would naturally accumulate.	Site Manager/contractor	As required	Construction	ECO and site manager
	Drip trays (minimum of 110cm deep) must be placed under all vehicles that stand on site over night or whenever necessary.	Site Manager/contractor	As required	Construction	ECO and site manager
	Concrete mixing areas must be designated and located away from any water resources.	Site Manager/contractor	As required	Construction	ECO and site manager
	Arrange secondary containment for the storage areas of removed contaminated paving bricks and soils to prevent further contamination.(i.e plastic lined temporary mini-bunds).	Site Manager/contractor	As required	Construction	ECO and site manager
	Construction activities should preferably take place during the dry summer months to prevent soil erosion caused by heavy thunderstorms.	Site Manager/contractor	At all times	Construction	ECO and site manager
	The contractor must ensure that the storage and mixing of chemicals on site on site is undertaken on a lined / bunded area.	Site Manager/contractor	At all times	Construction	ECO and site manager
	A hard-standing, impermeable area and and/or drip trays must be used for refueling.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Litter generated by the construction crew must be collected in rubbish bins with lids and regularly disposed of at registered sites.	Site Manager/contractor	At all times	Construction	ECO and site manager

	Storm water management plans must be approved by the local authority prior to commencement of construction activities.	Site Manager/contractor	As required	Construction	ECO and site manager
7.2.3 Stormwater Wetland management	No contaminated runoff must be allowed to reach any wetland system within and around the construction Site.	Site Manager/contractor	As required	Construction	ECO and site manager
	Where any disturbance of the soil takes place, these areas should be stabilized and any alien plants that establish should be cleared and regular follow up should be undertaken.	Site Manager/contractor	As required	Construction	ECO and site manager
	It is recommended that species identified during the construction phase are removed immediately within the wetlands with the assistance of a qualified specialist.	Site Manager/contractor	As required	Construction	ECO and site manager
	No storage of construction materials or chemicals must be allowed within the proximity of any wetland.	Site Manager/contractor	As required	Construction	ECO and site manager
	The Construction Site Manager’s Site supervisor must oversee that construction activities are being undertaken as per requirements of the environmental authorization, EMPr and all applicable ACSA Environmental requirements.	Site Manager/contractor	As required	Construction	ECO and site manager
7.2.3 Emergency Preparedness	Develop Emergency Response Plans for possible scenarios during construction.	Site Manager/contractor	As required	Construction	ECO and site manager
	A spill management procedure as well as spill kit must be available on site;	Site Manager/contractor	As required	Construction	ECO and site manager
	Spills must be cleared up immediately and contaminated soils must be taken to the nearest registered landfill site. Proof of safe disposal must be kept on file for record purposes	Site Manager/contractor	As required	Construction	ECO and site manager
	A register of all incidents shall be kept on file in order to ensure that all incidents that take place on site are recorded and dealt with appropriately	Site Manager/contractor	As required	Construction	ECO and site manager
7.2.4 Air Quality	Wet all unprotected cleared areas and stockpiles with water to suppress dust pollution.	Site Manager/contractor	As required	Construction	ECO and site manager
	Ensure that no refuse wastes are burnt on the premises or on surrounding premises.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Soil stockpiles which have the potential of generating dust must be covered with tarpaulin/plastic sheeting.	Site Manager/contractor	As required	Construction	ECO and site manager
7.2.5 Visual Impact	Ensure that no refuse or builders’ rubble generated on the premises be placed, dumped or deposited on adjacent/surrounding	Site Manager/contractor	At all times	Construction	ECO and site manager

	properties including road verges, roads or public places and open spaces during or after the construction period of the new development.				
	The Site must be kept clean to minimize negative visual impacts.	Site Manager/contractor	At all times	Construction	ECO and site manager
7.2.6 Waste Management and Removal	All solid waste must be disposed of regularly at an approved registered landfill site.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Hazardous waste must be disposed at a registered landfill site, proof of disposal must be maintained on file.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Copies of the disposal waybills must be kept for proof of correct disposal.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Separation of waste must be encouraged on site, i.e. glass, paper and plastic must be separated.	Site Manager/contractor	At all times	Construction	ECO and site manager
	All the waste generated during the construction of the site must be stored in area that is able to prevent further possible contamination of the surrounding environment.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Supply sufficient and clearly labelled waste bins on site and empty them regularly.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Regular clearing/maintenance of bins is required.	Site Manager/contractor	At all times	Construction	ECO and site manager
7.2.7 Noise Pollution	Institute noise control measures throughout the construction phase for all applicable activities, including the construction times.	Site Manager/contractor	As required	Construction	ECO and site manager
	Limit the working hours during the construction phase between at least 07:00 and 18:00 during weekdays. No construction work should occur during weekends.	Site Manager/contractor	At all times	Construction	ECO and site manager
	During the construction phase, machinery must maintained regularly to ensure that malfunctions are noted at an early stage before negatively impacting the environment;	Site Manager/contractor	At all times	Construction	ECO and site manager
	Employees must keep noise levels to a minimum during construction activities and they must be aware that too much noise could impact neighbouring properties.	Site Manager/contractor	At all times	Construction	ECO and site manager
7.2.8 Health and Safety	Relevant temporary signage must be erected on site and the surroundings to advise people of the development taking place and acceptable speed limits.	Site Manager/contractor	As required	Construction	ECO and site manager
	Construction staff must be provided with the relevant Personal Protective Equipment (PPE).	Site Manager/contractor	As required	Construction	ECO and site manager

	Training on the handling of hazardous substances and emergency preparedness must be provided to staff on site to ensure that they know how to deal with emergencies.	Site Manager/contractor	At all times	Construction	ECO and site manager
	24 hour security personnel should be stationed at the access point in order to control access to the Site	Site Manager/contractor	At all times	Construction	ECO and site manager
	Construction Site Manager must ensure compliance with Occupational Health & Safety Act, No 85 of 1993 to ensure the health and safety of the contact workers as well as the staff of ACSA.	Site Manager/contractor	At all times	Construction	ECO and site manager
7.2.9 Fauna and flora	Removal of any flora on Site shall be restricted to the area required to execute the works and no vegetation will be cleared outside the construction area.	Site Manager/contractor	At all times	Construction	ECO and site manager
	No fauna should be harmed during construction activities. Identified fauna must be relocated to a safe area with assistance of a specialist.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Areas that have been identified to be sensitive and that will not be disturbed by the proposed development must be fenced and signposted as such.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Collection of any plants outside of the areas demarcated for development is not allowed.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Before machinery moves on to site, it must be confirmed that the supervising engineer understands the extreme sensitivity of specially protected areas of Conservation significance along the access road route.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Training must be provided to drivers of heavy machinery, and all staff, regarding the Sensitive vegetation before any work starts.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Further habitat degradation as well as habitat fragmentation must be minimized through the avoidance of areas not planned for the development	Site Manager/contractor	At all times	Construction	ECO and site manager
	Rehabilitation should commence as soon as each section of the road has been completed.	Site Manager/contractor	At all times	Construction	ECO and site manager
7.2.10 Vehicle access	Person and vehicle access should be restricted during construction so as to control access to potential dangerous excavations and materials on site.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Adequate signage and warnings must be erected to control traffic at the construction area.	Site Manager/contractor	At all times	Construction	ECO and site manager

	Ensure that construction vehicles adhere to the speed limits on all public roads.	Site Manager/contractor	At all times	Construction	ECO and site manager
	All temporary or permanent traffic calming measures, if required, must be erected according to the appropriate municipal specifications governing road works.	Site Manager/contractor	At all times	Construction	ECO and site manager
7.2.11 Soil management	Soil stockpiles should be located away from drainage lines, watercourses and areas of temporary inundation.	Site Manager/contractor	At all times	Construction	ECO and site manager
	All soil excavated during construction must, where practical, be separated into topsoil and subsoil. Subsoil must be used for backfilling and topsoil for landscaping and rehabilitation of disturbed areas.	Site Manager/contractor	At all times	Construction	ECO and site manager
	The top 60-600 mm of topsoil should be stripped off on all areas in which construction is planned to take place.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Soil stockpiles must not exceed 2m and must be covered at all times to avoid erosion as dust generation.	Site Manager/contractor	At all times	Construction	ECO and site manager
	All surplus excavated material should be disposed of in a suitable place and manner to prevent translocation of invasive plant species.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Clearing and grubbing should be undertaken only in the areas to be worked in. This can be achieved by phasing or sequencing construction.	Site Manager/contractor	At all times	Construction	ECO and site manager
	All erosion control works should be regularly inspected, especially after a rainfall event	Site Manager/contractor	At all times	Construction	ECO and site manager
	The stockpiles may only be placed within demarcated stockpile areas, which must fall within the demarcated construction area. The contractor shall, where possible, avoid stockpiling materials in vegetated areas that will not be cleared.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Stockpiled soils are to be kept free of weeds and are not to be compacted. The stockpiled soil must be kept moist using some form of spray irrigation on a regular basis as appropriate and according to weather conditions.	Site Manager/contractor	At all times	Construction	ECO and site manager
	If soil stockpiles are to be kept for more than 3 months they must be hydroseeded.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Stockpiles of construction materials must be clearly separated from soil stockpiles in order to limit any contamination of soils.	Site Manager/contractor	At all times	Construction	ECO and site manager

7.2.12 Soil erosion management	Soil erosion on Site must be prevented during all phases of the development.	Site Manager/contractor	At all times	Construction	ECO and site manager
	In instances where erosion becomes a negative impact during the construction phase, diversion berms and drains must be constructed to divert run-off away from exposed areas.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Soil stockpiles must not be placed to a water resource and must be covered at all times.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Erosion control measures to be implemented in areas sensitive to erosion such as water supply points, edges of slopes etc.	Site Manager/contractor	At all times	Construction	ECO and site manager
	These measures could include the use of sand bags, hessian sheets, retention or replacement of vegetation.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Wherever possible, existing vegetation cover on the development site should be maintained during the construction phase. The unnecessary removal of groundcover from slopes must be prevented, especially on steep slopes which will not be developed.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Clearing activities must only be undertaken during agreed working times and permitted weather conditions. If heavy rains are expected, clearing activities should be put on hold. In this regard, the contractor must be aware of weather forecasts.	Site Manager/contractor	At all times	Construction	ECO and site manager
	All bare slopes and surfaces to be exposed to the elements during clearing and earthworks must be protected against erosion using rows of hay-bales, sandbags and/or silt fences aligned along the contours and spaced at regular intervals (e.g. every 2m) to break the energy of surface flows.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Once shaped, all exposed/bare surfaces and embankments must be re-vegetated immediately as per the construction phase re-vegetation plan.	Site Manager/contractor	At all times	Construction	ECO and site manager
	All temporary erosion and sediment control measures must be monitored for the duration of the construction phase and repaired immediately when damaged. All temporary erosion and sediment control structures must only be removed once vegetation cover has successfully recolonised the affected areas.	Site Manager/contractor	At all times	Construction	ECO and site manager

	After every rainfall event, the contractor must check the site for erosion damage and rehabilitate this damage immediately. Erosion rills and gullies must be filled-in with appropriate material and silt fences or fascine work must be established along the gulley for additional protection until vegetation has re-colonised the rehabilitated area.	Site Manager/contractor	At all times	Construction	ECO and site manager
7.2.13 Water quality	Mixing/decanting of all chemicals and hazardous substances must take place either on a tray or on an impermeable surface. Waste from these should then be disposed of to a registered disposal Site.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Every effort should be made to ensure that any chemicals or hazardous substances do not contaminate the soil or groundwater on Site.	Site Manager/contractor	At all times	Construction	ECO and site manager
	The Contractors on Site must ensure that dirty water is separated from clean water through the implementation of the stormwater management plan.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Emergency contact numbers must be supplied on Site in order to deal with spillages and contamination events.	Site Manager/contractor	At all times	Construction	ECO and site manager
7.2.14 Hazardous substances	Hazardous substances or materials must be transported in sealed containers or bags	Site Manager/contractor	At all times	Construction	ECO and site manager
	The MSDS for any hazardous substance on Site must be available at the Site office/ construction camp at all times	Site Manager/contractor	At all times	Construction	ECO and site manager
	Staff working with such substances must be trained and be competent to deal with emergency situations.	Site Manager/contractor	At all times	Construction	ECO and site manager
	The proper storage and handling of hazardous substances (e.g. fuel, oil, cement, etc.) needs to be administered.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Mixing and/or decanting of all chemicals and hazardous substances must take place on a tray, shutter boards or on an impermeable surface and must be protected from the ingress and egress of stormwater.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Drip trays should be utilised at all dispensing areas.	Site Manager/contractor	At all times	Construction	ECO and site manager
	No refuelling, servicing or chemical storage should occur within 15m of the artificial wetland.	Site Manager/contractor	At all times	Construction	ECO and site manager
	No vehicles transporting concrete, asphalt or any other bituminous product may be washed on site.	Site Manager/contractor	At all times	Construction	ECO and site manager

	Vehicle maintenance should not take place on site unless a specific bunded area is constructed for such a purpose.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Hazardous storage and refuelling areas must be bunded prior to their use on site during the construction period following the appropriate SANS codes. The bund wall should be high enough to contain at least 110% of any stored volume. The surface of the bunded surface should be graded to the centre so that spillage may be collected and satisfactorily disposed of.	Site Manager/contractor	At all times	Construction	ECO and site manager
	All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at a registered hazardous landfill site.	Site Manager/contractor	At all times	Construction	ECO and site manager
	An emergency spill response procedure must be formulated and staff are to be trained in spill response. All necessary equipment for dealing with spills of fuels/chemicals must be available at the site. Spills must be cleaned up immediately and contaminated soil/material disposed of appropriately at a registered site.	Site Manager/contractor	At all times	Construction	ECO and site manager
	44-gallon drums must be kept on site to collect contaminated soil. These should be disposed of at a registered hazardous waste site.	Site Manager/contractor	At all times	Construction	ECO and site manager
7.2.15 Safety and Security	A security guard should be stationed at the access point in order to control access to the Site.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Construction Site Manager must ensure compliance with Occupational Health & Safety Act, No 85 of 1993 to ensure the health and safety of the contact workers as well as the staff of ACSA.	Site Manager/contractor	At all times	Construction	ECO and site manager
7.2.16 Rehabilitation/ Handover	All structures comprising the construction camp/site offices on site must be removed.	Site Manager/contractor	At all times	Construction	ECO and site manager
	The area that previously housed the site offices/ construction camp must be checked for spills of substances such as oil etc.	Site Manager/contractor	At all times	Construction	ECO and site manager

	All surfaces of the construction footprint areas must be checked for waste products i.e. oil or fuel spills must be cleared from the Site and disposed of at a licensed Landfill.	Site Manager/contractor	At all times	Construction	ECO and site manager
	If re-vegetation of exposed surfaces cannot be established immediately due to phasing issues, temporary erosion and sediment control measures must be maintained until such a time that re-vegetation can commence.	Site Manager/contractor	At all times	Construction	ECO and site manager
	The Site Manager must notify the ECO once the site close-out has taken place in order for the ECO to conduct a site close-out inspection.	Site Manager/contractor	At all times	Construction	ECO and site manager
	The construction sites must be cleared of all litter.	Site Manager/contractor	At all times	Construction	ECO and site manager
	After the removal of infrastructure and associated foundations, the site must be ploughed to break up and aerate compacted soils and nutrients such as compost must be added to the soil to encourage vegetation re-growth.	Site Manager/contractor	At all times	Construction	ECO and site manager
	All left over building materials must be removed from the Site.	Site Manager/contractor	At all times	Construction	ECO and site manager
	Fences, barriers and demarcations associated with the construction phase are to be removed from the Site.	Site Manager/contractor	At all times	Construction	ECO and site manager
	If the artificial wetland is disturbed during the construction phase, such disturbance (infilling, excavation, compaction etc.) must be rehabilitated immediately. All foreign material must be removed and disposed, the natural ground level reinstated (reshaping) and the disturbed areas re-vegetated.	Site Manager/contractor/ specialist	At all times	Construction	ECO, specialist and site manager
	The wetland must at all times be protected and kept in a good condition in order to sustain wetland ecosystems.	Site Manager/contractor	At all times	Construction	ECO and site manager

7.3 OPERATION PHASE

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
7.3.1 Site Rehabilitation and re-vegetation	Topsoil excavated as part of site preparation must be replaced after construction activities for re-vegetation purposes.	Contractor	As required	Immediately after construction	ACSA Representative
	It must be ensured that no further harm occurs to the fauna and flora on site.	Project Applicant	At all times	Operation	ACSA Representative
	Where suitable, previous fauna habitats must be restored on areas not disturbed by the development.	Project Applicant	As required	Immediately after construction	ACSA Representative/Ecological specialist
7.3.2 Alien vegetation	All alien invasive vegetation that colonise the construction site must be removed, preferably by uprooting. The contactor should consult the ECO regarding the method of removal.	Project Applicant	As required	Immediately after construction	ACSA Representative/ Ecological specialist
	All bare surfaces across the construction site must be checked for IAPs every two weeks and IAPs removed by hand pulling/uprooting and adequately disposed.	Project Applicant	As required	Immediately after construction	ACSA Representative/ Ecological specialist
	Herbicides should be utilised where hand pulling/uprooting is not possible. The ECO must be consulted in this regard.	Project Applicant	As required	Operation	ECO/ ACSA Representative/ Ecological specialist
7.3.3 Roads and stormwater infrastructure maintenance	Regular monitoring along the roads must be conducted during the roads operational phase to ensure that rehabilitation measures have been successful and to observe whether unstable cut and fill areas need to be stabilized, especially after heavy rainfall events.	Project Applicant	As required	Operation	ACSA Representative
	ACSA is responsible for the maintenance of stormwater control measures in order to ensure that no damming or ponding of water takes place after a rainfall event.	Project Applicant	As required	Operation	ACSA Representative
	Stormwater management structures must be maintained and cleaned to minimize erosion that could result in the siltation of wetland systems. This requires regular inspection of the stormwater drainage system to confirm its functionality and instituting maintenance as and when required to remove any blockages.	Project Applicant	As required	Operation	ACSA Representative
7.3.4 Visual impacts	The site must be kept in a neat and orderly manner at all times.	Project Applicant	As required	Operation	ACSA Representative
	The site must be appropriately fenced and access be controlled at all times.	Project Applicant	As required	Operation	ACSA Representative
7.3.5 Signage	Appropriate signage is	Project Applicant	At all times	Operation	ACSA

Aspect	Description of Action	Person Responsible for Implementing Action	Frequency	Period of Implementation	Monitor
	required to be placed at the emergency access gate specifying that the roads are only for use during emergency situations.				Representative
7.3.6 Access control	Access must be only allowed for the relevant emergency personnel and only during the required circumstances.	Project Applicant	As required	Operation	ACSA Representative

8. ENVIRONMENTAL AWARENESS TRAINING

The material/source of information for the EAP will be the approved Environmental Management Programme (EMPr), as well as other relevant specialist reports. The environmental awareness plan is detailed in the sections below:

8.1 CONTENT AND DELIVERY OF ENVIRONMENTAL TRAINING SESSION

The environmental training session will be carried out on site with all labourers and Contractors present. The session will be delivered in languages familiar to the workforce in order to ensure that full understanding the contents of the session is achieved.

The session will cover the following topics:

- The Environmental Management Programme (EMPr)
- What is the environment?
- What makes up the environment?
- Why is it so important to protect the environment?
- How can the environment be damaged?
- How can you protect the environment?

The training session will comprise a presentation with colourful posters and diagrams describing the above-mentioned issues. The information in the presentation will be presented in the languages familiar to the workforce. The information on presentation will be duplicated in hard copy hand-outs / brochures which are given to each member of the workforce to keep.

The session will be interactive and questions and discussion from the workforce is encouraged.

8.2 INDUCTION

All full time staff and contractors are required to attend an induction session, employees are inducted when they start working at the airport and thereafter on a continuous basis. Any contractor who performs work at the airport is also required to undergo the respective induction training. Environmental issues and aspects related to the operation of the site are addressed in induction sessions.

All environmental impacts and aspects and their mitigating measures will be discussed, explained and communicated to employees. The induction sessions will be modified according to the level of employee attending the induction session, so that all employees gain a suitable understanding of environmental issues and pollution.

8.3 ENVIRONMENTAL MEETINGS

Environmental meetings can be held with management, and supervisors and/or employee representatives. This will take the form of an open discussion between the site manager and these individuals. The symposiums will aid in environmental awareness being generated at all levels, as well as assist in defining all and identifying new environmental issues, concerns and potential pollution sources.

8.4 IN-HOUSE TRAINING

In-house training sessions may be held with relevant employees on a daily basis through the toolbox talks. Different topics may be covered during these sessions and will allow for employees to participate in determining what the environmental issues and concerns are with regard to their specific occupation. Education with regard to environmental incident reporting must be discussed during these sessions.

8.5 ON THE JOB TRAINING

On the job training is an essential tool in environmental and safety awareness. Employees will be given details of the expected environmental issues and concerns specifically related to the type of work they are involved in. Employees will be trained on how to respond if an environmental problem or source of environmental pollution arises. The training must be on-going, and all new employees be provided with the same standard of training as the existing employees.

8.6 FIRST AID AND FIREFIGHTING TRAINING

Some employees may be expected to attend First Aid and Firefighting Training with an accredited service provider, the training will ensure that the staff on site is aware of the requirements necessary to be undertaken should there be an incident/ emergency on site. Training certificates must be on the safety file and be up to date.

8.7 COMPLAINTS REGISTER AND ENVIRONMENTAL INCIDENT BOOK

Any complaints received must be registered and recorded by the responsible person on site. The complaint must be brought to the attention of the site manager, who will respond accordingly. The following information will be recorded:

- Name of complainant and their contact details;
- Time, date and nature of the complaint;
- Response and investigation undertaken; and
- Actions taken and by whom.

All complaints received will be investigated and a response (even if pending further investigation) is to be given to the complainant within 7 days.

8.8 ENVIRONMENTAL MONITORING

Environmental monitoring of the construction of the proposed development must be undertaken by the Environmental Control Officer (ECO) preferably twice a month. Monitoring is undertaken to ensure compliance with all aspects of the EMPr and is undertaken using a checklist which consolidates all the requirements of the Environmental Authorisation, the EMPr, and the specialist studies. Monthly audit reports will be sent to DEA throughout the construction period and a final close out audit will be undertaken once construction has been completed.

In order to facilitate communication between the ECO, Resident Engineer (RE) and Contractor, it is important that a suitable chain of command is structured that will ensure that the ECO's recommendations have the full backing of the project team before being conveyed to the Contractor. In this way, penalties as a result of non-compliances with the EMPr may be justified as failure to comply with instruction from the highest authority.

8.9 NON-COMPLIANCE WITH THE EMPR

Difficulties may be encountered with carrying out mitigation measures that could result in future non-compliance. The Contractor shall put in place procedures to motivate staff members to comply with the EMPr and to deal with acts of non-compliance, or damage to the environment. Penalties for non-compliance need to be discussed with the Contractor at the earliest stage (during the Pre-Construction Meeting).

It should be noted that compliance with the EMPr will become legally binding once the EMPr is approved by DEA. Non-compliance is deemed to be an offence in terms of the National Environmental Management Act and the applicant may be liable for a fine of up to R10 million or 10 years in prison, or both.

9. CONCLUSION

The lifespan of the road cannot be defined currently as the airport is relatively new, no required specifications can be made during this time in terms of decommissioning. It is therefore recommended that prior to decommissioning of the road in the future, a detailed decommissioning EMPr be prepared that can reassess the potential environmental and socio-economic impacts at that particular period of time.

That decommissioning EMPr should be based on the construction EMPr as the impacts and mitigation measures will be very similar with significant focus on remediation and rehabilitation. Specifications applicable to the Developer and the Contractor would also need to be defined in the decommissioning EMPr based on the environmental, social and economic considerations at the time.

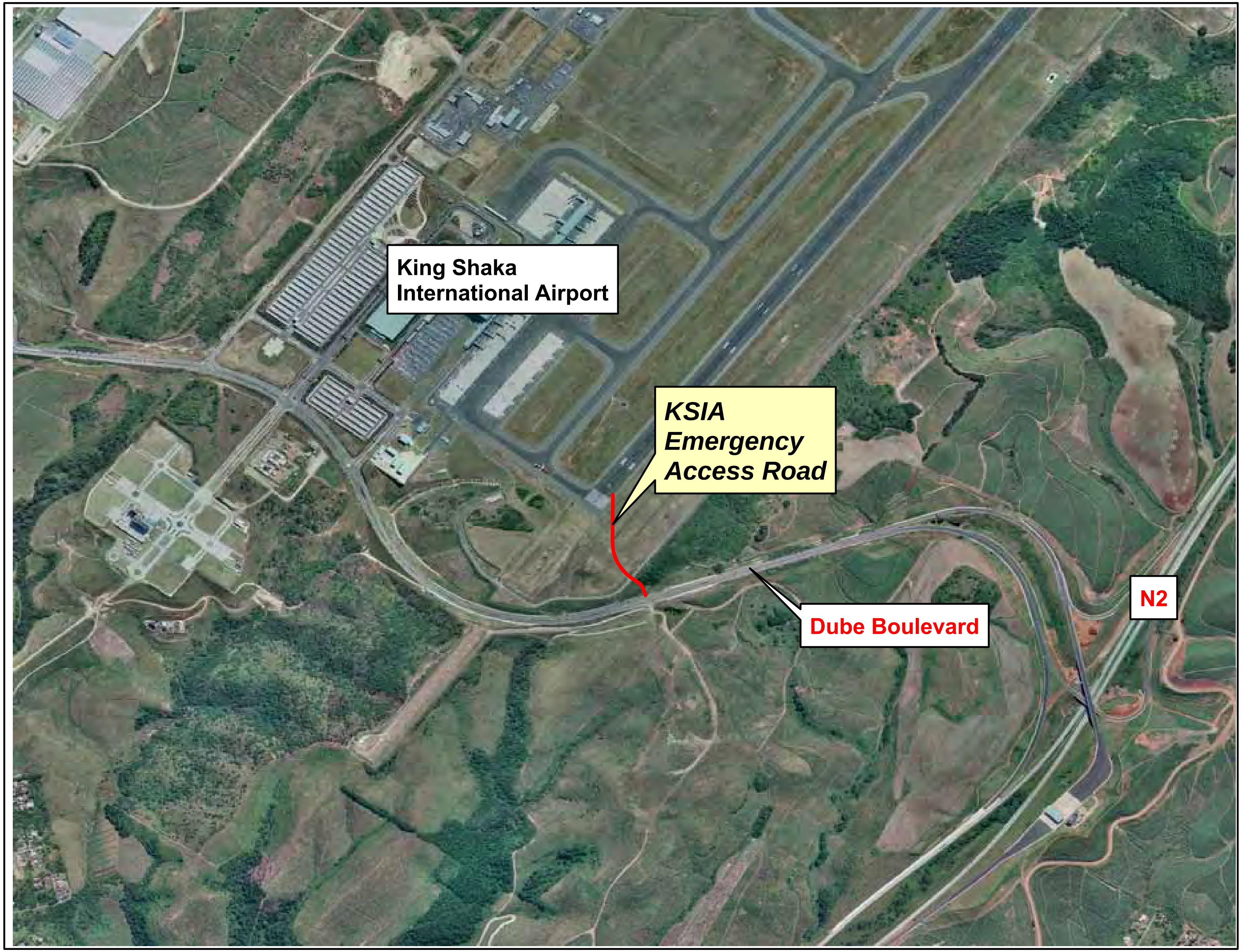
Prepared by

Ms. Vicki King
Senior Environmental Consultant- Geomeasure Group (Pty) Ltd

Ms Nokukhanya Gasa
Environmental Consultant-Geomeasure Group (Pty) Ltd

APPENDIX A

SITE PLAN



Digital Coverage from eThekwini Metro

Legend:

(KSIA Emergency Access Road

GEOMEASURE GROUP

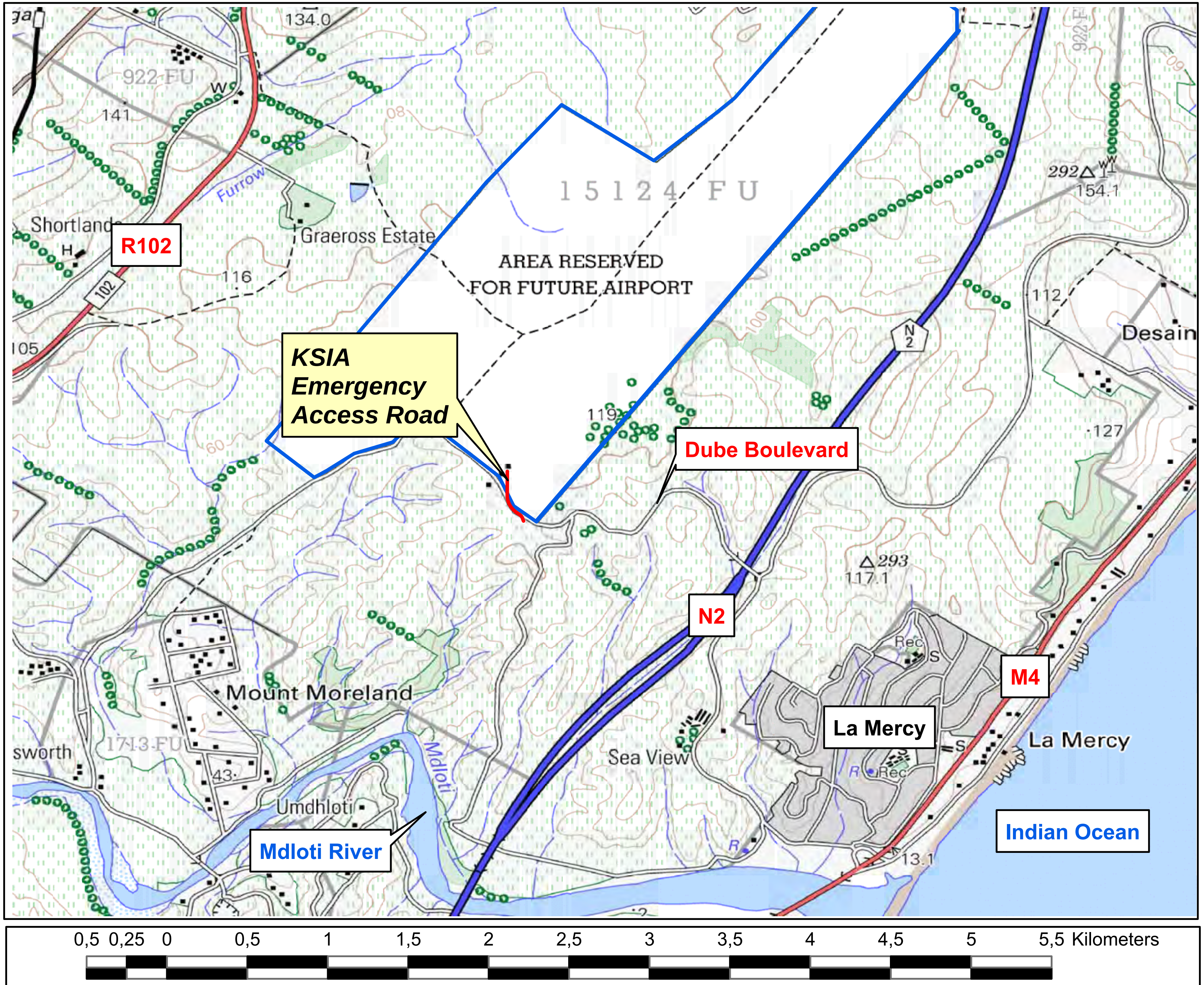
KSIA EMERGENCY ACCESS ROAD

SITE PLAN

DWG NO. 2017/162
Appendix: B

APPENDIX B

LOCALITY MAP



1 : 50 000 Digital Coverage from Chief Director: Surveys and Mapping

Legend:

▭	Approximate KSIA Boundary
(	KSIA Emergency Access Road

GEOMEASURE GROUP

KSIA EMERGENCY ACCESS ROAD

LOCALITY PLAN

DWG NO. 2017/162
Appendix: A

APPENDIX C

CV OF EAP

GEOMEASURE GROUP
Groundwater & Environmental Consultants

Reg. 2000/014164/07

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Kempton Park, 1619
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Curriculum Vitae

Vicki King

Title

Principle Scientist

Education

BSc in Biological Sciences and Geography
University of Birmingham United Kingdom
Masters in Environmental Law (LLM)
University of KwaZulu-Natal
Environmental Lead Auditor course
Potchefstroom University - 2000

Professional Associations

EAPSA Certified Environmental Practitioner
Registered Professional Natural Scientist
Member of the International Association for Impact Assessment
Member of the South African Association of Ecologists and Environmental Scientists
Member of the Environmental Law Association of SA
Member of Institute for Waster Management South Africa and the Institute of Directors

Languages

English

Employment History

Vicki has been working as an independent environmental consultant for over 22 years, during this time, she has undertaken or project managed over 450 environmental projects. She ran the Durban office of WSP Walmsley for 13 years and reviewed every technical document produced in the office during this time. She set up MEC in 2006 and now undertakes predominantly review, management systems, training, auditing and advisory work, calling on her many years experience in the field.

Fields of Experience

- Environmental Law
- All aspects of Integrated Environmental Management include management systems (ISO 14000)
- Scoping Studies
- EMPs
- EMPRs (mining industry)
- Environmental auditing and monitoring
- Particular interest lies in corporate governance and sustainable development within the industrial sector.

Curriculum Vitae

Vicki King

Related Projects

Corporate Governance

- Verification audit for McAlpine's Annual Sustainability Report at 4 sites in UK (industrial, retail, infrastructure and mining).
- Sustainability Training course (3 days).

Environmental Impact Assessment

- Assessment of three sites for project development in the Eastern Transvaal.
- EIA for Pegasus Coal mine, Trans-Natal Corp.
- EIA and management plan for housing development in Munster, Natal, Permprop.PEIA for Sengwa Colliery in Zimbabwe, Riozim.
- EIA and Management plan for the Northern Feeder Pipeline, Umgeni Water
- Full EIA for the Gokwe North Coal Mine in Zimbabwe for Rio Tinto Zimbabwe, 1993 - 1997, Project Leader.
- Environmental Scoping Study for an SRU and SCOT at the SAPREF Refinery on the KZN South Coast.
- Full EIA for the Murowa Diamond mine in Zimbabwe for Rio Tinto, 1999 to 2002, Project Leader.
- Scoping Study for the proposed pilot bitumen plant at Engen Refinery
- EIA for the Durban Solid Waste CDM project (Landfill gas to energy)
- Scoping Study for the SAPREF Clean Fuels Project
- Scoping study for the Engen Clean Fuels Project
- Environmental impact assessment for the Sappi Saiccor Expansion project.
- Assistance to the KZN Provincial Department of Agriculture and Environmental Affairs with the closure of files and issuing of RODs for 34 applications.
- Environmental Impact Assessment for the Bulbul Drive Gas recovery project.
- Environmental Impact Assessment for the Inkwazi Housing Development in Kwadukuza Municipality.
- Environmental Impact Assessment for the Kwadukuza Landfill upgrade project.
- S24G application and EMPr for the eThembeni Cemetery in Pietermaritzburg.

Environmental Management Plans

- Environmental Management Plan for the Courtyards Shopping Centre in KwaZulu Natal.
- Environmental Management Plan for the Huntsman Tioxide offshore pipeline replacement at Umbogintwini.
- Review of the SAPREF ISO 14000 system.
- Environmental management plans for the Nutri-Flo Spoornet sites.
- Strategic Environmental Assessments
- Strategic Environmental Assessment for the location of marinas, ski lanes and bathing areas for the Government of Mauritius
- SEA for development of a Tourism Strategy for Kwadukuza Local Municipality (in progress)
- Strategic Environmental Assessment to identify Industrial land in Ilembe District.

Catchment studies

- Independent Chair for the Mariannhill landfill Monitoring Committee.
- Ongoing consultation for DCLM at the Kwadukuza Landfill site in KZN.
- Project Management of the Leachate treatment solution project for DCLM.

Environmental Auditing

- Environmental audit at the Engen Storage Facility in Richards Bay.
- Environmental Audit at the Island View Bulk Storage Facility in Durban.
- Shadow audit for Diverseylever with URS Dames and Moore in Durban.
- HSE Report Verification for the McAlpine Group in United Kingdom.
- Environmental monitoring for the Umgeni South Coast Pipeline construction.
- Environmental legal audit for the three NPC sites around KZN.
- Landfill permit audits for the Bulbul Drive H:h landfill site.
- Environmental Legal Audit for Somkhele Coal Mine.
- Environmental Legal Audit for Zululand Anthracite Colliery.

Environmental Training

- Environmental Training for Contractors on the Booth Road Development, Durban.
- EIA Review training for eThekweni Municipal officials
- Environmental Law training for Metro Parks Department

- Sustainability Training for Capcan Africa (various clients).
- Real World EIA training for Consultants and Industry.

Due Diligence Studies

- Due diligence study for privatisation of the oil industry in Zambia.
- Due diligence for acquisition of various industrial sites in KZN.
- Due Diligence for 'Project Pipe' in Howick KwaZulu-Natal.

General Environmental Projects

- Seychelles Chapter in World Summit Sustainable Development book in order to provide a constructive analysis of the application of Environmental Assessment.
- Air quality abatement for Auto Reclaim.
- Strategic planning for the identification of Major Hazardous Installations in eThekwini.
- Duty of Care study for Sappi Saiccor industrial Modernisation Project.
- Baseline environmental assessment for a housing development in KwaZulu-Natal.

Closure Planning

- Closure Plan for Assmang Manganese, Cato Ridge.

Pasture Management

- Preparation of a pasture management plan on various equestrian properties in Assagay.
- Ongoing management of several equestrian properties in Assagay.

Environmental Review

- Review of the EIA for the proposed Xolobeni Mining Project.
- Review of Various mining applications for GCS Consultants
- Review of Several projects for Acer Africa
- Review of all Environmental Projects for Geomeasure Group.

GEOMEASURE GROUP
Groundwater, Environmental & Geotechnical Consultants

Reg. 2000/014164/07

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Curriculum Vitae

Nokukhanya Gasa

Title
Environmental Scientist

Education
BSc Honors Environmental Management
UNISA

BSocSci Geography and Environmental Management
University of KwaZulu Natal

Higher Certificate in Adult Basic Education
UNISA

Professional Associations
International Association for Impact Assessments (IAIAsa)

Languages
English
IsiZulu

Employment History

- Khanyiseleka Adult Education Centre: February 2005 to 07 February 2010: Part time educator
- Pravin Amar Development Planners: February 2010 to November 2010: Environmental Management Intern
- GCS Pty (Ltd): December 2010 to May 2012: Junior Environmental Scientist
- Geomeasure Group (Pty) Ltd. : June 2012 to date : Environmental Scientist

Fields of Experience

- Environmental Impact Assessments (EIAs)
- Basic Assessments
- NEMA S24G (Rectification) Applications
- Water Use Licence Applications
- Environmental Feasibility Assessments
- Legislative review (Environmental Acts and Regulations)
- Environmental Management Programmes (EMPr)
- Environmental Monitoring and Auditing
- Waste Management Licence Applications
- Public Participation Process
- Environmental Awareness Training
- Facilitation Skills
- Scheduled Trade Applications

Curriculum Vitae

Nokukhanya Gasa

Related Projects

Environmental Impact Assessments

Nokukhanya has been involved in the undertaking of full environmental impact assessments (i.e. Scoping and EIA) as well as Basic Assessments (BA) for industrial developments, infrastructure improvement, renewable electricity projects, coal mine extensions and waste management developments. EIAs undertaken follow the prescribed requirements of the EIA Regulations developed under Section sections 24(5), 24M and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998). As part of the undertaking of the EIA process, public participation, compilation of environmental management plans, facilitation of public meetings, identification as well as quantification of environmental impacts, appointment and coordination of specialists has been undertaken.

In addition, responsibilities of EIAs include carrying out site visits to the development site and authority communication in order to determine requirements of the competent authority. Collection of environmental data, management of specialists, weekly progressing reporting to client, compilation of supporting documentation, circulation of draft versions of the report and incorporation of comments received into the final version of the EIA reports.

Projects undertaken:

- Newcastle Landfill Site EIA
- Tricks Galvanising Plant EIA
- TNPA Richard's Bay Compactor Slab EIA
- Shakaville Landfill Decommissioning (BA)
- South Dunes Stormwater Channel and Associated Infrastructure BA
- Ferro Resins Tank Expansion BA
- Proposed BP Retail Sites BA

NEMA S24G (Rectification) Applications

Nokukhanya has been involved in the initiation and completion of NEMA S24G Applications (rectification process for projects undertaken without environmental authorization). The applications undertaken followed the BA process as specified in the EIA Regulations, after authority review and acceptance of the S24G Report; the client is issued with a fine which must be paid before authorization is issued.

Environmental Feasibility Assessments

The Geomeasure Group Environemntal Unit was requested by Makhaotse, Narasimulu and Associates (MNA) to undertake an Environmental Feasibility Assessment for a bulk water supply project in Nquthu. Nokukhanya has therefore been involved in the undertaking of site visits to which the proposed development would be located in order to gather baseline environmental and social data. Further to this, a review of applicable legislation and regulations is presented in the report with the potential impacts for each component of the development.

Legislative Reviews for specific projects

In terms of the EIA regulations under NEMA (Act 107 of 1998), proposed developments triggering the need for authorization must be assessed in accordance to the requirements of the Regulations. Clients/ developers have approached the unit for assistance in identifying whether their proposed development triggers the need for an assessment or not.

Nokukhanya has knowledge in the consultation of the relevant legislations relating to environmental management including Waste Management, Air Quality, Biodiversity Acts etc. Such consultation is compared against the development's specifications and location so that appropriate advice is presented to the client. In instances where the scope requires authority consultation, the Departmental authorities are approached accordingly.

Environmental Management Plans/Programmes

As per the requirements of the EIA Regulations, environmental impact assessment reports must contain an environmental management programme (EMPr) which is a document that details how environmental management will be achieved during construction, operation and decommissioning phases of the development. Nokukhanya has compiled in a number of EMPs for fuel service stations, water supply projects, infrastructure development projects at the Port of Richards Bay, proposed mixed use development at Verulam, fuel storage depots, coal mines in Northern KwaZulu Natal and industrial firms.

Environmental Monitoring and Auditing

Monitoring of activities being undertaken aims to ensure that compliance with relevant legislation, regulations internal and external policies, municipal bylaws as well as the site's environmental management documents is achieved. Nokukhanya has conducted construction and compliance audits in order to monitor compliance with the competent authority's record of decision as well as the approved management plans.

Projects undertaken:

- 16 BP Retail Sites in KZN
- Simhlangentsha Bulk Water Pipeline EMP Audit
- Ferro Resins Tank Expansion EMP Audit
- Mooi River Spill Site EMP Audit

Public participation process

Responsibilities of public participation include the placement of adverts in the newspaper, identification of interested and affected parties, placement of site notices, compilation of Background Information Documents, compiling of interested and affected party list, undertaking public meetings to discuss proposed projects as well as updating of issues and comments report.

Environmental awareness training

Nokukhanya has conducted environmental awareness training to contractors specializing in construction work communicating the importance of environmental management while undertaking construction as well as operational activities. Training has been provided for the following projects:

- Ferro Resins Tank Expansion
- Simhlangentsha Bulk Water Supply
- Unitrans Washbay Upgrade
- SANRAL N2 Bridge Upgrades

Waste Management Licence Applications

Nokukhanya has also been involved in the management and compiling of waste management licences which are compiled in terms of the requirements of the EIA Regulations. She has carried out these applications for the remediation of contaminated land at fuel depots and establishment of waste management infrastructure.

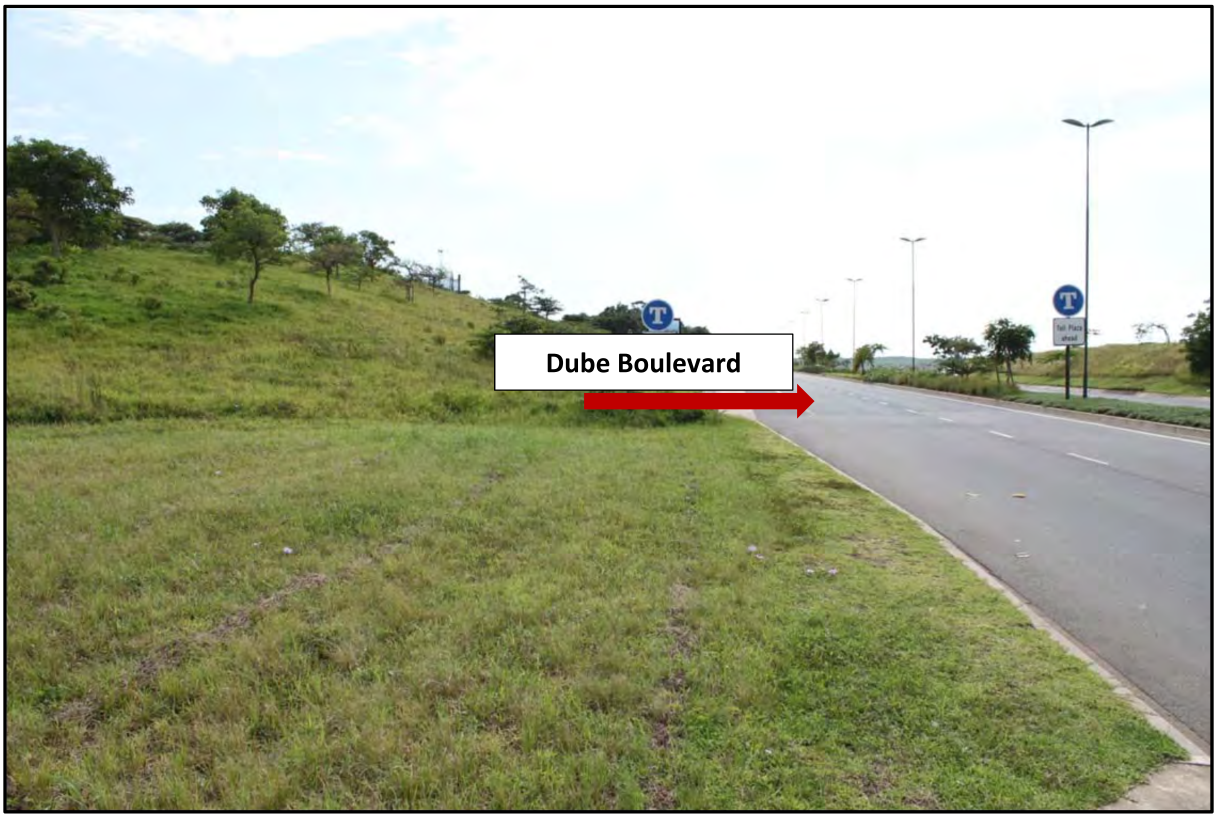
APPENDIX F

ADDITIONAL INFORMATION

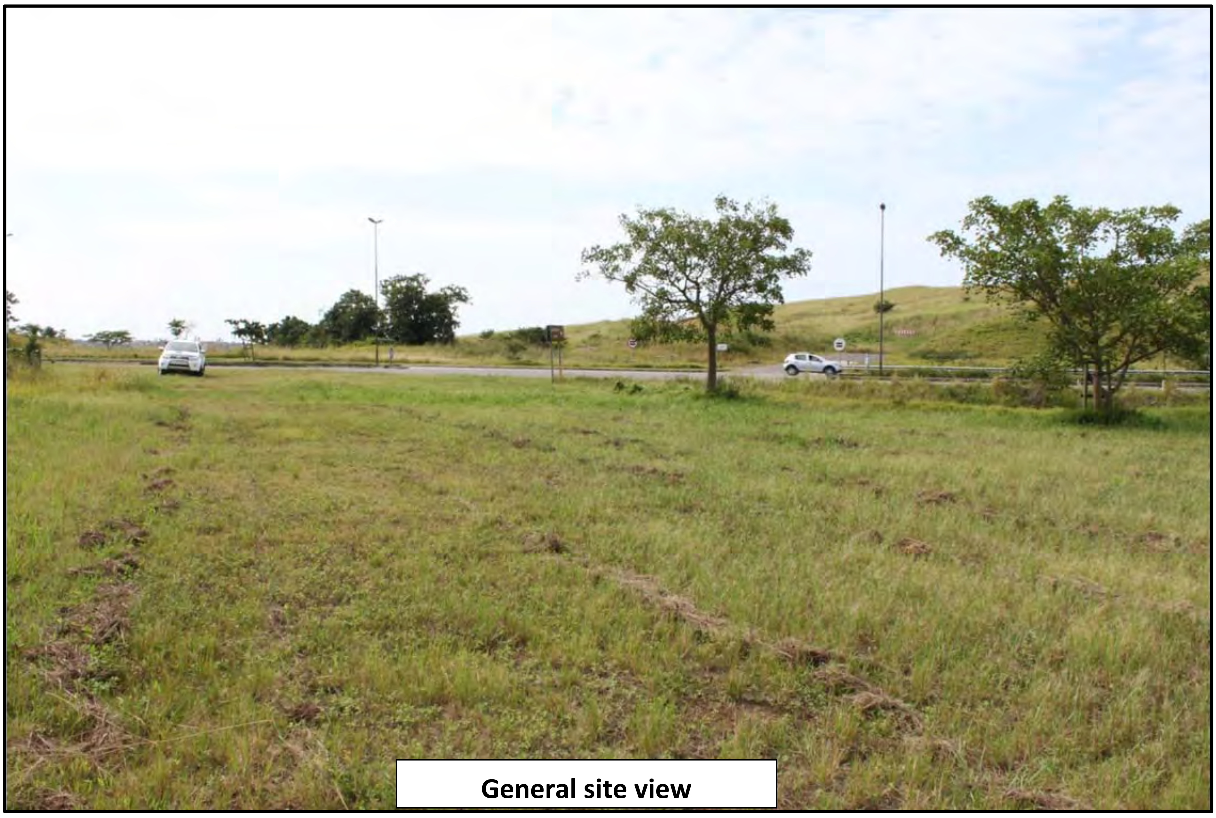
- PHOTOLOG
- DEA CORRESPONDENCE REGARDING NORTH ROAD


Emergency Access Gate 3


Stormwater channel wetland



Dube Boulevard



General site view

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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HILLCREST
3650

Tel no: 031 765 1900
Email: khanya@geomeasuregroup.co.za
PER EMAIL / MAIL

Dear Sir/Madam

APPLICABILITY OF THE NEMA EIA REGULATIONS 2014, AS AMENDED, WITH RESPECT TO THE CHANGE OF SCOPE OF WORKS FOR THE PROPOSED NORTHERN ACCESS ROAD FOR EMERGENCY VEHICLES AT THE KING SHAKA INTERNATIONAL AIRPORT WITHIN THE KWAZULU NATAL PROVINCE

The Department confirms having received your query on 16 April 2018 and additional information on 02 May 2018.

Based on the information submitted to the Department, Airports Company of South Africa (ACSA) wishes to establish 2 access roads for use of emergency vehicles at the King Shaka International Airport (KSIA) at the northern and southern ends of the airport to allow access in the event of an emergency.

The southern road will be 6m wide and 320m long and will be following a Basic Assessment process. The northern road is approximately 6m wide and approximately 2.4km long. Although many options were considered, only one routing option was considered favourable. Part of this road extends into the Dube Tradeport and Tongaat Hulett owned land. However, due to uncertainty over future use and development layout of the Tongaat Hulett Development, the road will serve as temporary emergency access whilst further engagements are held with relevant stakeholders.

On 08 December 2014 the Minister of Water and Environmental Affairs promulgated regulations in terms of Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), viz, the Environmental Impact Assessment (EIA) Regulations 2014 (GN R982, R983, R984 and R985 of 04 December 2014). The EIA Regulations, 2014, replaced the EIA Regulations that were promulgated in 2010 and also introduce new provisions regarding environmental impact assessments. The EIA Regulations, 2014 and listing notices, were subsequently amended on 07 April 2017 (refer to GN R324, R325, R326, R327 of 07 April 2017) and is being referred to as EIA Regulations, 2014, as amended. The same would apply to the listing notices containing the listed activities that would require Environmental Authorisation.

Your attention is therefore drawn to the listed activities in terms of the NEMA EIA Regulations, 2014, as defined in GN R983, R984 and R985 of 04 December 2014, as amended. Be advised that, based on the information provided, the proposed development does not constitute a listed activity as defined in terms of the

NEMA EIA Regulations, 2014, as amended. Written authorisation is therefore not required from the Competent Authority prior to the undertaking of the said activity.

Activity 12 of GN R983 04 December 2014, as amended:

The development of—

- *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;*
  where such development occurs—
  - *(a) within a watercourse;*
  - *(b) in front of a development setback; or*
  - *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —*

excluding—

- *(dd) where such development occurs within an urban area;*
- *(ee) where such development occurs within existing roads, road reserves or railway line reserves;*

Based on the information provided, this activity will not trigger as the road does not cross a watercourse.

Activity 19 of GN R983 04 December 2014, as amended:

The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;

but excluding where such infilling, depositing, dredging, excavation, removal or moving—

- *(a) will occur behind a development setback;*
- *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;*
- *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;*
- *(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or*
- *(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.*

Based on the information provided Activity 19 will not apply since a watercourse will not be crossed.

Activity 24 of GN R983 04 December 2014, as amended:

The development of a road—

- *(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or*
- *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;*

but excluding a road—

- *(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;*
- *(b) where the entire road falls within an urban area; or*
- *(c) which is 1 kilometre or shorter.*

Based on the information provided Activity 24 will not apply as it was indicated in the supporting documentation submitted that the proposed roads will not be wider than 6m.

Activity 61 of GN R983 04 December 2014, as amended:

The expansion of airports where the development footprint will be increased.

Based on the information provided Activity 61 will not apply as the footprint of the airport will not increase.

Be reminded that the onus is on Applicant to determine all applicable listed activities that would require Environmental Authorisation prior to the commencement of the construction activities. Further should any revision of your development comprise any other activities that constitute a listed activity/ies as defined in GN R983, R984 and R985 of 04 December 2014, as amended, it must also form part of the Application for Environmental Authorisation.

Please note however, that the Department cannot confirm the applicability of Listing Notice 3 (GN R. 985) as this Listing Notice (GN R. 985) is province specific (Sensitive Geographic Areas). You are thus requested to consult with the KwaZulu Natal Department of Economic Development, Tourism and Environmental Affairs (DEDTEA) as to the applicability of Listing Notice 3, prior to the commencement of any construction activities. A copy communicating the outcome of your consultation process with DEDTEA must be forwarded to this Department for record keeping purposes.

Additionally, we wish to bring to your attention that the 'NEMA Applicability Form' is no longer available online as it was removed from the Departmental website. The onus is on the Applicant/EAP to ascertain whether activities are listed or not. However, if there are any specific EIA queries related to the proposed development you may email it to EIAadmin@environment.gov.za and if you have any EIA Regulation related interpretation queries you may email them to IQ@environment.gov.za.

Kindly quote the abovementioned reference number in any future correspondence in respect of the application.

This Department reserves the right to revise or withdraw its decision or to request further information from you should new information on this matter become available.

You are hereby reminded of Section 24F of the NEMA that no activity may commence prior to an Environmental Authorisation being granted by the Department.

Yours sincerely

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Letter signed by: Mr Vusi Skosana
Designation: Director: Coordination, Strategic Planning and Support
Date: 11/05/2018