FINAL LIFE-CYCLE ENVIRONMENTAL MANAGEMENT PROGRAMME

MULILO SONNEDIX PRIESKA PHOTOVOLTAIC ENERGY PLANT ON FARM HOEKPLAAS NEAR COPPERTON, NORTHERN CAPE

(DEA Ref. No. 12/12/20/2503)

EMPr REPORT 1: PV FACILITY

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PROJECT DETAILS

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Report 1 - Proposed Mulilo Sonnedix Prieska Photovoltaic Energy Plant On Farm Hoekplaas Near Copperton, Northern Cape

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ABBREVIATIONS

AC	Alternating Current
CEMP	Construction Phase Environmental Management Programme
DC	Direct current
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DWA	Department of Water Affairs
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Reports
EMP	Environmental Management Programme
EPC	Engineering, procurement and construction contractor
kV	Kilovolt
LEMP	Life-Cycle Environmental Management Programme
NEMA	National Environmental Management Act (No. 107 of 1998)
O&M	Operation and Maintenance contractor
OHS	Occupational Health and Safety Act (No. 85 of 1998)
OEMP	Operational Phase Environmental Management Programme
SDEMA	Specification Data Environmental Management
SKA	Square Kilometre Array
SPEC EMA	Specification Environmental Management

1 OVERVIEW

This document represents the Life-Cycle Environmental Management Programme (LEMP) for the approved 100 megawatt (MW)[1] photovoltaic (PV) solar energy plant on the farm Hoekplaas (Remainder of Farm 146), near Copperton, Northern Cape.

This project was granted Environmental Authorisation (EA) from the Department of Environmental Affairs (DEA) on 21 January 2013 (see Appendix E for a copy of the EA).

1.1 Purpose of the LEMP

The LEMP was compiled during the Environmental Impact Assessment (EIA) process to provide a link between the mitigation measures identified for the assessed project impacts and the actual environmental management on the ground during project implementation and operation.

In other words, the purpose of this document is to provide for environmental management throughout the following life-cycle stages of the proposed development:

- Planning and design,
- Pre-construction and construction,
- Operation, and
- Decommissioning.

Furthermore, this LEMP aims for alignment and optimisation of environmental management processes with conditions of authorisation, thereby ensuring that identified environmental considerations are efficiently and adequately taken into account during all stages of development.

1.2 Legal requirements of Environmental Management Programmes

The contents of the LEMP must meet the requirements outlined in Section 24N (2) and (3) of National Environmental Management Act (no. 107 of 1998) (NEMA) (as amended) and Section 33 of the 2010 EIA Regulations (Government Notice Regulations [GN R.] 543). The LEMP must address the potential environmental impacts of the proposed activity on the environment throughout the project life-cycle including an assessment of the effectiveness of monitoring and management arrangements after implementation. Table 1 lists the requirements of an LEMP as stipulated by Section 33 of GN R.543. Table 2 lists the requirements of an LEMP as stipulated by Section 24N (2) and (3) of the NEMA.

[1] 100 MW Direct Current (DC) was approved, but only 86.25 MW DC (115 % of 75 MW Alternating Current (AC) Contracted) will be constructed as restricted by Department of Energy and Eskom. At the time of drafting the EIA this restriction was not in place.

Table 1: Section 33 of GN R.543 listing the requirements of an LEMP

33. *A draft environmental management programme must comply with section 24N of the Act and include –*

(a) details of –
- *(i) the person who prepared the environmental management programme; and*
- *(ii) the expertise of that person to prepare an environmental management programme;*

(b) information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of—
- *(i) planning and design;*
- *(ii) pre-construction and construction activities;*
- *(iii) operation or undertaking of the activity;*
- *(iv) rehabilitation of the environment; and*
- *(v) closure, where relevant.*

(c) a detailed description of the aspects of the activity that are covered by the draft environmental management programme;

(d) an identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);

(e) proposed mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon;

(f) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development, including, where appropriate, concurrent or progressive rehabilitation measures;

(g) a description of the manner in which it intends to—
- *(i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;*
- *(ii) remedy the cause of pollution or degradation and migration of pollutants;*
- *(iii) comply with any prescribed environmental management standards or practices;*
- *(iv) comply with any applicable provisions of the Act regarding closure, where applicable;*
- *(v) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;*

(h) time periods within which the measures contemplated in the environmental management programme must be implemented;

(i) the process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity;

(j) an environmental awareness plan describing the manner in which—
- *(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and*
- *(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment;*

(k) where appropriate, closure plans, including closure objectives.

The legislation hereby aims to ensure that effective environmental management is implemented throughout the life cycle of the project via the translation of EIA management actions into the LEMP.

The Department of Environmental Affairs and Development Planning (DEA&DP)'s[2] *Guideline for Environmental Management Plans* (2005) aims to inform and guide the preparation and implementation of LEMPs. The guideline defines LEMPs as:

> *"an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced".*

Section 24N (2) and (3) of the NEMA listing the requirements of an LEMP are set out in Table 2.

Table 2: Section 24N (2) and (3) of the NEMA listing the requirements of an LEMP

24N.(2) *the environmental management programme must contain-*
*(*a) *information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of –*
(i) planning and design;
(ii) pre-construction and construction activities;
(iii) the operation or undertaking of the activity in question;
(vi) the rehabilitation of the environment; and
(vii) closure, where relevant.
(b) details of –
(i) the person who prepared the environmental management programme; and
(ii) the expertise of that person to prepare an environmental management programme
(c) a detailed description of the aspects of the activity that are covered by the draft environmental management plan;
(d) information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a);
(e) information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance.
(f) as far as is reasonable practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and
(g) a description of the manner in which it intends to-
(i) modify, remedy, control or stop any action, activity or process which causes pollution

[2] Please note that DEA&DP's guideline is used even though the proposed project is based in the Northern Cape, as DEA has not compiled a guideline on EMPs.

or environmental degradation;

(ii) remedy the cause of pollution or degradation and mitigation of pollutants; and

(iii) comply with any prescribed environmental management standards or practices.

(3) *the environmental management programme must , where appropriate-*

(a) set out time periods within which the measures contemplated in the environmental management programme must be implemented;

(b) contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of prospecting or mining operations or related mining activities which may occur inside and outside the boundaries of the prospecting area or mining area in question; and

(c) develop an environmental awareness plan describing the manner in which-

(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and

(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment.

The LEMP aims to meet the requirements as legislated by the NEMA as well as adhering to the DEA&DP guideline document for EMPs[3]. It should however be noted that no guideline or guidance exists in terms of best practice approach to LEMPs. This document should thus be seen in an iterative context allowing for amendments throughout the life-cycle of the project, allowing for adjustments as new information is made available.

1.3 Structure of the LEMP

As discussed above, the LEMP aims to address environmental management throughout the project life-cycle, from planning and design, through construction, to operation and potential decommissioning. The LEMP has been structured to include the following sections from the approved EIA Report[4]:

1. Discussion summarising environmental management influencing the planning and design of the proposed project (Chapter 3);
2. Construction EMP based on identified impacts and mitigation measures (Chapter 2);
3. Operational Framework based on identified impacts and mitigation measures (Chapter 5); and
4. Decommissioning Framework providing guidance on key considerations to be considered during decommissioning/closure (Chapter 7).

1.4 Expertise of Environmental Assessment Practitioners

Section 33 of GN R.543 and Section 24N (2) and (3) of the NEMA requires that an EMP must include the details of the person(s) who prepared the EMP, and the expertise of that person

[3] Lochner, P. 2005. *Guideline for Environmental Management Plans*. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

[4] See Appendix F for a list of mitigation measures approved during the EIA process

to prepare an EMP. In this regard, the *Curriculum Vitae* of the Environmental Assessment Practitioners who compiled the LEMP are included in Appendix A.

2 BACKGROUND INFORMATION

This section has been divided into subsections which outline how environmental considerations have informed and been incorporated into the planning and design phases of the authorised PV facility. The Environmental Authorisation approved a 100 MW PV facility consisting of the following components:

- PV structures to generate up to 100 MW of energy,
- Upgrading existing internal farm access roads and construction of new roads to accommodate the construction vehicles and access to the site,
- Electrical fence, and
- Other infrastructure including an office, connection centre and a guard cabin.

Detailed designs have been undertaken as part of the pre-construction phase as indicated in Appendix G. The detailed designs took into consideration the mitigation measures proposed for the planning and design phases as indicated in Section 3, as well as sensitive onsite ecological features (Figure 1).

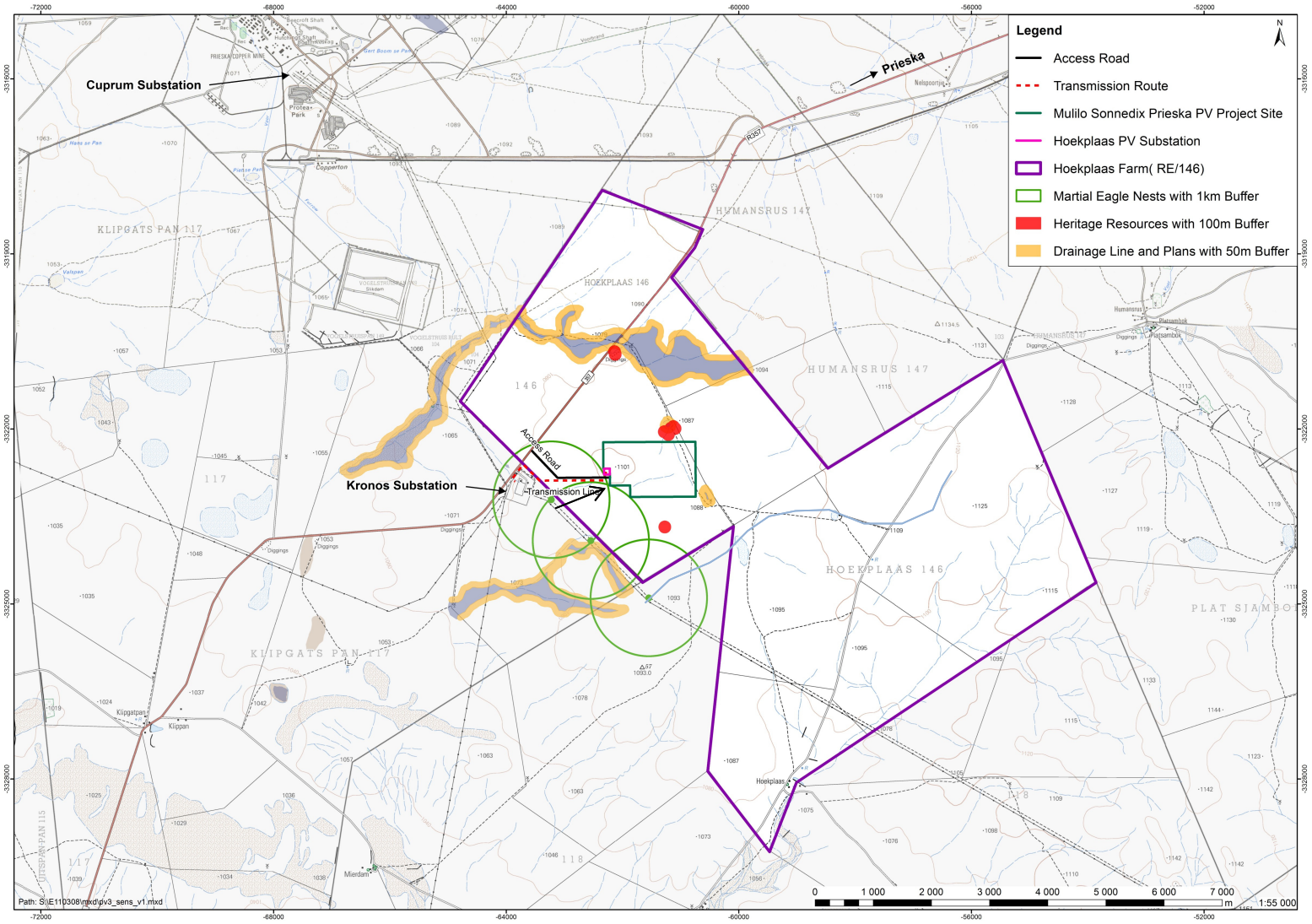

Figure 1: Sensitive ecological areas and the authorised project

3 PLANNING AND DESIGN

The design for the approved PV facility should respond to the identified environmental constraints and opportunities. The following mitigation measures related to the design for the proposed development have been recommended to reduce the assessed environmental impacts.

3.1 Design of the Project

Botanical

- Locate the proposed project in such a way that the development footprint is minimized;
- Avoid shallow depressions and well defined pans and buffer by at least 100 m;
- Avoid the botanically sensitive pan indicated in Figure 1. No construction should be allowed within 50 m of the 'ring' of tall shrubs fringing the pan;
- Compile a rehabilitation plan with the aid of a rehabilitation specialist (see Appendix C);
- Position access roads in such a way that no clearing within no-go areas is necessary and definite drainage areas are avoided; and
- Design the construction of access roads for minimal impact.

Fauna

- Allow small ground level openings, 20-30 cm in height, in the electrical fence to facilitate the movement of small mammals and reptiles through the site.

Avifauna

- Implement planning and design mitigation measures for protection of avifauna based on the outcome of the comprehensive bird monitoring programme as per the guidelines provided in Section 6 of this EMP;
- The results of pre-construction avifauna monitoring must be submitted to the Northern Cape Department pf Environment and Nature Conservation, Birdlife South Africa and the Endangered Wildlife Trust and DEA on a quarterly basis;
- Institute a comprehensive impact monitoring scheme, and use the results of the scheme to inform and refine a dynamic approach to mitigation.

Heritage

- A 100 m buffer zone should be implemented from the edge of the pans for sites situated alongside the pans; and
- Test excavations around the pans should be done before construction to check for buried archaeological material.

Visual

- New structures should be placed where they are least visible to the greatest numbers of people, i.e. in places where the topography can offer shielding (where possible);

- Visibility of buildings and the local sub-station should be reduced by cladding the buildings in non-reflective colours and materials that would blend in with the natural environment. e.g. cladding with local stone or plaster and paint with earthy tones for paint colours, roofs should be grey and non-reflective and doors and window frames should reference either the roof or wall colours;
- Site offices, if required, should be limited to single storey and they should be sited carefully using temporary screen fencing to screen from the wider landscape;
- Finishing materials for the infrastructure (including support structures) should be of colours that are non-reflective and in dark matte colours such as dark grey or charcoal; and
- Information on the project should be provided to local people, such as through a poster at the entrance to the site.

Socio-Economic

- Obtain a list of locally available labour and skills. Preference should be given to local communities for employment opportunities; and
- Base recruitment on sound labour practices and with gender equality in mind.

Surface Water

- Channel runoff should be diverted in such a way as to minimise erosion and if necessary, soil stabilising techniques should be implemented in vulnerable areas;
- Stormwater channels and "mitre" chutes should be constructed to direct the stormwater flows and minimize and control erosion;
- The minor storm design period should be used to determine the size of the earth channels. A return period of 1:5 years is applicable which approximates to an average intensity of 30 mm/hour;
- Should additional access roads be required, these will also have to be built with culverts to prevent the impediment of water movement;
- The major storm occurrence (i.e. 1:25 year, 1:50 year and 1:100 year) should be used to calculate culverts in defined drainage lines and determine flood levels where necessary. The intensities for each occurrence are: 1:25 year – 46 mm/hour, 1:50 year – 53 mm/hour and 1:100 year – 61 mm/hour respectively; and
- Low-lying depressions and watercourses (including drainage lines) should be avoided wherever possible.

Internal Roads

- Roads should be designed to have minimal impact on the environment;
- Gravel roads should be graded and shaped with a 2.5 % crossfall back into the slope, allowing stormwater to be channelled in a controlled manor towards the natural drainage lines;
- Where roads intersect natural, defined drainage lines, suitably sized culverts or drive through causeways should be installed or constructed; and
- Where internal roads need to be realigned, these should not cross drainage lines (where possible).

Land use

- A detailed impact analysis should be undertaken together with the South African SKA Project Office (SASPO) to identify mitigation measures for the construction and operation of the PV facility.

Sedimentation and Erosion

- Site clearance and earth moving activities should take place in the dry season as far as possible to prevent erosion and limit disturbances to surface areas.

4 CONSTRUCTION PHASE EMP

The Construction EMP aims to address mitigation measures pertaining to the construction phase as identified during the course of the EIA. This section includes both General Specifications as well as Draft Specification Data, addressing general construction issues and issues that are not addressed by the General Specifications, respectively. Relevant roles and responsibilities during construction are defined in Section 8 of this EMPr.

4.1 Construction EMP General Specifications

The complete General Specifications have been included in Appendix B and include the following sections:

1 **1 GENERAL**
1.1 Scope
1.2 Definitions
1.3 Normative References
1.4 Supporting Specifications And Legal Framework
1.5 Management And Administration
1.5.1 Environmental Site Officer (ESO)

2 CONTRACTOR MOBILISATION AND GENERAL PROVISIONS
2.1 Baseline photography
2.2 Method statements
2.3 Environmental Awareness
2.3.1 Environmental awareness training
2.3.2 Toolbox talks
2.3.3 Construction personnel information posters
2.4 Surveying and setting out
2.4.1 Site establishment
2.4.2 Site fencing and demarcations
2.4.3 No Go Areas
2.5 Overarching environmental requirement
2.5.1 Protection of natural features
2.5.2 Protection of flora and fauna
2.5.3 Protection of archaeological and palaeontological remains
2.5.4 Noise control
2.5.5 Lighting
2.5.6 Fuel (petrol and diesel) and oil
2.5.7 Contaminated water
2.5.8 Stormwater and drainage
2.5.9 Solid waste management
2.5.9.1 Shutter oil and curing compound
2.5.9.2 Bitumen
2.5.9.3 Hazardous substances
2.5.10 Workshop, equipment maintenance and storage
2.5.11 Materials handling, use and storage
2.5.12 Dust
2.5.13 Aesthetics
2.5.14 Disruption to existing and neighbouring land use activities
2.5.15 Temporary site closure
2.5.16 Public roads
2.5.17 Security and access control
2.5.18 Access routes / haul roads
2.5.19 Housekeeping
2.5.20 Ablution facilities
2.5.21 Recess areas and canteens
2.5.22 Site clinic or first aid station
2.6 Emergency procedures
2.6.1.1 Fire
2.6.1.2 Accidental leaks and spillages
2.7 Community relations
2.8 Construction Methods and procedures
2.8.1 Site clearance
2.8.2 Demolition
2.8.3 Cement and concrete batching
2.8.4 Earthworks
2.8.5 Dewatering
2.8.6 Bitumen
2.8.7 Erosion and sedimentation control
2.8.8 Crane operations
2.8.9 Trenching
2.8.10 Drilling and jack hammering
2.8.11 Stockpiling
2.8.12 Site closure and rehabilitation
2.8.13 Temporary revegetation of the areas disturbed by construction.

3 COMPLIANCE WITH REQUIREMENTS AND PENALTIES

4.2 Project Specifications

The following section provides the Draft Specification Data which, along with the General Specifications, will be included in all contract documentation associated with the PV facility and will accordingly be binding on the Contractor.

Scope: The general principles contained within this Specification Data shall apply to all construction related activities. All construction activities shall observe any relevant environmental legislation and in so doing shall be undertaken in such a manner as to minimise impacts on the natural and social environment.

Interpretations: This Specification contains clauses specifically applicable and related to the environmental requirements for the Mulilo Sonnedix Prieska PV solar energy facility, near Copperton, Northern Cape.

Where any discrepancy or difference occurs between this Specification Data included in this EMP and the General Specifications included as an Appendix B, the provision of this Specification EMP shall prevail.

Definitions:
For the purposes of this Specification the following definitions shall be added:

- Works
  Permanent works to be constructed and completed in accordance with the Contract.

- Working area:
  The land and any other place on, under, over, in or through which the Works are to be executed or carried out, and any other land or place made available by the Employer in connection with the Works. The Working Area shall include the site office, construction camp, stockpiles, batching areas, the construction area, all access routes and any additional areas to which the Engineer permits access. The construction footprint must be kept to a minimum.

4.3 Specification Data: Environmental Management (SDEMA)

SDEM 4.3.1 Materials handling, use and storage (Subclause 2.4.11)

The Engineer shall be advised of the areas that the Contractor intends to use for the stockpiling of both natural and manufactured materials. No stockpiling shall occur outside of the working area (as designated by the engineer) and without the Engineer's prior approval of the proposed stockpiling areas. Imported material shall be free of litter, contaminants or exotic plant seed. The Contractor shall ensure that material is not stockpiled along the border of any water body (permanent or seasonal), including pans or within close proximity to no-go areas.

Location and treatment of material stockpiles shall take consideration of prevailing wind directions and dwellings. Stockpiles shall be stored under cover so as to prevent erosion and run off during rainy periods.

Dust suppression measures shall be used particularly during dry periods of weather during the summer months.

SDEM 4.3.2 Hazardous substances (Subclause 2.4.9.3)

Procedures detailed in the Materials Safety Data Sheets (MSDS) shall be followed in the event of an emergency situation. Potentially hazardous substances shall be stored, handled and disposed of as prescribed by the Engineer.

An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage shall be implemented. This shall include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.

Measures shall include:

- Daily vehicle inspection to detect any leakages and or spillages.
- Weekly visual inspection of plant and standing equipment.
- Weekly visual inspection of fuel tanks.
- A record of these inspections needs to be kept to demonstrate compliance.
- The contractor needs to provide a method statement for "emergency procedures to deal with leakage and spillage of hazardous substances".
- Spill remediation kits shall be kept on site and all staff members shall be informed of where it is located.

SDEM 4.3.3 Shutter oil and curing compound (Subclause 2.4.9.1)

Shutter oil and curing compound shall be stored and dispensed within a bunded area, and not located closer than 50 m from river banks / wetlands / drainage lines or 100 m from pans.

4.4 Requirements

SDEM 4.4.1 Ablution facilities (Subclause 2.4.20)

A sufficient number of chemical toilets shall be provided by the Contractor in the construction camp area and at appropriate locations approved by the Engineer. Temporary / portable toilets shall not be located within 50 m from the top of the river banks/water courses/drainage lines or 100 m from pans. The ratio of ablution facilities for workers shall not be less than that required by the Construction Regulations, 2014 of the Occupational Health and Safety Act. All temporary/ portable toilets shall be secured to the ground to prevent them from toppling due to wind or any other cause.

SDEM 4.4.2 Solid Waste Management (Subclause 2.4.9)

The contractor shall be required to prepare a method statement to indicate how and where general waste will be disposed of based on the following requirements:

Hazardous waste

- Contaminated soil should be disposed at a registered landfill if bioremediation is not feasible. If bioremediation is a viable remediation solution, a method statement shall be approved by the ECO prior to the commencement thereof. The method statement shall also describe the proposed monitoring for bioremediation.
- Spills or leaks of construction hazardous materials including but not limited to concrete curing compounds, asphalt products, paints, petroleum products from equipment operation and maintenance, pesticides and herbicides shall be monitored and remediated immediately in accordance with the applicable environmental legislation if detected.
- All hazardous waste materials must be carefully stored as advised by the ECO, and then disposed of at a licensed landfill site.
- No hazardous waste may be buried or burned under any circumstances.
- A certificate of disposal by shall be obtained the Contractor and kept on file, if relevant.
- MSDS shall be available for all hazardous substances stored on site.
- Appropriate hazardous waste spill kits shall be available on site.
- An approved waste disposal contractor must be employed to remove and recycle waste oil, if practical.
- Burying or burning of solid waste shall not be allowed.

General waste

- Regular disposal of general waste to registered landfill sites shall be required to prevent nuisance factors such as odours, vermin and flies. No burning of waste shall be allowed.
- Provide adequate waste bins.
- Set up system for regular waste removal to an approved landfill facility.
- Minimise waste by sorting wastes into recyclable and non-recyclable wastes, if practical.
- No waste may be buried or burned under any circumstances.
- A housekeeping team should be appointed to regularly maintain the litter and rubble situation on the construction site.
- Littering by the employees shall not be allowed under any circumstances.
- The ECO shall monitor the neatness of the work sites as well as the Contractor campsite.
- Skip waste containers should be maintained on site. These should be kept covered and arrangements made for them to be collected regularly to prevent vermin and odours.
- A certificate of disposal by shall be obtained the Contractor and kept on file, if relevant.

SDEM 4.4.3 Contaminated Water (Subclause 2.4.7)

The Contractor shall prevent the discharge of any pollutants, such as soaps, detergents, cements, concrete, lime, chemicals, hydrocarbons, glues, solvents, paints and wastewater into the surrounding terrestrial and aquatic environment. No discharge would be allowed and all contaminated soil, contaminated water and hazardous materials shall be disposed at a registered facility.

SDEM 4.4.4 Site Structures (Subclause 2.3)

No site structures shall be located within 50 m from the top of the river banks / water courses / drainage line or 100 m from a pan. Construction yards should be restricted in extent as far as possible and should be screened by visually impermeable material.

Ensure the camp is neat and tidy at all times. Site offices, if required, should be limited to single storey and should be sited carefully using temporary screen fencing to screen from the wider landscape.

SDEM 4.4.5 Fuel (Petrol and Diesel) and oil (Subclause 2.4.6)

Fuels in the form of diesel and petrol shall not be stored within 50 m from the top of the river banks / water courses / drainage lines or 100 m from a pan.

SDEM 4.4.6 Equipment Maintenance and Storage (Subclause 2.4.10)

A designated area with an impermeable surface shall be available for the washing of equipment and vehicles. Wastewater generated from the washing of vehicles and equipment shall drain via an oil and water separator into a bunded area. The oil should be removed as required by a registered service provider to a register facility. The water

accumulated in the bunded area can evaporate. If solids area accumulated in the bunded area over time, if should be removed by a registered contractor and disposed at a registered facility. Wastewater generated from construction or the washing of vehicles shall not be permitted to enter water courses, either directly or via a stormwater system.

SDEM 4.4.7 Stormwater Erosion Control (Add Section 2.4.8)

The Contractor shall take reasonable measures to control the erosive effects of stormwater runoff. Any runnels or erosion channels developed during the construction period or during the maintenance period shall be backfilled and compacted to limit the impacts of sediment deposition into the surrounding aquatic environment.

An erosion management plan for monitoring and rehabilitating erosion events associated with the facility was compiled (see Appendix E) and shall implemented.

The design of storm water infrastructures shall ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The design shall include appropriate measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures shall promote the dissipation of storm water run-off.

Construction activities shall be scheduled to take place in the dry season (winter) as far as possible.

SDEM 4.4.8 Method Statements (Subclause 2.2)

The following additional method statements shall be provided by the Contractor within 14 days of the receipt of the Letter of Acceptance and prior to the activity covered by the Method Statement being undertaken:

- Logistics for the environmental awareness course for all the Contractors employees.
- Emergency procedures for fire, accidental leaks and spillages of hazardous materials including:
    - who shall be notified in the event of an emergency, including contact numbers for the relevant local authority,
    - where and how any hazardous spills will be disposed of,
    - the size of spillage which the emergency procedures could contain,
    - location of all emergency equipment and an indication of how regularly the emergency equipment will be checked to ensure that it is working properly.
- Location and layout of the construction camp in the form of a plan showing offices, stores for fuels, hazardous substances, vehicle parking, access point, equipment cleaning areas and staff toilet placement.
- Location, layout and preparation of cement / concrete batching facilities including the methods employed for the mixing of concrete and the management of runoff water for

such areas. An indication shall be given of how concrete spoil will be minimised and cleared.
- Method of undertaking earthworks, including spoil management, erosion, dust and noise controls.
- Method of undertaking blasting (if required).
- Method to detect leakages based on Section 4.3.2.
- Management measures to be undertaken in instances where traffic flows may be interrupted.
- Extent of areas to be cleared, the method of clearing and the preparation for this clearing so as to ensure minimisation of exposed areas. This method statement must be in line with the rehabilitation plan included in Appendix C.
- Measures to be put in place during temporary closure periods, e.g. December holidays.
- Measures to be put in place to limit sediment deposition into the surrounding terrestrial and aquatic environment.
- Method statement on integrated waste management shall be compiled by the contractor based on SDEM 4.4.2.
- Methods to undertake bioremediation.

SDEM 4.4.9 Site Clearance (Subclause 2.7.1)

Removal of vegetation (uprooting) must be kept to a minimum. Only those areas where it is imperative to remove vegetation i.e. construction areas, identified storage areas, roads and minor tracks should be cleared. If uprooting is required, the Contractor shall store the top material and root material of cleared vegetation (top 300 mm layer), for subsequent use during rehabilitation and re-vegetation. All other areas should remain vegetated. If brush-cutting is required as a minimum intervention, this should be applied with discretion; however, it would always be preferred to uprooting. If vehicle movement is required off designated roads and tracks, it would be advisable to drive over the shrubs (crush) rather than to uproot them. This would prevent loss of these shrubs since they would be able to regrow if not uprooted.

In places where shrubs are uprooted, the plant material must be stockpiled and retained for rehabilitation purposes.

The Contractor shall not make use of herbicides or other chemical methods to clear the proposed site especially near the identified water courses. In order to limit erosion the Contractor shall retain original groundcover, as far as practically possible, adjacent to the aquatic environment and to the trenching line as per the rehabilitation plan in Appendix C.

SDEM 4.4.10 No go areas (Subclause 2.3.3)

All works to be undertaken shall be within the boundary of the site. A "no go" area shall extend on either side of the working area i.e. all areas outside of the defined working area

and designated access roads. The working area shall be demarcated in an appropriate manner determined by the Engineer.

Based on the ecological importance, all construction activities shall remain outside of all aquatic environments, and a buffer of 50 m must be maintained between construction related activities and any rivers, drainage lines and areas identified as no go areas and 100m from any pans. These no go areas shall stay in place until construction of the infrastructure within the buffer area must commence.

The recommended 100 m buffer around the pan indicated in Figure 1 and 100 m buffer around heritage resources shall be demarcated as "no go" areas and construction activities shall remain outside these designated areas. No equipment associated with earthworks shall be allowed outside of the site and defined access routes, or within "no go" areas, unless expressly permitted by the Engineer. All construction should take place within the footprint of the proposed facility. Re-alignment of roads should not cross drainage lines.

SDEM 4.4.11 Flora, avifauna and fauna (Subclause 2.4.2)

A vegetation rehabilitation plan, as included in Appendix C, shall be implemented. The rehabilitation specialist shall recommend species to be used in rehabilitation as well as any special measures required, e.g. shade-netting and alien vegetation removal. Furthermore, ground shall be returned as far as possible to original levels/gradients and any excess material shall not be left in piles, but shall be removed off-site.

Topsoil (300 mm) from construction areas where vegetation clearing is required shall be removed and stockpiled for rehabilitation purposes as per the requirements of the Rehabilitation Plan. The site shall be cleared in sections as required for construction and not all at once. Rehabilitation shall start as soon as construction in an area is complete in accordance to the rehabilitation plan.

The Alien Invasive Management Plan included in Appendix C shall be implemented. Furthermore, perennial alien species such as *Prosopis glandulosa* shall be removed from areas disturbed or cleared during construction and disposed of in an appropriate manner to prevent re-establishment and / or spreading of these species. Awareness of these species shall be created and monitoring shall take place every three (3) months at all construction areas, roads and tracks to ensure that this species does not gain a foothold.

If *Galenia africana* specimens are found onsite, the source plants should be removed and destroyed. The construction phase shall be closely monitored by an ECO who shall identify areas that require rehabilitation in the post-construction phase.

Wherever *G.Africana* starts to establish it shall be quickly eradicated by uprooting and burning at a suitable site to ensure that it does not become established. Herbicidal treatment could then be required for its control and if necessary would be required to be

applied according to manufacturers' specifications. Herbicidal treatment shall not be applied in areas within 50 m of a watercourse or on windy days.

No flora shall be removed or damaged, outside of the designated working area, without specialist botanical input.

Boscia albitrunca is the only protected tree species found in the Hoekplaas area. Only one specimen was found in the northern part of the farm Hoekplaas (McDonald, 2013) and this species was not found in the construction area. There will therefore be no impact on this species by the construction and consequently no permit according to the National Forests Act, 1998 (Act No. 84 of 1998) would be required to remove such trees. However, should specimens be identified on site, a suitably qualified botanist should be contacted to assist with the requisite permitting process required for its removal.

Aloe claviflora (kraalaalwyn), a protected species in the Northern Cape Province, occurs sporadically on Hoekplaas RE/146 but is not common. If it is encountered (a low probability) during the construction phase the plants shall be removed and relocated elsewhere in similar habitat which would not be affected by construction. This would require a permit from the Department of Environment and Nature Conservation, Northern Cape in terms of the Northern Cape Nature Conservation Act 2009 (Act 9 of 2009) before the plant removal process may commence.

Asbos (*Psilocaulon* sp.) can be used effectively to stabilize soil in disturbed areas.

The collection of firewood by construction workers is prohibited.

Any snakes found on site shall be removed from site and released into an area away from the site, without harm.

The contractor shall ensure that the time a trench is left exposed is kept to a minimum, and that open trenches are inspected on a daily basis for animals which may have fallen or become trapped. Any animals found trapped in any trenches shall be freed without harm.

The site shall be monitored for avifaunal impacts immediately before and after construction to implement further measures to mitigate any impacts if required.

SDEM 4.4.12 Protection of archaeological and paleontological remains (Subclause 2.4.3)

Should substantial fossil remains be exposed during construction, these should be safeguarded by the ECO, preferably *in situ*, and the South African Heritage Resources Association (SAHRA) should be notified by the ECO immediately so that appropriate mitigation can be undertaken.

The no-go areas and their buffer zones must be cordoned off during the construction phase.

The engineer shall be briefed on the recording requirements by the archaeologist before excavations are done. This report must be submitted to the consultant archaeologist for dissemination to SAHRA to aid others in the development of a broader understanding of the Pleistocene landscape of this area.

Test excavations around pans impacted on by the PV plant shall be done before construction to check for buried archaeological material. If avoiding sensitive archaeological sites is not feasible, sampling and recording of the archaeological site before its destruction must be undertaken.

SDEM 4.4.13 Access routes/ haul roads (Subclause 2.4.18)

The contractor shall ensure that all regulations relating to traffic management are observed and local traffic officials are informed of the construction activities. As far as possible, attempts shall be made to ensure that high construction related road usage coincides with low traffic flow periods. Transport components overnight as far as possible.

Signage and safety measures during the construction of the access roads shall comply with the guidelines as set out in the latest issue of the SADC Road Traffic Signs Manual. Standard "construction ahead" warning signs should be placed on all relevant roads in the area. Ensure access roads are kept clean and storage of materials is screened and that that all road junctions have good sightlines.

A traffic management plan for the site access roads shall be compiled and implemented to ensure that no hazards would results from the increased truck traffic and that traffic flow would not be adversely impacted. This plan shall include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations; ensure good sightlines and traffic control measures.

Access road shall be kept tidy, and measures shall be taken to minimise dust from construction traffic on gravel roads.

A transportation plan were compiled and implemented for the transport of PV components, main assembly cranes and other large pieces of equipment (see Appendix H).

SDEM 4.4.14 Cement and concrete batching (Subclause 2.7.3)

No cement and / or concrete batching shall occur within the "no-go" areas or within 50 m from the top of river banks/water courses/drainage lines or within 100 m of the pans. Reasonable measures shall be implemented to prevent contaminated surface run-off into the surrounding vegetation.

SDEM 4.4.15 Earthworks (Subclause 2.7.4)

Any blasting is to be executed by a suitably qualified person.

Controlled blasting techniques shall be employed to minimise dust and fly rock during blasting.

Prior to blasting the Contractor shall notify the relevant occupants / owners of surrounding land and address any concerns. Buildings within the potential damaging zone of the blast shall be surveyed preferably with the owner present, and any cracks or latent defects pointed out and recorded either using photographs or video. All Local Authority regulations are to be adhered to and all service infrastructures are to be located prior to commencement of blasting activities.

Blasting or drilling shall take place during normal working hours. The Contractor shall notify emergency services, in writing, a minimum of 24 hours prior to any blasting activities commencing on site. Adequate warning must be issued to all personnel on site prior to blasting activities taking place. All legally required signals are to be clearly indicated. The Engineer shall be issued daily updates of the days intended blasting activities.

The Contractor shall prevent damage to special features and the general environment, which includes the removal of flyrock. Damage caused by blasting / drilling shall be repaired to the satisfaction of the Engineer.

Minimise areas disturbed at any one time and protect exposed soil against wind erosion, e.g. by dampening with water or covering with hessian.

SDEM 4.4.16 Community relations (Subclause 2.6)

Maintain a register that shall contain details of the measures taken to resolve complaints and the details of the communication of these measures to the person who raised the complaint.

SDEM 4.4.17 Erosion and sedimentation control (Subclause 2.7.7)

Erosion control measures as included in Appendix F shall be implemented to minimise erosion at excavation / clearing sites or aggregate storage sites. Where necessary, sedimentation barriers shall be laid between the Work Area and the "no-go" areas to limit sediment deposition. The sedimentation barrier shall consist of a geotextile fabric stretched across and attached to supporting posts and stabilised with sandbags. The barrier shall be inspected daily and any damage shall be repaired immediately. Sediment deposits shall be removed once they reach half the height of the barrier.

SDEM 4.4.18 Site closure and rehabilitation (Subclause 2.7.12)

All construction debris found within the disturbed areas shall be removed and disposed of at a registered landfill site.

The Vegetation Rehabilitation Plan included in Appendix C shall be implemented. The construction footprint associated with the activity shall be re-vegetated with indigenous vegetation, as directed by this rehabilitation plan. Rehabilitation of disturbed areas shall commence as soon construction of the specific section have been completed.

SDEM 4.4.19 Labour requirements

Recruitment shall be based on sound labour practices and with gender equality in mind. Obtain a list of locally available labour and skills. Preference shall be given to local communities.

Appropriate training shall be provided to enable individuals to apply their skills to other construction and development projects in the region once the construction phase is completed.

SDEM 4.4.20 Lighting (Subclause 2.5.5)

A lighting management plan was compiled (dated 4 March 2014) and recommended the following mitigation measures. Minimise light waste by directing light only to the area requiring lighting. Use most energy efficient light sources for example light sources with correlated colour temperatures of less than 2000K. Mounting heights for lights shall be optimal to reduce spill of light into adjacent areas. Apply local lamp shielding where required. Use lights with a high cut off only to prevent upward lighting. Where possible, use motion detectors to activate lighting. All lighting shall be controlled by daylight switching to avoid operation during daylight conditions.

SDEMA 5 COMPLIANCE WITH REQUIREMENTS AND PENALTIES

SDEM 5.1 Penalties (Subclause 3.2)

Stop order works will be issued for the transgressions listed below. Stop order works may be issued per incident at the discretion of the Engineer.

a) Any employees, vehicles, plant, or thing related to the Contractor's operations operating within the designated boundaries of a "no-go" area.
b) Any vehicle driving in excess of designated speed limits.
c) Persistent and unrepaired oil leaks from machinery.
d) Persistent failure to monitor and empty drip trays timeously.
e) The use of inappropriate methods for refuelling.
f) Litter on site associated with construction activities.
g) Deliberate lighting of illegal fires on site.
h) Employees not making use of the site ablution facilities.
i) Failure to implement specified noise controls
j) Failure to empty waste bins on a regular basis.
k) Inadequate dust control.
l) A spillage, pollution, fire or any damage to any watercourse/ wetland resulting from negligence on the part of the Contractor.
m) Any act, that in the reasonable opinion of the Engineer, constitutes a deliberate contravention of the requirements of these Specifications

The Engineer will determine what constitutes a transgression in terms of this clause, subject to the Conditions of Contract. In the event that transgressions continue, the Engineer may cancel the Contract.

5 OPERATIONAL FRAMEWORK EMP

This section contains the Operational Framework EMP table which constitutes the Operational Framework EMP.

The information is summarised in tabular format illustrating the activity, aspect, impact, mitigation measure, performance indicators, resources, schedule and verification. These criteria are listed and explained below:

The following components are identified/ described:

- **Activity**: component/ activity of the project for which the impact has been identified;
- **Aspect**: the aspect of the above activity which will be impacted;
- **Impact**: the environmental impact identified and to be mitigated;
- **Mitigation measure**: measures identified for implementation in terms of environmental management to reduce, rectify or contain the identified environmental impact – mitigation is divided into the following:
    - **Objective**: desired outcome of mitigation measure,
    - **Mechanism**: method of achieving the objective;
- **Performance indicators**: outcomes that will indicate achievement of objective/s;
- **Responsibility**: party or parties identified for implementation of mitigation measure/s;
- **Resources**: available resources to aid implementation of mitigation;
- **Schedule**: timeframe in which identified impact and mitigation measure is anticipated to occur; and
- **Verification**: party or parties identified as responsible for review and assessment of final outcome.

5.1 Specification Data: Environmental Management (SDEMA)

	Operational Framework Environmental Management Programme Table						
No	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**SCHEDULE**	**VERIFICATION**
1.	Environmental management documentation and procedures	No framework within which to locate the management of the operational phase. No procedures against which to assess environmental performance during the operational phase and thus no measure of compliance.	**Objective:** To ensure that the operation of the PV facility does not result in avoidable impacts on the environment, and that any impacts that do occur are anticipated and managed. **Mechanism:** 1) Appoint a suitably qualified ECO to monitor compliance (either independent or in-house). 2) Audit the compliance with the requirements of the environmental specification contained within the OEMP.	Environmental impacts effectively monitored and managed during the operational phase. Comprehensive record of compliance and remedial actions available to the authorities	ECO, EPC and O&M contractor	Twice in the 1st three years and then once every five years	EPC & O&M contractor
2.	Environmental management of the operational phase	Positive impacts on socio-economic environment during operation	**Objective:** To ensure that the operation of the PV facility maximises positive impacts on the socio-economic environment. **Mechanism:** 1) Train local people for operation and maintenance of facility. 2) Employ local labour for the operational phase, where possible, and particularly for day to day	Consult annual skills and training records, employment records and proof of staff residency in the area prior to employment	EPC and O&M contractor	During Operational Phase (full lifetime) when the need arise to employ people.	DEA Holder of the EA

	Operational Framework Environmental Management Programme Table						
No	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**SCHEDULE**	**VERIFICATION**
			operations and maintenance.				
3.	Protection of fauna, flora and avifauna	Constructing a PV facility may have impacts on the vegetation. Certain sections of the site will be cleared of vegetation and it could become prone to alien species.	Objective: To prevent unnecessary disturbance to natural vegetation and to maintain a good veld condition. Mechanism: 1) Shallow depressions and well defined pans (see Figure 1) should be avoided, with buffer zones of at least 100 m around pans; 2) Remove perennial alien species such as P. glandulosa at sites disturbed or cleared, or where panel washing occurs. These should be disposed of in an appropriate manner to prevent future re-infestation and / or spreading of alien vegetation; 3) The small ground level openings in the electrical fence, 20-30 cm in height, should be kept clear to allow for small mammals and reptiles to move through the site; 4) Minimize noise and disturbance associated with maintenance activities at the plant once it becomes operational; 5) Instituting a comprehensive impact monitoring scheme, and using the results of this scheme to inform and	No animals are injured. No employees enter the no-go areas. No alien vegetation establishment. Invasive alien vegetation monitoring programme (see Appendix C) implemented.	EPC and O&M contractor	During the operational phase	Holder of the EA

	Operational Framework Environmental Management Programme Table						
No	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**SCHEDULE**	**VERIFICATION**
			refine a dynamic approach to mitigation. 6) Vegetation should be allowed to persist along roads to assist with management of water runoff. 7) The results of post-construction avifauna monitoring must be submitted to the Northern Cape Department of Environment and Nature Conservation, Birdlife South Africa and the Endangered Wildlife Trust and DEA on a quarterly basis.				
4.	Restoration of disturbed areas	Disturbed areas could be prone to erosion and further degradation	**Objective:** To prevent unnecessary disturbance to natural vegetation and to maintain a good veld condition. **Mechanism:** 1) At the start of the rehabilitation process, the disturbed areas shall be scarified using a mechanical agricultural ripper (vlekploeg) to break up the compacted soil. This shall be done immediately prior to the rainy season (autumn) for best results. 2) If necessary gypsum should be added to the soil to enhance water infiltration in areas that have been compacted by vehicles. 3) Stockpiled plant material removed	Disturbed areas restored immediately	Restoration specialist, Engineer, EPC and O&M contractor	During the construction and operational phase	Holder of the EA

	Operational Framework Environmental Management Programme Table						
No	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**SCHEDULE**	**VERIFICATION**
			from the cleared areas shall be chipped to form coarse mulch that can be distributed over the disturbed areas. 4) Comply with the rehabilitation plan included in Appendix C. Partly cleared and reseeded areas shall be protected from grazing for at least three years to allow the new seedlings to establish and release their first seeds.				
5.	Stormwater runoff, erosion, and pollution of surface water and groundwater resources.	Contamination of stormwater runoff can impact on the surface and groundwater resources. The mismanagement of stormwater can furthermore result in erosion.	**Objective:** Prevent stormwater from eroding the land and becoming contaminated. **Mechanism:** 1) Monitor both soil chemistry and erosion and mitigate if required; 2) Should soil chemistry be affected (this is likely to be an increase in salinity), the nature of the washing mixture could be changed, or acceptable waste treatment employed; 3) Channel runoff should be diverted in such a way as to minimise erosion and if necessary, soil stabilising techniques should be implemented in vulnerable areas;	Stormwater not contaminated by construction activities. Stormwater control measures are effective at regulating runoff from the site and erosion channels do not develop. Freshwater ecosystems are not unduly	EPC and O&M contractor	After site clearing has taken place up to the end of the operational phase.	Holder of the EA

	Operational Framework Environmental Management Programme Table						
No	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**SCHEDULE**	**VERIFICATION**
			4) Gravel roads should be graded and shaped with a 2.5 % crossfall back into the slope, allowing stormwater to be channelled in a controlled manor towards the natural drainage lines; and Storm water infrastructure should be properly maintained.	disturbed by construction activities within the drainage channels.			
6.	Visual impact	The site is visible to the public and a construction site might have a negative visual impact on the sense of place.	**Objective:** To protect the sense of place. **Mechanism:** 1) All excess material shall be removed off-site, and the ground shall be returned to original levels / gradients as far as possible; 2) New structures should be placed where they are least visible to the greatest numbers of people, in places where the topography can offer shielding, where possible; 3) Non-reflective colours and materials that would blend in with the natural environment should be used for all buildings. E.g. cladding with local stone or plaster and paint with earthy tones for paint colours, roofs should be grey and non-reflective and doors and window frames	No complaints from the public.	EPC & O&M contractor	Operational Phase	Holder of the EA

	Operational Framework Environmental Management Programme Table						
No	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**SCHEDULE**	**VERIFICATION**
			should reference either the roof or wall colours; and 4) Finishing materials of the infrastructure (including support structures) should be of colours that are non-reflective and in dark matte colours such as dark grey or charcoal. Light impacts 1) Minimise light waste by directing light only into the area in which it is required. 2) Use most energy efficient light sources for example light sources with correlated colour temperatures of less than 2000K. 3) Mounting heights for lights shall be optimal to reduce spill of light into adjacent areas. 4) Apply local lamp shielding where required. 5) Use light with a high cut off only to prevent upward lighting. 6) Where possible, use motion detectors to activate lighting. 7) No continuous lighting may occur. 8) All lighting shall be controlled by daylight switching to avoid operation				

	Operational Framework Environmental Management Programme Table						
No	**ASPECT**	**IMPACT**	**MITIGATION MEASURE: (objective and mechanism)**	**PERFORMANCE INDICATOR**	**RESPONSIBILITY**	**SCHEDULE**	**VERIFICATION**
			during daylight conditions.				
7..	Impacts on local economy (employment) and social conditions	The activity might impact on the economy (local shops, restaurants, and Guest Houses, etc.)	**Objective:** To ensure on-going sustainability of the local tourism / hospitality industry. **Mechanism:** 1) Give preference to local communities for employment opportunities; and 2) Base recruitment on sound labour practices and with gender equality in mind.	Contribute to local community upliftment	EPC & O&M contractor	Operational phase	Holder of the EA
8.	Land use	Based on the distance to the nearest Square Kilometre Array (SKA) station the proposed development could potentially impact on the SKA project.	**Objective:** To prevent electromagnetic interference generated from the power generation equipment and prevent the facility from acting as secondary transmitters. **Mechanism:** 1) Implement measures recommended in the modelling study, as agreed to with SKA	No interference with the SKA project.	EPC & O&M contractor	Operational phase	Holder of the EA

6 MONITORING PROGRAMMES

6.1 Avifaunal Monitoring Programme

A suitable qualified avifaunal specialist developed a monitoring programme which met the requirements of the avifaunal specialist study undertaken as part of the EIA phase. This programme shall be included in this section and considered to be part of the LEMP.

The programme shall allow for monitoring of the site immediately before and after construction to implement further measures to mitigate any impacts if required.

6.2 Erosion Monitoring Programme

A suitable qualified hydrologist developed a monitoring programme which met the requirements of the EIA phase. This programme was included in Appendix E of the LEMP.

6.3 Alien vegetation Monitoring Programme

A suitable qualified botanical specialist developed a monitoring programme which met the requirements of the botanical specialist study undertaken as part of the EIA phase. This programme was included in Appendix C of the LEMP.

7 DECOMMISSIONING

The Power Purchase Agreement for the Mulilo Sonnedix Prieska PV is valid for a period of 20 years after which the plant would most likely be upgraded or decommissioned and the site rehabilitated. Should the PV plant be decommissioned, materials and infrastructure that could not be recycled would need to be disposed of at an approved landfill site. Infrastructure should be removed and disturbed areas rehabilitated in accordance to the specifications of a suitably qualified rehabilitation specialist during decommissioning.

Since the proposed PV plant comprises of inert materials (mostly concrete), the residual risks associated with decommissioning would be negligible. Roads which are no longer required after decommissioning should be scarified and the areas rehabilitated with the assistance of a rehabilitation specialist.

Materials will be recycled where appropriate, and any hazardous substances shall be removed and disposed of in terms of the requirements of the relevant legislation (e.g. Hazardous Substances Act, No. 15 of 1973 and the National Environmental Management: Waste Act, 2008) and SANS specifications.

8 ROLES AND RESPONSIBILITIES

Prior to the commencement of construction and operation of the project a suitably qualified and experienced ECO shall be appointed by the proponent to ensure that the mitigation rehabilitation measures and recommendations referred to in the EA are implemented and to ensure compliance with the provisions of the LEMP, thereby ensuring that identified environmental considerations are efficiently and adequately taken into account during all stages of development.

8.1 Holder of the EA

Mulilo Sonnedix Prieska PV (Pty) Ltd shall:

- Assume overall responsibility for the administration and implementation of the LEMP through an identified in house Project Manager or Engineer;
- Appoint or engage a suitably qualified Project Manager or Engineer; and
- Appoint or engage a suitably qualified independent ECO to monitor compliance with the LEMP and undertake monthly and close out audits of compliance with the requirements of the LEMP and provide a copy of the audit reports to the DEA and the Contractor.

8.2 Project Manager

The Project Manager or Engineer shall:

- Have overall responsibility for the environment;
- Have the authority to stop works and issue fines, as necessary;
- Receive reports from the ECO and shall report to the holder of the Environmental Authorisation (Mulilo Sonnedix Prieska PV); and
- Support the ECO in his/her roles and responsibilities.

The duties of the Project Manager during the operation phase will include:

- Liaison with the Holder of the EA and DEA;
- Monitoring of the operation of the project for compliance with the various environmental requirements contained in the Framework Operational EMP;
- Ensuring the proactive and effective implementation and management of environmental protection measures; and
- Monitoring of compliance with the EA related to the operational phase as issued by DEA as well as other relevant environmental legislation.

8.3 ECO

The ECO shall:

- Oversee and monitor compliance with and implementation of the construction phase EMP, and Rehabilitation Plan, including compliance with the relevant conditions contained in the EA and the relevant environmental legislation.

The duties of the ECO during construction phase will include:

- Liaison with the Holder of the Manager or Engineer and DEA;
- Monitoring of all of the Contractor's activities for compliance with the various environmental requirements contained in the construction Specification;
- Monitoring of compliance with the EA related to the construction phase as issued by DEA as well as other relevant environmental legislation;
- Reviewing of the Contractor's environmental Method Statements;
- Ensuring that the requisite remedial action is implemented in the event of non-compliance;
- Ensuring the proactive and effective implementation and management of environmental protection measures;
- Ensuring that a register of public complaints is maintained by the Contractor and that any and all public comments or issues are appropriately reported and addressed;
- Routine recording and reporting of environmental activities on a weekly and monthly basis; and
- Recording and reporting of environmental incidents.

9 CONCLUSION

In conclusion it should be noted that the LEMP should be regarded as a living document and changes should be made to the LEMP as required by project evolution, while retaining the underlying principles and objectives on which the document is based.

The compilation of the LEMP has incorporated impacts and mitigation measures from the EIAR as well as additional input from specialists. The LEMP has ensured that the mitigation measures shall be implemented throughout the project lifecycle in its entirety as opposed to phase-specific measures.

APPENDIX A

CURRICULUM VITAE OF ENVIRONMENTAL ASSESSMENT PRACTITIONERS

Curriculum vitae: Mrs K de BRUYN

Name	:	**de Bruyn, Karen**
Date of Birth	:	12 December 1987
Profession/Specialisation	:	Environmental studies and management
Years with Firm	:	3
Nationality	:	South African
Years experience	:	4

Key qualifications

Karen is an environmental scientist with four years' of experience in the environmental management field. She has a wide range of experience in undertaking environmental processes for small and medium to large-scale developments ranging from renewable energy projects, civil projects and general waste related projects to mining projects.

As technical staff, Karen is responsible for compiling reports for both the basic assessment and environmental impact assessment (EIA) processes in accordance with applicable legislation.

Karen is a certified natural scientist with the South African Council for Natural Scientific Professions (SACNSP), a member of the International Association for Impact Assessments South Africa (IAIASA) and also an associate member of the Institute of Waste Management of Southern Africa (IWMSA). She holds a Master of Philosophy degree in Environmental Management and a Bachelor of Science degree in Conservation Ecology, both obtained from the University of Stellenbosch in South Africa.

Employment record

03/2011 - Date	Aurecon, Environmental Assessment Practitioner (EAP)
02/2010 - 02/2011	Anèl Blignaut Environmental Consultants, Junior Environmental Assessment Practitioner (EAP)

Experience record

Implementation of the Klipgats Pan Environmental Authorisation (EA) **(Northern Cape Province, South Africa) 11/2013 - Date.** *Project Leader.* Mulilo Renewable Energy received Preferred Bidder Status for one of their photovoltaic facilities near Copperton and required assistance with the implementation of the EA, including updating of the Environmental Management Plan (EMP). Responsible for the management of tasks and review of all documentation. Also assisting client with questions on the EIA process. (Mulilo Renewable Energy).

Implementation of the Hoekplaas EA **(Northern Cape Province, South Africa) 11/2013 - Date.** *Project Leader.* Mulilo Renewable Energy received Preferred Bidder Status for one of their photovoltaic facilities near Copperton and required assistance with the implementation of the EA, including updating of the EMP. Responsible for the management of tasks and review of all documentation. Also assisting client with questions on the EIA process. (Mulilo Renewable Energy).

Mulilo De Aar 1 Wind Energy Facility **(Northern Cape Province, South Africa) 01/2013 - Date.** *Project leader.* This project entailed the assessment of potential impacts on surface water features as a result of the previously authorised 100 Megawatt (MW) Wind Energy Facility (WEF) (referred to as De Aar 1) on the Smouspoort (Remainder of Farm 130) and Zwartkoppies (Portion 2 of Farm 131) farms near De Aar. The objective of this Basic Assessment (BA) process is therefore to assess potential impacts associated with the construction of internal access roads, three construction yards, 33 kilovolt (kV) overhead electrical reticulation lines and a substation/ control building in close proximity to surface water features. Responsible for management of the process, report compilation, review of specialist reports and public participation process. Involved for 4 person-months. (Mulilo Renewable Energy (Pty) Ltd).

Beira Port master plan **(Sofala Province, Mozambique) 10/2013 – 02/2014.** *Environmental Practitioner.* The Beira Port master plan aims to identify the key components impacting on the capacity and efficiency of the Beira Port and its associated corridor feeder system, the selection of an appropriate development model

to facilitate the ports strategic development for the next 20 years. Responsible for describing the environmental baseline and compile the legislation framework for inclusion in the final plan. Involved for 0.5 person-months. (Common Market for Eastern and Southern Africa).

Fatal flaw study for a potential Solar Energy Facility site near Vanderkloof Dam **(Free State Province, South Africa) 10/2013 - 11/2013.** *Environmental Practitioner.* The study entailed a fatal flaw analysis of two potential Solar Energy Facility sites in the Free State Province. Responsible for the assessment of the sites and compilation of the fatal flaw report. (VentuSA Energies).

Mulilo photovoltaic (PV) expansion **(Northern Cape Province, South Africa) 03/2013 - Date.** *Technical Staff Member.* This project entailed two EIA processes for the proposed photovoltaic energy facilities at Badenhorst Dam Farm and Du Plessis Dam Farm. At Badenhorst Dam Farm, the solar energy project would comprise of four 75MW solar energy facilities. At Du Plessis Dam Farm, the solar energy project would comprise of three 75MW solar energy facilities. Responsible for report compilation, review of specialist reports and public participation process. Involved for 1.27 person-months. (Mulilo Renewable Energy (Pty) Ltd).

Social and environmental impact assessment (SEIA) for the proposed mining of the Z20 uranium deposit. **(Erongo Region, Namibia) 10/2012 - 10/2013.** *Technical Staff Member.* Aurecon was appointed to manage a social and environmental impact assessment (SEIA) for the proposed mining of the Z20 uranium deposit and the infrastructure corridor linking the mine to the Rössing plant. Responsible for compilation of the scoping, the SEIA and environmental management plan (EMP) reports. Involved for 2.18 person-months. (Rössing Uranium Limited).

Update to environmental and social impact assessment (ESIA) for the construction of the Ministry of Staff houses at Ombika Gate of the Etosha National Park **(Etosha National Park, Namibia) 06/2012 - 08/2012.** *Technical Staff Member.* The Millennium Challenge Account Namibia (MCA-N) is supporting the Ministry of Environment and Tourism (MET) with regard to infrastructure improvements in Etosha National Park (ENP). An environmental and social impact assessment (ESIA) study in 2010 by Aurecon identified and assessed all environmental and social impacts and developed required mitigation measures for all identified environmental issues for the site on the eastern side of the Ombika Gate (Ombika East). Both the site selection report and the follow-up site specific ESIA study were formally approved and environmental clearance granted by MET in accordance with the Environmental Management Act (EMA) of 2007. However, MET has formally requested that an alternate site on the west side of the road (Ombika West) be included in the assessment for the new staff village at Ombika (Okaukuejo Gate). Responsible for updating the ESIA report, assisting with report writing, presenting results to Interested and Affected Parties (I&APs), site visits and informing adjacent landowners of the additional study. Involved for 1 person-month. (Ministry of Environment and Tourism).

Construction phase environmental management programme (EMP) for the proposed office building for SANRAL on Erf 39688, Upper Oakdale **(Western Cape Province, South Africa) 04/2012 - 05/2012.** *Technical Staff Member.* SANRAL required additional office space and proposed to develop a business park that would involve the construction of an office building of approximately 3000 m²; widening of the existing Mispel road, additional access roads, landscaping, lighting, parking bays, security and signage. The environmental management programme (EMP) provided a link between the identified impacts and the environmental management required during project implementation. Responsible for compiling the EMP, liaising with client and site visits. Involved for 1 person-month. (SANRAL).

Integrated waste management plan and Section 24 G process to address the illegal waste disposal activities at Strandfontein High School, Mitchell's Plain **(Western Cape Province, South Africa) 02/2012 - Date.** *Technical Staff Member.* The Department of Environmental Affairs and Development Planning (DEA&DP) Directorate: Environmental Compliance and Enforcement, issued Strandfontein Secondary School with a warning letter based on the illegal waste disposal activities on Erf 14927. In response to these illegal activities, the DEA&DP intervened and all disposal activities were ceased. An integrated waste management Plan (IWMP) was compiled and a Section 24 G process in terms of NEMA is being undertaken. Responsible for report compilation, liaising with authorities and site visits. Involved for 4 person-months. (Western Cape Education Department).

Proposed photovoltaic solar energy facilities near De Aar **(Northern Cape Province, South Africa) 09/2011 - Date.** *Technical Staff Member.* Mulilo Renewable Energy proposed to construct three photovoltaic solar energy facilities near De Aar, which would enable them to be taken into consideration as an independent power producer (IPP). The integrated resource plan (IRP) 2010 allows for an additional 14 749MW of renewable energy in the electricity mix in South Africa by 2030, and Mulilo wanted to participate in

this programme. The proposed facilities would be able to generate 169MW collectively. Responsible for compiling the scoping reports, the basic assessment report (BAR), conducting the public participation process (PPP) and liaising with all stakeholders. Involved for 4 person-months. (Mulilo Renewable Energy (Pty) Ltd).

Determination of future rehabilitation costs associated with existing landfill sites **(Regional, South Africa) 05/2011 - Date.** *Technical Staff Member.* The project entailed the determination of associated future rehabilitation costs of existing landfill and solid waste disposal sites in line with GRAP 17 requirements. Where licences and permits were lacking, the minimum requirements for rehabilitation as developed by Department of Water Affairs during 1998 were used to ensure compliance. The costing included provision for the relevant environmental processes, civil works and post decommissioning monitoring. Responsible for report writing, finances and management of specialists. Involved for 1 person-month. (Mubesko Africa).

Operational phase management plan of the Sandown Shoprite Checkers in Parklands **(Western Cape Province, South Africa) 04/2011 - 05/2011.** *Technical Staff Member.* As a prerequisite to get the building plans for the Sandown Shoprite Checkers approved, an operational environmental monitoring programme (OEMP) had to be submitted to the City of Cape Town. The OEMP addressed key issues of on-site stormwater management, landscaping and management of a portion of public open space and a retention pond containing floating islands. Responsible for compiling an operation phase management plan. Involved for 1 person-month. (Shoprite Checkers).

Basic assessment process for the upgrade of Distillery Road in Wellington **(Western Cape Province, South Africa) 04/2011 - Date.** *Technical Staff Member.* Drakenstein Municipality was aiming to upgrade a 1.4km section of Stokery Road, starting 200m from the intersection with Main Road 27, Champagne Street, up to the intersection with Main Road 219, Main Street. The geometric layout was upgraded from a 9.2m surfaced road to a 14.8m surfaced road, with 1.8m surfaced sidewalks. This allows for two 3.4m lanes per direction to accommodate the left and right turning of heavy vehicles, and for safer pedestrian usage. The stormwater system upgrade included a concrete culvert to replace the current unlined channel on the western side. Responsible for completing the application form, the basic assessment report (BAR) and the environmental management plan (EMP). Involved for 3 person-months. (Drakenstein Local Municipality).

Borrow pit inspection in Oudtshoorn **(Western Cape Province, South Africa) 03/2011 - 03/2011.** *Technical Staff Member.* The project entailed assisting with the screening evaluation of potential borrow pit sites in the Oudtshoorn Municipal District. The three potential borrow pit sites were assessed in a high level screening process according to suitability from an environmental perspective to take it to the next level of geological investigation. Responsible for assisting the team leader with the compilation of the feedback/screening report of the potential sites that were investigated, and assisting with field work. Involved for 0.5 person-months.

Education

2011 : MPhil Environmental Management, University of Stellenbosch, South Africa
2009 : BSc Conservation Ecology, University of Stellenbosch, South Africa

Career enhancing courses

2013 : Project Management, University of Cape Town (UCT), South Africa
2012 : Certificate in Business Writing for Professionals, University of Cape Town (UCT), South Africa

Professional affiliations

Associate Member, Institute of Waste Management of Southern Africa (IWMSA)
Member, International Association for Impact Assessments South Africa (IAIASA)
Certified Natural Scientist, South African Council for Natural Scientific Professions (SACNSP)

Languages

	Reading	**Writing**	**Speaking**
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

Publications

De Bruyn K, and Pretorius D, 2013. "Addressing contemporary recycling problems inherited by poor". International Association of Impact Assessments Conference.

Referees

Company	Contact Person	Telephone nr.
Anèl Blignaut Environmental Consultants	Anèl Blignaut	+27 82 751 9596 anel@dpeng.co.za

Curriculum vitae: Ms FI GRESSE

Name	:	**GRESSE, FRANCIENA ISABELLA**
Date of Birth	:	14 March 1985
Profession/Specialisation	:	Environmental practitioner
Years with Firm	:	6
Nationality	:	South African
Years experience	:	7

Key qualifications

Franci is a senior environmental practitioner in Aurecon's Cape Town office. She has been involved in various environmental investigations, including environmental impact assessments (EIAs), environmental management plans (EMPs), environmental management programmes (EMPs), rehabilitation plans and fatal flaw analysis.

She has been involved with the South African National Biodiversity Institute's (SANBI) wetland rehabilitation programme (Working for Wetlands) for the past four years, which requires the compilation of basic EIAs and rehabilitation plans. This project also won the 2012 Aurecon Chairman's Award. Furthermore, she has also been involved with a number of projects in the renewable energy sector.

Franci served on the committee of the South African affiliate of the International Association for Impact Assessment (IAIA) for the Western Cape Branch from 2009 to 2011, and remains a member. She is also in the process of registering as a Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNSP). She completed a Bachelor of Science and an Honours Degree in Conservation Ecology at the University of Stellenbosch (South Africa).

Employment record

03/2009 - Date	Aurecon, Senior Environmental Consultant
2008 - 02/2009	Aurecon, Candidate Environmental Consultant

Experience record

Implementation of the Klipgats Pan Environmental Authorisation (EA) **(Northern Cape Province, South Africa) 11/2013 - Date.** *Project Leader.* Mulilo Renewable Energy received Preferred Bidder Status for one of their photovoltaic facilities near Copperton and required assistance with the implementation of the Environmental Authorisation (EA), including updating of the Environmental Management Plan (EMP). Responsible for the management of tasks and review of all documentation. Also assisting client with questions on the EIA process. (Mulilo Renewable Energy).

Implementation of the Hoekplaas Environmental Authorisation (EA) **(Northern Cape Province, South Africa) 11/2013 - Date.** *Project Leader.* Mulilo Renewable Energy received Preferred Bidder Status for one of their photovoltaic facilities near Copperton and required assistance with the implementation of the Environmental Authorisation (EA), including updating of the Environmental Management Plan (EMP). Responsible for the management of tasks and review of all documentation. Also assisting client with questions on the EIA process. (Mulilo Renewable Energy).

Environmental impact assessment and compilation of an environmental management plan for the Swakopmund-Mile 7 Water Supply, Phase 2 **(Swakopmund, Namibia) 11/2013 - Date.** *Project Leader.* NamWater appointed Aurecon to assist with the environmental impact assessment process for the proposed construction of a new water pipeline between Swakopmund and Mile 7. Responsible for the management and review of the EIA reports and processes, as well as the project's finances. (NamWater).

Working for Wetlands plan 2014 - 2017 **(Western Cape Province, South Africa) 06/2013 - 12/2015.** *Task Leader.* The South African National Biodiversity Institute (SANBI) appointed Aurecon to provide environmental and engineering services for the Working for Wetlands Programme which is a national wetland rehabilitation programme. Responsible for the management of the environmental authorisation component of the project, as well as the compilation of Basic Assessment Reports (BAR) for the country. Other responsibilities include the compilation of Wetland Rehabilitation Plans for the Western Cape, Northern Cape, North West and Limpopo Provinces, liaison with authorities and the public (public participation

process) and management of wetland specialists. (South African National Biodiversity Institute (SANBI)).

Environmental impact assessment (EIA) for the expansion of approved solar energy facilities located near Prieska and De Aar **(Northern Cape Province, South Africa) 03/2013 - 10/2014.** *Phase Leader.* Mulilo Renewable Energy decided to expand the approved solar energy facilities on the farms Hoekplaas and Klipgats in Prieska, as well as on the farms Badenhorst Dam and Du Plessis Dam in De Aar. The expasion of Hoekplaas farm in Prieska includes ten additional 75MW photovoltaic (PV) facilities and six additional PV units at Klipgats Pan farm. The expansion at Badenhorst Dam farm includes four additional 75MW PV facilities and three additional PV units at Du Plessis Dam farm. Responsible for the management and review of the EIA reports and processes, as well as the project's finances. (Mulilo Renewable Energy).

Fatal flaw study for two potential Wind Energy Facility (WEF) sites **(Northern and Western Cape Provinces, South Africa) 03/2013 - 04/2013.** *Environmental Practitioner.* The study entailed a fatal flaw analysis of two potential Wind Energy Facility (WEF) sites in the Northern and Western Cape Provinces. Responsible for the assessment of the sites and compilation of the fatal flaw report. (Juwi Renewable Energies (Pty) Ltd).

Photovoltaic (PV) energy facilities near Copperton **(Northern Cape Province, South Africa) 02/2013 - Date.** *Project Leader.* The project entails two Environmental Impact Assessments (EIAs) for 15 75MW Photovoltaic (PV) energy facilities, located near Copperton. Responsible for the management and review of the EIA process and finances. (Mulilo Renewable Energy (MRE)).

Repair of flood damage to road structures in the Eden District Municipality **(Western Cape Province, South Africa) 2012 - Date.** *Environmental Practitioner.* The project entails the compilation of Maintenance Management Plans (MMP) for seven areas with the Eden District Management Area to repair. Responsible for compilation of MMPs, review of reports and liaison with stakeholders and authorities. (Western Cape Provincial Department of Transport and Public Works).

Richtersveld Wind Energy Facility (WEF) **(Northern Cape Province, South Africa) 07/2012 - 08/2012.** *Environmental Practitioner.* The project entailed a due diligence of the proposed Wind Energy Facility (WEF) to review compliance with the requirements of the Department of Energy's Independent Power Producer (IPP) process. Responsible for the review of the environmental reports and compilation of the due diligence report. (TRE Tozzi Renewable Energy S.p.A and Guma Group).

Three Photovoltaic (PV) energy facilities near Copperton **(Northern Cape Province, South Africa) 09/2011 - Date.** *Environmental Practitioner.* The project entailed three Environmental Impact Assessments (EIAs) for three Photovoltaic (PV) energy facilities comprising 75MW to 150MW, located near Copperton. Responsible for the management the EIA process and project specialists, compilation of scoping and EIA reports and liaison with authorities. (Mulilo Renewable Energy (MRE)).

Fatal flaw study for four potential Wind Energy Facility (WEF) sites **(Northern and Western Cape Provinces, South Africa) 11/2011 - 05/2012.** *Environmental Practitioner.* The study entailed a fatal flaw analysis of four potential Wind Energy Facility (WEF) sites across the Northern and Western Cape Provinces. Responsible for the management of specialists, review of reports, assessment of the sites and compilation of the fatal flaw report. (Mainstream Renewable Power South Africa).

Proposed Paarl Mountain and Ysterbrug pumping main upgrades **(Western Cape Province, South Africa) 2011 - 2013.** *Environmental Advisor.* The Drakenstein Municipality appointed Aurecon's engineers to investigate and plan the proposed upgrade of the Paarl Mountain and Ysterbrug Pumping Scheme. The upgrading of the pipelines feeding the Meulwater Water Treatment Works from the Bethel and Nantes dams, also part of this scheme, was also investigated. Responsible for providing advice on environmental processes required. Other responsibilities included the management of the independent Environmental Assessment Practitioner and the review of all EIA documentation. (Drakenstein Municipality).

Proposed Rehabilitation of Wetlands as Part of the Working for Wetlands **(Western, Northern, Limpopo and Gauteng Provinces) 2010 - 2013.** *Environmental Practitioner.* Appointed by the South African National Biodiversity Institute (SANBI) to conduct Environmental Impact Assessments (EIAs) for the rehabilitation of specific wetlands in all provinces of South Africa over a five year period. Responsible for the compilation of Basic Assessment Reports (BAR) and Wetland Rehabilitation Plans for the Western Cape, Northern Cape, Gauteng and Limpopo Provinces. Other responsibilities included liaison with authorities, public participation process, management of specialists and general project management of the environmental component of the project. (South African National Biodiversity Institute (SANBI)).

***Environmental Impact Assessment (EIA) for the proposed extension of the Ash Dam facility at Kriel Power Station* (Mpumalanga Province, South Africa) 2010 - Date.** *Environmental Practitioner.* Appointed by Eskom to conduct an Environmental Impact Assessment (EIA) for the proposed construction of a fourth ash dam facility at the Kriel Power Station. Responsible for the general project management and finances, screening process, compilation of the scoping and EIA reports, public participation and the compilation of a waste management licence application. (Eskom Holdings).

***Environmental Impact Assessment (EIA) for proposed solar energy facility, Onder Rietvlei Farm* (Aurora, Western Cape Province, South Africa) 2010 - 2011.** *Environmental Practitioner.* Appointed by Solaire Direct to undertake a basic environmental impact assessment process for the proposed construction of a 10 MW solar energy facility. Responsible for the compilation of the draft and final reports, public participation process, management of specialists and general project management. (Solaire Direct Southern Africa).

***Environmental Impact Assessment (EIA) for proposed relocation of solar energy facility, Onder Rietvlei Farm* (Aurora, Western Cape Province, South Africa) 2010 - 2011.** *Project Leader.* Appointed by Solaire Direct to undertake a basic Environmental Impact Assessment (EIA) process for the proposed relocation of an approved, but not yet constructed 10 MW solar energy facility. Responsible for the management and review of the EIA process and finances. (Solaire Direct Southern Africa).

***Environmental Sensitivity Study (ESS) for a proposed solar energy facility on a farm Near Aurora* (Western Cape Province, South Africa) 2010.** *Environmental Practitioner.* Appointed to provide and Environmental Sensitivity Study (ESS) which inter alia highlights the potential constraints ("red flags") and opportunities presented by the site from an environmental perspective. Responsible for the compilation of the ESS. (Solaire Direct Southern Africa).

***Proposed erection of Eskom communication sirens/PA systems* (Blaauwberg, Western Cape Province, South Africa) 2009 - 2010.** *Environmental Practitioner.* The project entailed three Environmental Impact Assessment (EIA) processes for the (a) erection of 10 new sirens in the Parklands area, (b) the relocation of one siren in Bloubergstrand, and (c) the upgrade of five sirens on farms near Melkbosstrand. Responsible for compiling EIA reports, and the public participation process. (Eskom).

***Proposed construction of a new pipeline from Bovlei Winer to Withoogte Dam* (Wellington, Western Cape Province, South Africa) 2009 - 2010.** *Environmental Practitioner.* The Drakenstein Municipality proposed to replace a section of the existing pipeline extending from the Withoogte Dam to the Welvanpas Reservoir near Wellington as part of the municipality's water master plan in order to improve the overall water supply. Responsible for the compilation of the Environmental Impact Assessment (EIA) report, management of specialists and the public participation process. (Drakenstein Municipality).

***Proposed remediation, rehabilitation and restoration of the Spruit, Krom, Leeu and Palmiet Rivers* (Western Cape Province, South Africa) 2009 - 2010.** *Environmental Practitioner.* Appointed by the Drakenstein Municipality to undertake the requisite Environmental Impact Assessment (EIA) process for the rehabilitation, remediation and stabilisation of four rivers in Paarl and Wellington. Responsible for the EIA and public participation processes. (Drakenstein Municipality).

***Overberg District Municipality: Integrated Transport Plan (ITP): strategic environmental informants* (Western Cape Province, South Africa) 2009.** *Environmental Practitioner.* Aurecon's Transportation Unit was appointed to revise the Integrated Transport Plan (ITP). The Environmental Unit was sub-contracted to provide environmental input. Responsible for identifying and describing the relevant informants. (Overberg District Municipality).

***Overberg District Municipality Integrated Transport Plan (ITP) strategic environmental informants* (Western Cape Province, South Africa) 2009.** *Environmental Practitioner.* Aurecon's Transportation Unit was appointed to revise the Integrated Transport Plan (ITP). The Environmental Unit was sub-contracted to provide environmental input. Responsible for identifying and describing the relevant informants. (Overberg District Municipality).

***Annandale Commercial: development of petrol filling station on portion of Erf 5561* (Kuils River, Western Cape Province, South Africa) 2009.** *Environmental Practitioner.* Appointed to compile a Construction Environmental Management Plan (CEMP) for the construction of a filling station on the corner of Gladioli Street and Amandel Drive, Kuils River. Responsible for the compilation of the project specification document as part of the CEMP. (Communicate).

Pre-feasibility and feasibility studies for augmenting the Western Cape water supply system **(South Africa) 2008 - 2013.** *Project Staff.* The Department of Water Affairs commissioned pre-feasibility and feasibility studies for the augmentation of the Western Cape water supply system through the further development of the surface water resources. Surface water schemes to be investigated were identified by the Western Cape water supply system reconciliation strategy study. Responsible for the public participation process, managing environmental specialists, and compiling a socio-economic overview of the study area. (Department of Water Affairs (DWA)).

Environmental Impact Assessment (EIA) for the proposed Langezandt Quays development in Struisbaai Harbour **(Western Cape Province, South Africa) 2008 - Date.** *Environmental Practitioner.* Aurecon was appointed to undertake an Environmental Impact Assessment EIA process for the proposed development of a four storey development on Erf 848 within the Struisbaai harbour precinct. Responsible for drafting responses to the Department of Environmental Affairs' independent review report on the proposed development. (Golden Falls (Pty) Ltd).

Proposed redevelopment of the Blaauwberg Conservation Area: Eerstesteen Node **(Western Cape Province, South Africa) 2008 - 2010.** *Environmental Practitioner.* The project entailed an Environmental Impact Assessment (EIA) process for redeveloping the Eerstesteen Conservation Area on the West Coast. Responsible for compiling the EIA report, as well as managing specialists and the public participation process. (City of Cape Town).

Table Mountain Group aquifer feasibility study and pilot project **(Western Cape Province, South Africa) 2008 - 2010.** *Environmental Control Officer.* The City of Cape Town initiated a study into the Table Mountain Group Aquifer as a potential water source to augment the city's supply. The feasibility and pilot project phase Record of Decision (RoD) required completion for site-specific Environmental Management Plans (EMPs) for drilling sites that were assessed to be environmentally sensitive. Site-specific EMPs were designed for sensitive sites to ensure minimal environmental impact during the drilling phase. Responsible for monitoring compliance with the RoD and EMP during the drilling phase. (City of Cape Town).

Application for rectification in terms of Section 24G of the National Environmental Management Act (NEMA) for the unlawful commencement of a fruit processing factory on Op de Tradouw Farm, Number 69 **(Barrydale, Western Cape Province, South Africa) 2008 - 2009.** *Environmental Practitioner.* The project consisted of an application for rectification in terms of Section 24G of NEMA. Responsible for compiling an environmental impact report and an Environmental Management Plan (EMP) for the application, as well as managing the public participation process. (Schoonies Family Trust).

C.A.P.E. Olifants-Doring Catchment Management Agency project: development of a catchment management strategy water resource protection sub-strategy for the Olifants-Doring Catchment **(South Africa) 2008 - 2009.** *Environmental Practitioner.* Appointed by CapeNature to compile a catchment management strategy water resource protection sub-strategy for the Olifants-Doorn catchment. Responsible for compiling a database that lists all institutions and their respective mandates in terms of water resource protection and biodiversity conservation decision making for the Olifants-Doring Catchment, workshop arrangements, and general project related work. (CapeNature).

Proposed extension of Lock Road **(Kalk Bay, Western Cape Province, South Africa) 2008 - 2009.** *Project Staff.* The project comprised an Environmental Impact Assessment (EIA) process for extending Lock Road to an existing erf. Involved during the final stages of the application. (Mr Rick Bartlett).

Proposed development of apple and pear orchards on Soetmelksvlei Farm **(Western Cape Province, South Africa) 2008 - 2009.** *Project Staff.* This Agri-development project involved the development of 50ha of apple and pear orchards in the Riviersonderend region. Responsible for compiling the basic assessment report, Environmental Management Plan (EMP), and managing the specialists and public participation process. (BETCO).

Water reconciliation strategy for the Algoa water supply area **(Eastern Cape Province, South Africa) 2008 - 2009.** *Environmental Practitioner.* This project provided an assessment of the environmental opportunities and constraints for a suite of water schemes in the Algoa water supply area. This was undertaken as part of a broader study in the area.

Environmental sensitivity study for the proposed Dasdrif Poultry Farm **(Moorreesburg, Western Cape Province, South Africa) 2008.** *Project Staff.* The project consisted of an Environmental Sensitivity Study (ESS) which, inter alia, highlighted the potential constraints (“red flags”) and opportunities presented by the site from an environmental perspective. Responsible for compiling the ESS. (Eikenhoff Poultry Farms (Pty)

Ltd).

***Department of Economic Affairs, Environment and Tourism (DEAET) decision-making support* (South Africa) 2008.** *Project Staff.* Responsible for assisting the DEAET with the review and processing of Environmental Impact Assessment (EIA) applications in terms of the Environment Conservation Act. (Department of Economic Affairs, Environment and Tourism (DEAET)).

***Joint Maputo River Basin water resources study* (Mozambique, Swaziland and South Africa) 2008.** *Project Staff.* The project provided an environmental opportunities and constraints assessment of a suite of potential dams in South Africa and Swaziland, within the Maputo River Catchment. This was undertaken as part of a broader study into the catchment.

Education

2007 : BSc (Hons) Conservation Ecology, University of Stellenbosch, South Africa

Career enhancing courses

2013 : Using MS Project for EIAs, Aurecon
2012 : Using SANBI's Biodiversity GIS datasets for EIAs, South African National Biodiversity Institute (SANBI)
2008 : Using Natural Resources for Community Development, Gesellschaft Technische Zusammenarbeit (GTZ), South Africa

Professional affiliations

Member, International Association of Impact Assessment (IAIA)

Languages

	Reading	**Writing**	**Speaking**
English	Excellent	Excellent	Excellent
Afrikaans	Excellent	Excellent	Excellent

Curriculum vitae: Ms L CORBETT

Name	:	**CORBETT, LOUISE**
Date of Birth	:	31 July 1981
Profession/Specialisation	:	Environmental Practitioner
Years with Firm	:	7
Nationality	:	South African
Years experience	:	8

Key qualifications

Louise is currently employed as an Associate and Senior Environmental Practitioner in Aurecon's Cape Town office. She has a BSc (Hons) in Environmental and Geographical Science, specialising in Environmental Management, which she obtained from the University of Cape Town (UCT) in 2004. She has seven years' experience in the environmental field and has compiled and managed numerous environmental investigations, including Environmental Impact Assessments (EIAs), Environmental Management Plans (EMPs) and Environmental Management Programmes (EMPs).

Louise has a particular interest in the energy sector, and has undertaken numerous environmental projects in this field. She was the Treasurer of the South African affiliate of the International Association for Impact Assessment (IAIA) for the Western Cape Branch from 2009 to 2011, and remains a Member. She is also a Registered Professional Natural Scientist with the South African Council for Natural Scientific Professions (SACNSP).

Employment record

02/2012 - Date	Aurecon, Associate/Senior Environmental Practitioner
2009 - 01/2012	Aurecon, Senior Environmental Practitioner
2006 - 2009	Aurecon, Environmental Practitioner
2006 - 2007	CCA Environmental (Pty) Ltd, Cape Town, South Africa, Environmental Consultant
2005	Morrison's Plc, London, United Kingdom, Systems Administrator
2004 - 2005	Barclays Bank Plc, London, United Kingdom, Customer Services Advisor

Experience record

Richtersveld Wind Energy Facility (WEF) **(Northern Cape Province, South Africa) 07/2012 - 08/2012.** *Project Leader.* The project entailed a due diligence of the proposed Wind Energy Facility (WEF) to review compliance with the requirements of the Department of Energy's Independent Power Producer (IPP) process. Responsible for the management and review of the environmental input to the due diligence report. (TRE Tozzi Renewable Energy S.p.A and Guma Group).

Ramp-up of manganese for the Port of Port Elizabeth **(Eastern Cape Province, South Africa) 07/2012 - Date.** *Environmental Practitioner.* The project entailed FEL2 study consulting services for providing a second berth for manganese bulk vessels in the Port of Port Elizabeth to ramp up export volumes, by extending the existing berth 14. Three main options (with sub-options) were developed as solutions to accommodate the preferred mooring arrangement layout, namely the provision of a mooring buoy; the provision of a mooring dolphin; and mooring to the existing quay. Responsible for review of environmental input required to determine if the project required authorisation in terms of the National Environmental Management Act (NEMA). (Transnet National Ports Authority (TNPA)).

Wind and solar energy facility on Kangnas Farm near Springbok **(Northern Cape Province, South Africa) 03/2012 - Date.** *Project Leader.* The project entailed an Environmental Impact Assessment (EIA) for a wind and solar energy facility comprising 750MW and 250MW respectively, located approximately 40km from Springbok. Responsible for the management and review of the EIA process and finances. (Mainstream Renewable Power South Africa).

Hydropower station on the Orange River near Kakamas **(Northern Cape Province, South Africa) 2011 - 2012.** *Project Leader.* The project entailed a Basic Assessment (BA) for a hydropower station comprising 12MW, located on the Orange River near Kakamas. Responsible for the management, finances, undertaking the BA process, specialist coordination and Public Participation Process (PPP). (ArcellorMittal).

Fatal flaw study for four potential Wind Energy Facility (WEF) sites **(Northern and Western Cape Provinces, South Africa) 11/2011 - 05/2012.** *Project Leader.* The study entailed a fatal flaw analysis of four potential Wind Energy Facility (WEF) sites across the Northern and Western Cape. Responsible for the management and review of the fatal flaw analysis. (Mainstream Renewable Power South Africa).

Three Photovoltaic (PV) energy facilities near De Aar **(Northern Cape Province, South Africa) 09/2011 - Date.** *Project Leader.* The project entailed two Environmental Impact Assessments (EIAs) and a Basic Assessment (BA) for three Photovoltaic (PV) energy facilities, comprising between 20MW and 150MW, located near De Aar. (Mulilo Renewable Energy (MRE)).

Three Photovoltaic (PV) energy facilities near Copperton **(Northern Cape Province, South Africa) 09/2011 - Date.** *Project Leader.* The project entailed three Environmental Impact Assessments (EIAs) for three Photovoltaic (PV) energy facilities comprising 75MW to 150MW, located near Copperton. Responsible for the management and review of the EIA process and finances. (Mulilo Renewable Energy (MRE)).

Wind Energy Facility (WEF) on the eastern plateau near De Aar **(Northern Cape Province, South Africa) 09/2011 - Date.** *Project Leader.* The project entailed an Environmental Impact Assessment (EIA), in terms of the National Environmental Management Act (NEMA), for a new Wind Energy Facility (WEF) comprising 300MW to 520MW. The site is located on the eastern plateau, approximately 20km east of De Aar. Responsible for the management and review of the EIA process and finances. (Mulilo Renewable Energy (MRE)).

Wind Energy Facility (WEF) near Koekenaap **(Western Cape Province, South Africa) 07/2011 - Date.** *Project Leader.* The project entailed undertaking the Basic Assessment (BA) for the construction of eight proposed wind turbines to generate approximately 19.2MW on the Olifant's River settlement near Koekenaap. Responsible for the management and review of the BA process and finances. (Plan 8).

Reverse Osmosis (RO) plant at Hendrina Power Station near Pullenshope **(Mpumalanga Province, South Africa) 02/2011 - 08/2012.** *Project Leader/Senior Environmental Practitioner.* The Water Management System (WMS) at Hendrina Power Station was at risk of non-compliance with Eskom's Zero Liquid Effluent Discharge (ZLED) policy due to excess wastewater. In order to reduce the risk of non-compliance, Eskom proposed to construct a Reverse Osmosis (RO) plant to treat concentrated cooling water, which was being disposed of at the Ash Dam as wastewater. The treated water from this plant would be re-used in the power station's processes. The project entailed a Basic Assessment (BA) and Waste Management Licence (WLM) for the RO plant. Responsible for the undertaking, management and review of the BA process and finances. (Eskom Holdings).

Rehabilitation of the stormwater system at Zevenwacht Residential Estate **(Western Cape Province, South Africa) 2011 - Date.** *Project Leader.* The project entailed a Basic Assessment (BA) for the rehabilitation of the stormwater management system on Zevenwacht Residential Estate in order to avoid seasonal flooding of an adjacent residential estate. Responsible for the management and review of the BA process. (City of Cape Town).

Anaerobic biodigester in Elgin **(Western Cape Province, South Africa) 12/2010 - Date.** *Project Leader.* The project entailed a Basic Assessment (BA) for an anaerobic digester and associated infrastructure for the processing of organic waste to generate heat and electricity on erven 291 and 292 in Grabouw. Responsible for the management and review of the BA process and finances. (Elgin Fruit Juices).

Wind Energy Facility (WEF) near Gouda **(Western Cape Province, South Africa) 12/2010 - Date.** *Project Leader.* The project entailed an Environmental Impact Assessment (EIA) for a Wind Energy Facility (WEF) comprising 30MW, located near Gouda. Responsible for the undertaking, and the management and review of the EIA process and finances. (iNca Energy).

Upgrading of the Pretoria Portland Cement (PPC) Riebeeck Plant near Riebeeck West **(Western Cape Province, South Africa) 11/2010 - 2012.** *Technical Advisor.* This project entailed the undertaking of an Environmental Impact Assessment (EIA) for the upgrading of the existing Pretoria Portland Cement (PPC) Riebeeck Plant. Aurecon undertook the environmental authorisation processes required for the proposed upgrade to the existing cement manufacturing plant in Riebeeck West. The upgrade of PPC Riebeeck would align the plant's functioning and operations with the emission requirements now and in the foreseeable future. Responsible for ad hoc review and technical input. (Pretoria Portland Cement (PPC)).

Wind Energy Facility (WEF) in Saldanha **(Western Cape Province, South Africa) 10/2010 - 12/2012.** *Project Leader.* The project entailed a Basic Assessment (BA) for a Wind Energy Facility, comprising six

turbines, located within the industrial area of Saldanha. Responsible for the management and review of the BA process and finances. (ArcellorMittal).

Wind Energy Facility (WEF) on Struisbult Farm near Copperton **(Northern Cape Province, South Africa) 10/2010 - 12/2012.** *Project Leader.* The project entailed an Environmental Impact Assessment (EIA) for a Wind Energy Facility comprising 140MW, located near Copperton. Responsible for the undertaking, management and review of the EIA process and finances. (Plan 8).

Solar energy facility on Onder Rietvlei Farm near Aurora **(Western Cape Province, South Africa) 07/2010 - 02/2012.** *Project Member.* The project entailed a Basic Assessment (BA) for the proposed construction of a 10MW solar energy facility on Portion 3 of Farm 18 near Aurora. Responsible for review of documentation. (Solairedirect Southern Africa).

Environmental Impact Assessment (EIA) for Moatize Coal Mine expansion **(Tete Province, South Africa) 03/2010 - 01/2011.** *Environmental Impact Assessment (EIA) Technical Team Member.* The Moatize Mine mainly produced coking coal for export (12Mtpa), but it was proposed to expand operations at the mine due to the favourable global market for coal. It was planned that Moatize Mine would increase its production of Run of Mine (ROM) coal from 26 to 52Mtpa, which would result in an additional 12Mtpa of coal production for export. The project entailed an Environmental Impact Assessment (EIA) for the expansion of the existing Moatize Coal Mine in the Tête Province in Mozambique. Responsible for report writing. (Vale Moçambique).

Extension of the ash dam facility at Kriel Power Station **(Mpumalanga Province, South Africa) 11/2009 - Date.** *Advisory Role.* The project entailed an Environmental Impact Assessment (EIA) and a Waste Management Licence (WML) for the proposed construction of a fourth ash dam facility at the Kriel Power Station. This ash dam would fulfil ash disposal requirements for the remainder of the power station's operational life, during which approximately 111.18 million cubic metres of ash will be produced. Responsible for ad hoc review of various documents and providing technical input as required. (Eskom Holdings).

Reverse Osmosis (RO) plant at Tutuka Power Station **(Mpumalanga Province, South Africa) 11/2009 - 07/2012.** *Senior Environmental Practitioner.* The brine from the existing Reverse Osmosis (RO) plant was being disposed of on the ash dump through irrigation, which was resulting in leachate from the ash dump. Eskom proposed the construction of an additional RO plant to concentrate the brine from the existing plant in order to limit brine being sent to the ash dump, and to recover water that would be used within the power station. The project entailed a Basic Assessment (BA) and Waste Management Licence (WML) for the RO plant. Responsible for the undertaking, management and review of the BA process and finances. (Eskom Holdings).

Wind monitoring masts in Middelburg **(Eastern Cape Province, South Africa) 03/2009 - 07/2010.** *Senior Environmental Practitioner.* The project entailed a Basic Assessment (BA) for two wind monitoring masts for the collection of wind data. Responsible for the compilation of the Basic Assessment Report (BAR) and ran the public participation process. (African Infrastructure Investment Managers (AIIM)).

Wind monitoring masts in Cookhouse **(Eastern Cape Province, South Africa) 2009.** *Senior Environmental Practitioner.* The project entailed a Basic Assessment (BA) for two wind monitoring masts for the collection of wind data. Responsible for the compilation of the Basic Assessment Report (BAR) and running the Public Participation Process (PPP). (African Infrastructure Investment Managers (AIIM)).

Wind monitoring masts in De Aar **(Northern Cape Province, South Africa) 2009.** *Senior Environmental Practitioner.* The project entailed a Basic Assessment (BA) for two proposed wind monitoring masts for the collection of wind data in De Aar. Responsible for the compilation of the Basic Assessment Report (BAR) and running the Public Participation Process (PPP). (African Infrastructure Investment Managers (AIIM)).

Two coal-fired power stations in the Waterberg area **(Limpopo Province, South Africa) 03/2008 - Date.** *Project Leader.* The project involved site selection and an Environmental Impact Assessment (EIA) for two proposed coal-fired power stations in Limpopo. The EIA and the framework compilation of an Environmental Management Plan (EMP) were undertaken with the involvement of 17 specialists. Responsible for the site selection process, undertaken by the EIA team; and identifying sites based on technical, environmental and economic constraints. Later in the project cycle took over the management of the project, including compilation of the Environmental Impact Report (EIR) and project finances. (Eskom).

Garden City New Town Development near Kraaifontein **(Western Cape Province, South Africa) 01/2008 - 2012.** *Senior Environmental Practitioner.* This project included an Environmental Impact Assessment (EIA), in terms of the National Environmental Management Act (NEMA), for a proposed

integrated mixed use housing development covering 782ha, on behalf of Garden Cities and Basil Read. The development comprises various housing types (low income, finance linked and bonded homes), crèches and schools, places of worship, a market area and transport nodes, commercial and light industrial premises, a police station, clinics, sports fields and open spaces/parks, stormwater detention ponds, roads, sewage, water infrastructure and an electrical substation. Responsible for the EIA, all related administrative and management tasks and the compilation of a framework Environmental Management Plan (EMP). (Garden Cities/Basil Read).

Review work **(Eastern Cape Province, South Africa) 2008.** *Environmental Practitioner.* Appointed by the Eastern Cape's Department of Economic Development and Environmental Affairs (DEDEA) to review and process the backlog of Environmental Impact Assessment (EIA) applications under the Environmental Conservation Act (ECA). Responsible for reviewing and processing a number of applications under the ECA according to sound EIA practices and legal requirements; drafting correspondence to applicants, as well as Records of Decision (RoD) on behalf of DEDEA. (Eastern Cape Department of Economic Development and Environmental Affairs (DEDEA).

Siting exercise for a Coal-to-Liquids (CTL) facility **(South Africa) 2008.** *Environmental Practitioner.* The project entailed the identification of sites for an 80-barrel a day Coal-to-Liquids (CTL) facility as well as selection of a preferred site based on a multi-criteria decision analysis tool. Responsible for the compilation of reports. (PetroSA).

Plant extraction facility in the Paarl Industrial Area **(Western Cape Province, South Africa) 11/2007 - 07/2009.** *Environmental Practitioner.* The project comprised a Basic Assessment (BA) for the construction of a plant extraction facility in Paarl. Responsible for compiling the Basic Assessment Report (BAR) and running the Public Participation Process (PPP). (Cognis).

Subdivision of Farm Palmiet River, Number 319, Elgin **(Western Cape Province, South Africa) 02/2007 - 02/2009.** *Environmental Practitioner.* The project included a Basic Assessment (BA) for the proposed subdivision of Farm Palmiet River for residential purposes. Responsible for finalising the Basic Assessment Report (BAR) and compiling the comments and response report. (Molteno Brothers).

Deepwater geophysical survey of the South African continental margin **(South Africa) 2007.** *Environmental Practitioner.* The project comprised a deepwater geophysical survey of the South African continental margin. Responsible for the compilation of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP), undertaking the Public Participation Process (PPP), and specialist coordination. (PetroSA).

Upgrade of fuel pipelines at Cape Town International Airport (CTIA) **(Western Cape Province, South Africa) 2007.** *Environmental Practitioner.* The project comprised an exemption application for the upgrading of fuel pipelines at Cape Town International Airport (CTIA). Responsible for working on compiling the exemption application. (Kantey & Templer for Airports Company of South Africa (ACSA)).

2D seismic survey in the northern block, offshore Namibia **(Namibia) 2007.** *Environmental Practitioner.* The project comprised a 2D seismic survey in the Northern Block, offshore Namibia. Responsible for compiling the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP), undertaking the Public Participation Process (PPP), and specialist coordination. (BHP Billiton).

Rocklands Eco Estate, Cape Town **(Western Cape Province, South Africa) 07/2006 - 2007.** *Environmental Practitioner.* The project involved a Basic Assessment (BA) for the development of a proposed eco estate with approximately 80 houses and public open space. Responsible for being involved in specialist coordination and running the Public Participation Process (PPP). (Rocklands Eco Estate (Pty) Ltd).

Upgrading of facilities at the River Club in Observatory **(Western Cape Province, South Africa) 2006 - 2007.** *Environmental Practitioner.* The project included a Basic Assessment (BA) for the proposed upgrading of facilities at the River Club, including a conference centre and additional buildings. Responsible for being involved in specialist coordination and running the Public Participation Process (PPP).

Subdivision and rezoning of Erf 3410, Simon's Town **(Western Cape Province, South Africa) 2006 - 2007.** *Environmental Practitioner.* The project consisted of a Basic Assessment (BA) for the proposed development of 10 luxury houses in Glencairn. Responsible for compiling the Basic Assessment Report (BAR), specialist coordination, and running the Public Participation Process (PPP). (Cape Town Coastal Properties).

Subdivision and rezoning of Erf 23300 in Maitland, Royal Maitland Phase 3 **(Western Cape Province, South Africa) 2006 - 2007.** *Environmental Practitioner.* The project entailed a Basic Assessment (BA) for the subdivision and rezoning of Erf 23300 in Maitland, for the proposed development of middle-income housing (Royal Maitland Phase 3). Responsible for being involved in compiling the Basic Assessment Report (BAR), specialist coordination and running the Public Participation Process (PPP). (Cape Town Community Housing Company (CTCHC)).

Subdivision and rezoning of Erf 1366, Eerste River **(Western Cape Province, South Africa) 2006 - 2007.** *Environmental Practitioner.* The project comprised a Basic Assessment (BA) for rezoning Erf 1366, Eerste River, for a residential development of 47 houses. Responsible for compiling the Basic Assessment Report (BAR), specialist coordination, running the Public Participation Process (PPP), and compiling a Construction Environmental Management Plan (CEMP). (Tech-Sure Fin).

Development of the Ibhubesi gas field and associated infrastructure **(Western Cape Province, South Africa) 2006 - 2007.** *Environmental Practitioner.* This project included an Environmental Impact Assessment (EIA) for the development of Ibhubesi natural gas field and associated infrastructure near Saldanha Bay. Responsible for writing sections of the scoping report and EIA, as well as compiling comments reports and maintaining the Interested and Affected Parties (I&AP) database. (Forest Oil).

Upgrading of National Route 1 (N1) intersections near De Doorns **(Western Cape Province, South Africa) 07/2006 - 01/2007.** *Environmental Practitioner.* The project consisted of a Basic Assessment (BA) for the proposed upgrading of intersections on National Route 1 (N1) near De Doorns. Responsible for being involved in the compilation of the Basic Assessment Report (BAR) and running the Public Participation Process (PPP). (Argus Gibb for the South African National Roads Agency Limited (SANRAL)).

New regional landfill to service the City of Cape Town **(Western Cape Province, South Africa) 2006 - 2007.** *Environmental Practitioner.* The project involved an Environmental Impact Assessment (EIA) for a landfill near Atlantis. Responsible for being involved in organising the Public Participation Process, compiling a comments report and managing the Interested and Affected Parties (I&AP) database. (City of Cape Town).

Borrow pits for the upgrading of road sections in the Overberg District **(Western Cape Province, South Africa) 2006 - 2007.** *Environmental Practitioner.* The project entailed Environmental Management Programmes (EMPs) in terms of the Minerals and Petroleum Resources Development Act (MPRDA) for nine borrow pits, required for the resurfacing of gravel roads in the Overberg District. Responsible for compiling the EMPs, managing two specialists and running the Public Participation Process (PPP). (PD Naidoo & Associates for the Provincial Administration of the Western Cape (PGWC)).

Borrow pits in the Beaufort West and Murraysburg area, Karoo **(Western Cape Province, South Africa) 2006 - 2007.** *Environmental Practitioner.* The project entailed Environmental Management Programmes (EMPs) in terms of the Minerals and Petroleum Resources Development Act (MPRDA) for 40 strategic borrow pits, required for the resurfacing of gravel roads in and around the Beaufort West and Murraysburg areas (Central Karoo District) in the Karoo. Responsible for compiling the EMPs, managing two specialists and running the Public Participation Process (PPP). (Kwezi V3 for the Provincial Government of the Western Cape (PGWC)).

Rezoning of public open space in Boston, Bellville **(Western Cape Province, South Africa) 2006 - 2007.** *Environmental Practitioner.* The project entailed a Basic Assessment (BA) for the proposed construction of an off-ramp and parking area in on a portion of Erf 10565 in Boston, Bellville. Responsible for helping to compile the Basic Assessment Report (BAR), and running the Public Participation Process (PPP). (Bright's Hardware).

Resealing of a trunk road and main roads, and the upgrading of a divisional road near Uniondale **(Western Cape Province, South Africa) 2006.** *Environmental Practitioner.* The project entailed the resealing of Trunk Road 44, Section 1 (TR44/1); Main Roads 401, 404, and 368 (MR401, MR404 and MR368); and the upgrading of Divisional Road 1834 (DR1834) from gravel to sealed road. An associated borrow pit was also developed. Responsible for the compilation of the Environmental Management Plan (EMP) and checklist in terms of the Environmental Conservation Act (ECA); and undertaking the Public Participation Process (PPP) and specialist coordination. (SNA for the Provincial Government of the Western Cape (PGWC)).

Geotechnical survey in the southern and northern blocks offshore Namibia **(Namibia) 2006.**

Environmental Practitioner. The project comprised a geotechnical survey of the southern and northern blocks offshore Namibia. Responsible for the compilation of an addendum report for the surveys and managing the Public Participation Process (PPP), specialist coordination, and the compilation of the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP). (BHP Billiton).

***Exemption application for tow surfing in the Table Mountain National Park Marine Protected Area (MPA)* (Western Cape Province, South Africa) 2006.** *Environmental Practitioner.* The project entailed an exemption application to allow for tow surfing, a prohibited activity, within the Table Mountain National Marine Protected Area (MPA). Responsible for compiling the exemption application, which included research into the environmental impacts of tow surfing, in terms of noise and emissions. (Tow-Surf South Africa).

***Construction Environmental Management Plan (CEMP) for Sitari Fields Golf Estate, Firgrove/Macassar* (Western Cape Province, South Africa) 2006.** *Environmental Practitioner.* The project comprised a golf estate consisting of mixed uses, including a golf course, housing and a clubhouse. Responsible for the compilation of a Construction Environmental Management Plan (CEMP). (Olympian Developing Company).

***Abstraction of groundwater to augment Sedgefield's water supply* (Western Cape, South Africa) 12/2004 - 02/2009.** *Senior Environmental Practitioner.* The project entailed a Basic Assessment (BA) for the abstraction of groundwater in order to augment Sedgefield's water supply. The approach was based on making better use of the available water resources and supplementing the traditional surface water resources with a combination of ground water, desalinated water and the re-use of final effluent. The conjunctive supply approach limits the risk of supply failure from a single source, and ensures sustainable potable water security for Sedgefield. Responsible for the compilation of the Basic Assessment Report (BAR) and for running the Public Participation Process (PPP). (Knysna Local Municipality).

***Sedgefield off-channel storage dam* (Western Cape Province, South Africa) 12/2004 - 06/2010.** *Environmental Practitioner.* The project involved an Environmental Impact Assessment (EIA) for an off-channel dam in Sedgefield. Responsible for compiling the EIA report and for the Public Participation Process (PPP). (Knysna Local Municipality).

Education

2004	:	BSc (Hons) Environmental Management, University of Cape Town (UCT), South Africa
2003	:	BSc Environmental and Geographical Science, University of Cape Town (UCT), South Africa

Career enhancing courses

2012	:	Conflict Management Course, Centre for Conflict Resolution (CCR), Cape Town, South Africa
2010	:	Project Management Course, Aurecon in-house training, South Africa
2009	:	Certificate in Project Management: Principles and methods for use in business, University of Cape Town (UCT), South Africa
2008	:	Using Natural Resources for Community Development, Gesellschaft Technische Zusammenarbeit (GTZ), South Africa

Professional affiliations

Member, International Association for Impact Assessment South Africa (IAIAsa)
Professional Natural Scientist, South African Council for Natural Scientific Professions (SACNASP)

Languages

	Reading	**Writing**	**Speaking**
English	Excellent	Excellent	Excellent
Afrikaans	Good	Good	Good

Publications

Corbett L, and Mangnall M, 2009. "The Value of Pre-EIA Screening Exercises". Presented at the 2009

Internatioal Association for Impact Assessment (IAIA) Conference.

By my signature below I certify the correctness of the information above and my availability to undertake this assignment.

_____	_____
Signature of Staff Member	Date

APPENDIX B

CONSTRUCTION EMP GENERAL SPECIFICATIONS (COMPREHENSIVE)

GENERAL ENVIRONMENTAL SPECIFICATION FOR CONSTRUCTION

CONTENTS

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1 GENERAL

1.1 SCOPE

This Specification covers the standard requirements for controlling the impact of construction activities on the environment. It contains clauses that are generally applicable to the undertaking of civil engineering works to impose pro-active controls on the extent to which the construction activities impact on the environment. This Specification contains only generic specification clauses which may be augmented or superseded by project specific specifications contained in an Environmental Management Plan or Environmental Authorisation.

The Specifications contained herein shall apply to contractors undertaking work as part of the project. The Principle Contractor shall be responsible for the implementation of these Specifications.

Interpretations and variations of this Specification are set out in the Specification Data.

1.2 DEFINITIONS

For the purposes of this Specification the definitions and abbreviations given in the applicable specifications listed in 1.4and the following definitions shall apply:

Environment: The surroundings within which humans exist and that are made up of:

i) the land, water and atmosphere of the earth;
ii) micro-organisms, plant and animal life;
iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Potentially hazardous Substance: A substance that, in the reasonable opinion of the Engineer, can have a deleterious effect on the environment. Any substance or mixture containing such substances as listed in the OHSA General Machinery Regulation 8: Schedule A.

Method Statement: A written submission by the Contractor to the Engineer in response to the Specification or a request by the Engineer, setting out the plant, materials, labour and method the Contractor proposes using to carry out an activity, identified by the relevant specification or the Engineer when requesting the Method Statement, in such detail that the Engineer is enabled to assess whether the Contractor's proposal is in accordance with the Specifications and/or will produce results in accordance with the Specifications.

The Method Statement shall cover applicable details with regard to: construction procedures, materials and equipment to be used, transportation of equipment/materials to and from site, movement of equipment/material on site, storage of materials on site, containment (or action to be taken if containment is not possible) of leaks or spills of any liquid or material that may occur, timing and location of activities, areas of non-compliance with the Specifications, and any other information deemed necessary by the Engineer.

Reasonable: Unless the context indicates otherwise, reasonable in the opinion of the Engineer after he has consulted with a suitably experienced person, not an employee of the Employer, in "environmental implementation plans" and "environmental management plans" (both as defined in Act No 107,1998).

Solid waste: All solid waste, including construction debris, chemical waste, excess cement/concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

Contaminated water: Water contaminated by the Contractor's activities, e.g. concrete water and runoff from plant/ personnel wash areas.

Top material: The top 150 mm of soil (topsoil) and root material of cleared vegetation.

1.3 NORMATIVE REFERENCES

1.4 Supporting specifications and legal framework

The following specifications shall, *inter alia*, form part of the Contract Document.

a) An approved Environmental Management Plan;
b) The conditions associated with any relevant Environmental Authorisation or Permit;
c) SANS 1200 Series of Standardized Specifications;
d) SANS 1200 A or SANS 1200 AA, as applicable;
e) Occupation Health and Safety Act (OHSA): Specification AO,
f) Construction Regulations, 2003, and
g) Standards listed in Appendix A.

1.5 Management and administration

This Specification and any supporting document containing project specific specifications shall be provided to a perspective Contractor's at the tender / quoting stage. The implementation of this General Specification (or subsequent agreements as the case may be) is non-negotiable and every perspective contractor shall cost for and make the necessary provisions available to ensure implementation of these General Environmental Specifications and any associated documents (i.e. Environmental Management Plan and or Environmental Authorisation). The Contractor may defer responsibility for implementation and oversight of environmental requirements onto a third party, but may not defer liability and will held accountable for any non-compliances and associated damages.

The Contractor shall construct and/or implement all the necessary environmental protection measures in each area before any construction work may proceed under the direction of the Engineer or delegated official. The Engineer may suspend the Works at any time should the Contractor, in the Engineer or delegated official's opinion, fail to implement, operate or maintain any of the environmental protection measures adequately. The costs of such suspension shall be to the Contractor's account.

1.5.1 Environmental Site Officer (ESO)[1]

The Contractor shall, at commencement, appoint, in writing, a suitably qualified or otherwise senior member of his permanent site staff to perform the role of the ESO. The Contractor shall ensure that this appointee is provided adequate time to fulfil the requirements of the role, which will be proportional to the project scale and extent. Should the Engineer find that the ESO does not adequately fulfil the role and duties of the ESO then the Contractor maybe directed to recruit a suitably qualified, dedicated ESO for the duration of the construction period. The ESO will be required to develop a detailed understanding of the Specifications and ensure that the Contractor's fulfils the requirements of the specifications and remains compliant throughout the project term, including any defects liability period. The ESO will be required to report of compliance issues during monthly progress meetings and to co-operate with the any official representative from the Government, Client and Engineer on environmental management matters. The key responsibilities of the ESO include the following:

- Develop a detailed understanding of the requirements of this specification;
- Obtain confirmation in writing from the Client that all regulatory processes, authorisation and permit requirements have been fulfilled. Copies of the permits and authorisations shall be obtained, and retained onsite, and studied by the EO prior to the commencement of site establishment and site works. Any conditions contained in a permit or authorisation shall be deemed to form part of this Specification. Special attention must be given to any areas identified as No Go areas during an EIA study.
- Undertake routine inspections of all areas and activities under the Contractor's control, identify environmental non-conformances and incidents and initiate measures to remedy such issues.
- Ensuring that the Contractor's staff abide by the Specification and initiate disciplinary actions where required.
- Report on environmental incidents and compliance matters at monthly progress meetings.
- Liaise and co-operate with any official environmental representative from the Government, Client

[1] This role is the same as an Environmental Officer (EO)

and Engineer regarding environmental matters associated with the project.

- Ensure that any environmental monitoring requirements are met and undertaken with precision, according to best practice sampling and monitoring methodologies.

2 CONTRACTOR MOBILISATION AND GENERAL PROVISIONS

2.1 Baseline photography

Following official handover of the site to the Contractor and prior to the commencement of mobilisation activities, the Contractor shall take photographs of all areas that will be impacted by construction activity and their immediate surrounds. Photographs shall include, *inter alia*, all works areas, site establishment and laydown areas, access roads, gates, no go and natural areas, debris, boundary fences, existing structures and infrastructure on the site and any defects or issues to any of the foregoing. These photographs shall be provided to the Engineer for reference purposes.

2.2 Method statements

Method statements shall be produced and submitted for approval by the Engineer at least five working days prior to the commencement of the activities. The Contractor shall not commence the activity until the Method Statement has been approved. Approval of method statements shall not unreasonably be withheld. The Engineer may approve, reject or approve with conditions any method statement.

The Engineer may request, on an *ad hoc* and reasonable basis, that a method statement be produced for any activity or component of the works which carries significant risk. All method statements must comply with the provisions of this Specification, unless, if there is a need to deviate from the provisions of the specification such deviation must be clearly articulated in the method statement or letter, a motivation provided for the need for such deviation and proposed mitigation measures that will be implemented to ensure that such deviation will not pose a undue risk to the environment. The Engineer shall, without risk of prejudice, retain the right to reject any proposed deviation and is under obligation to consult with and confirm the acceptability of such deviation with an Environmental Specialist or Government Official. A method statement containing a proposed deviation must also be approved in writing by the Client. Method statements containing proposed deviations shall be submitted at least 15 working days prior to the commencement of the activity.

The following is a provisional list of required method statements:

1) Mobilisation Plan, with consideration to the following:
    a. A plan indicating the layout of the site establishment area, laydown and staging areas, workshops, fuel storage and dispensing areas, stores (including explosives), offices, ablutions, recess areas, roads and sidings, fences and gates, signboards, central waste storage area and any other temporary structure or use area that will be directly affected by site establishment or routine project administration.
    b. Provisions to address and maintain housekeeping throughout the site.
    c. A detailed plan and design for the fuel storage site, including the type and volume of storage container and the design and capacity of the bund. The plan shall include procedures and measures to prevent spills and leaks of fuels and oils during transference.
    d. A provisional list of major vehicles, plant and equipment that will be permanently based on site and where plant, equipment and vehicles will be parked when not in use.
    e. A list of the bulk construction materials and a description of how they will be transported to site and where they will be staged prior to use.
    f. A description of a temporary storm water control measures to be installed around yards and site establishment areas.
    g. A description of the proposed security and access control measures.
    h. A description and plan of roads to be used during construction and the proposed traffic safety measures.
    i. A provision list of potentially hazardous materials that will be used during construction phase and a description of how and where these will be stored.
    j. A detailed description of a waste management plan giving consideration to:
        i. Measures relating to recycling, reducing and reusing any waste.
        ii. A description of the type and the proposed number and location of rubbish bins.

iii. The location and design of the central waste storage area including hazardous wastes.
iv. A plan for dealing with inert waste including building rubble and spoil.

k. Provisional Construction Programme.
l. Outline of the Contractor's staff recruitment policy.
m. Description of the construction staff accommodation provisions and policy.
n. Any special arrangements or agreements made between the Contractor, the landowner, municipality, local businesses/ service providers and or neighbouring land owners.

2) Emergency preparedness and response plan, detailing the following:
   a. A telephone contact list of personal responsible for emergency prevention and response, including the relevant Client and Engineer representatives and local emergency services.
   b. A list and description of the types of emergencies that may arise on site.
   c. Site evacuation procedures and emergency assembly point.
   d. Procedures to be followed in the event of a fire.
   e. Safeguard measures to prevent fire, with special reference to hazardous materials, fuels and lubricants and explosives stores.
   f. A plan showing the following:
      i. The location and type of firefighting equipment.
      ii. Emergency assembly point
      iii. Evacuation routes.
   g. Measures for the handling use and storage aimed at preventing spills and leaks of hydrocarbons and other hazardous substances.
   h. Procedures to be followed after spill or leak of hydrocarbon or other hazardous substances including.
      i. Training of plant and equipment operators in the procedures.
      ii. A description and location of spill containment, clean up materials, personal protective equipment and specialist handling equipment of site or in plant and equipment.
      iii. Procedure for reporting a spill, containment, clean up, remediation and disposal.

3) Earthworks plan, detailing the following:
   a. A layout drawing indicating the following
      i. Location and extent of all areas to be cleared.
      ii. Location of topsoil stockpiles.
      iii. Location of temporary and final spoil areas
   b. A description of how cleared vegetation and other debris will be dealt with.
   c. A description of how dust will be controlled.
   d. A description of and plans for dealing with water:
      i. Preventing ingress of water into excavations.
      ii. Approach to dewatering.
      iii. Storm water and erosion control measures.
      iv. Pollution and sediment control and treatment measures and disposal of contaminated water.

4) Concrete works plan, detailing the following:
   a. How concrete will be produced on site (Batched on site or ready-mix). If batched on site then detailed procedures and plans must be produced as to how much, where and how this will be undertaken.
   b. Measures to avoid the contamination of water and measures to treat contaminated water, including storm water control interventions and cleaning of tools and equipment, including drum wash, that used in the concrete operations;
   c. Measures to prevent and clean up spillage of concrete spills and over pours.
   d. Measures for dealing with concrete admixtures, shutter oil and any other chemical substances that may be employed in the concrete works.
   e. Any other measure employed during the batching, transport or pouring of concrete to avoid pollution of contamination of the environment.

2.2.1 Environmental awareness training

Within seven days of the Commencement Date, the Contractor's site staff including foremen and site management staff shall attend an environmental awareness training course. The Contractor shall liaise with

the Engineer prior to the Commencement Date to fix a date and venue for the course. The environmental awareness training course shall be held in the morning during normal working hours. The Contractor shall provide a suitable venue and ensure that the specified employees attend the course. The Contractor shall keep a register of attendance and attendees must sign that they were in attendance and shall provide the Engineer with a copy of the attendance register the day after each course as part of their monthly submissions. The Environmental awareness course will be included in the general orientation of any new employees, who must also sign acknowledgement of receiving the course and any associated materials.

Subject to the implementation of a written warning system and any appropriate disciplinary interventions, repetitive failure to observe the requirements set out in this specification by any one member of staff should be treated as a dismissible offence. Should recurring non-compliances occur as a result of the actions or omissions of one individual, the Engineer may instruct the Contractor to remove such person from site.

2.2.2 Toolbox talks

Relevant environmental site matters, incidents and issues shall form part of the Contractor's tool box talks. The Contractor shall make a note of what environmental subjects were discussed

2.2.3 Construction personnel information posters

The Contractor shall erect and maintain information posters for the information of his employees depicting actions to be taken to ensure compliance with aspects of the Specifications. Such posters will be supplied by the Engineer and shall be erected at a location specified by the Engineer.

2.3 Surveying and setting out

2.3.1 Site establishment

The Engineer shall be advised of the area that the Contractor intends using for his site establishment by way of the Mobilisation plan discussed under item 1) of Clause 2.2. The Contractor's camp shall occupy as small an area as possible, and no site establishment shall be allowed within 50 m of any watercourse unless otherwise approved by the Engineer.

The Contractor shall inform the Engineer of the intended actions and programme for site establishment. The site layout shall be planned to facilitate ready access for deliveries, facilitate future works and to curtail any disturbance or security implications for neighbours.

2.3.2 Site fencing and demarcations

As may be required, the Contractor shall erect and maintain permanent and/or temporary fences of the type and in the locations directed by the Engineer. Such fences shall, if so specified, be erected before undertaking designated activities. The Contractor shall not damage or remove any boundary fences without the agreement of the adjoining landowner. Where property fences are replaced these shall, at the minimum, meet specification of the fencing it replaces, in terms of top height, sturdiness and rigidity (pole foundations and supports and strength and wire gauge), security (barbed or razor wire) and size of the largest openings (i.e. distances between horizontal wires or mesh dimensions.

2.3.3 No Go Areas

If required, certain areas shall be considered "no go" areas and these may be detailed in the Environmental Management Plan or as conditions attached to an Environmental Authorisation. The Contractor shall ensure that, insofar as he has the authority, no unauthorised entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the demarcated "no go" areas. "No go" area demarcation fencing shall be established prior to the commencement of construction in the vicinity.

"No go" areas shall be demarcated with fencing consisting of wooden or metal posts at 3 m centres with 1 plain wire strand tensioned horizontally at 900 mm from ground level. Commercially available danger tape shall be wrapped around the wire strand. The Contractor shall maintain the fence for the duration of construction and ensure that the danger tape does not become dislodged.

2.4 Overarching environmental requirements

The following provisions relate to all areas of construction.

2.4.1 Protection of natural features

The Contractor shall not deface, paint, damage or mark any natural features (e.g. rock formations) situated in or around the Site for survey or other purposes unless agreed beforehand with the Engineer. Any features affected by the Contractor in contravention of this clause shall be restored/ rehabilitated to the satisfaction of the Engineer.

The Contractor shall ensure that plant, equipment, materials and staff are not permitted to enter any designated “no go” area.

The Contractor shall not permit his employees to make use of any natural water sources (e.g. springs, streams, and open water bodies) for the purposes of swimming, personal washing and the washing of machinery or clothes.

2.4.2 Protection of flora and fauna

Except to the extent necessary for the carrying out of the Works (as per an approved method statement), flora shall not be removed, damaged or disturbed nor shall any vegetation be planted without the Engineer’s approval. Firewood may not be collected from the site unless written approval is provided by the Engineer.

Trapping, poisoning and/ or shooting of animals is strictly forbidden. No domestic pets or livestock are permitted on Site.

The use of biocides is subject to the approval of the Engineer unless provided for in the project specification. Where the use of biocides and other poisonous substances has been specified, they shall be stored, handled and applied with due regard to their potential harmful effects. Persons using any biocide or poisonous substances shall have received training in the appropriate handling, use and storage of such materials. Care will be taken to ensure no movement or drift occurs into non-target areas. Dyes shall be mixed into sprayed biocide so that the treatment areas may be inspected and the risk of over spray / re-spraying is avoided.

2.4.3 Protection of archaeological and palaeontological remains

The Contractor shall take reasonable precautions to prevent any person from removing or damaging any fossils, coins, articles of value or antiquity and structures and other remains of archaeological interest discovered on the Site, immediately upon discovery thereof and before removal. The Contractor shall inform the Engineer immediately of such a discovery and carry out the Engineers instructions for dealing therewith. All construction within the vicinity of the discovery shall cease immediately and the area shall be cordoned off until such time as the Engineer authorises resumption of construction in writing.

The Engineer will contact and follow due process as required by the relevant authority.

All buildings older than 60 years require a permit from South African Heritage Resources Agency in terms of the National Heritage Resources Act (no. 25 of 1999). A demolition permit is also required from the local authority in terms of the National Building Regulations.

2.4.4 Noise control

The applicable regulations framed under the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), and the provisions of SANS 1200 A Subclause 4.1 regarding "built-up areas" shall apply to all areas within audible distance of residents whether in urban, peri-urban or rural areas.

Appropriate directional and intensity settings are to be maintained on all hooters and sirens, and the Contractor shall provide and use suitable and effective silencing devices for pneumatic tools and other plant such that the noise level in inhabited areas and dwellings adjacent to the work areas will not increase by more than 7 dB(A)Leq 60 above residual background sound levels. Similarly in habituated areas adjacent to access roads maximum noise levels shall not exceed 60 dB(A)Leq 60 and maximum sound pressure level of 70 dB(A).

Where excess noise generation is unavoidable, the Contractor shall, by means of barriers, isolate the source

of any such noise in order to comply with the said regulations. The Contractor shall restrict any of his operations that may result in excessive noise disturbance to those communities and dwellings abutting the Site to the hours of 08:00 to 17:00 on weekdays and Saturdays. No work will be permitted on Sundays unless otherwise agreed to with the Engineer.

Where loud construction operations or plant are required, that cannot be practically barricaded (i.e. Pile driving, hydraulic breakers or rock crushing), nearby residents that may be disturbed by the operation will be notified and provided with a program for the works prior to commencement. The Contractor shall be reasonable in accommodating the needs of neighbours and take reasonable measures to minimise the impact of noise on neighbouring communities.

With the exception of warning and emergency sirens and public address systems used during an emergency, no sound is to be broadcast across the site with approval from the Engineer.

2.4.5 Lighting

The Contractor shall ensure that any lighting installed on the site for his activities does not interfere with road traffic or cause a reasonably avoidable disturbance to the surrounding community or other users of the area. Subject to meeting the minimum requirements of the OHSA and general security, lighting shall be kept to the minimum. Care will be taken to ensure lighting is task specific and does not spill into the surrounding environment through appropriate placement and shielding. Floodlighting of expansive work areas or up- or down lighting of vertical structures or natural features shall only be permitted if approved by Engineer.

2.4.6 Fuel (petrol and diesel) and oil

Unless otherwise specified, fuel may be stored on site in an area approved by the Engineer. The Contractor shall ensure that all liquid fuels (petrol and diesel) are stored in tanks with lids, which are kept firmly shut or in bowsers. The tanks/bowsers shall be situated on a smooth impermeable surface (concrete or 250 µm plastic) with an earth bund (plastic must have a 5 cm layer of sand on top to prevent damage and perishing). The impermeable lining shall extend to the crest of the bund and the volume inside the bund shall be 130% of the total capacity of all the storage tanks/ bowsers. The bunded area shall be covered to protect it from rain. Provision shall be made for refuelling at the fuel storage area, by protecting the soil with 250 µm plastic covered with a minimum of a 5 cm layer of sand.

If fuel is dispensed from 200 litre drums, only empty externally clean drums may be stored on the bare ground. All empty externally dirty drums shall be stored on an area where the ground has been protected. The proper dispensing equipment shall be used, and the drum shall not be tipped in order to dispense fuel. The dispensing mechanism of the fuel storage drum shall be stored in a waterproof container when not in use.

The Contractor shall prevent unauthorised access into the fuel storage area. No smoking shall be allowed within the vicinity of the fuel storage area. The Contractor shall ensure that there is adequate fire-fighting equipment at the fuel stores.

Where reasonably practical, plant shall be refuelled at the fuel storage area or at the workshop as applicable. If it is not reasonably practical then the surface under the refuelling area shall be protected against pollution to the reasonable satisfaction of the Engineer prior to any refuelling activities. The Contractor shall employ the use of appropriate non-spill dispensing equipment and drip trays to prevent spills during refuelling. The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 200 ℓ of hydrocarbon liquid spill. The Contractor shall ensure that staff responsible for refuelling of plant is trained to clean up any fuel of oil spills as they occur. The Contractor shall obtain the Engineer's prior approval for any refuelling or maintenance activities. The fuel bowsers and stores must be inspected daily by the Contractor and any contaminated soil shall be collected and disposed of via the hazardous waste system. Care will be taken to ensure that oil contaminated soil, rags or other materials are not disposed of as part of domestic waste system due to the fire risk.

2.4.7 Contaminated water

The Contractor shall take reasonable measure to prevent the contamination of water and where this is not

possible will set up a contaminated water management system, which shall include collection facilities to be used to prevent pollution, as well as suitable methods of disposal of contaminated water. The Contractor shall prevent the discharge of water contaminated with any pollutants, such as soaps, detergent, cements, concrete, lime, chemicals, glues, solvents, paints and fuels, into the environment.

The Contractor shall notify the Engineer immediately of any pollution incidents on Site. The Engineer's approval is required prior to the discharge of contaminated water to the Municipal sewer system.

2.4.8 Stormwater and drainage

The Contractor shall ensure that storm water is managed in such a way that prevents erosion. The Contractor shall install temporary stormwater control measures which may include cut off drains, berms, side drains, retention ponds or similar needed to divert stormwater away from earthworks areas, or as directed by the Engineer.

2.4.9 Solid waste management

The Contractor shall provide sufficient bins with lids on Site to store the produced on a daily basis. Solid, non-hazardous waste shall be disposed of in the bins provided and no on-site burying, dumping or burning of any waste materials, vegetation, litter or refuse shall occur. Bins shall not be allowed to become overfull and shall be emptied a minimum of once daily. The waste may be temporarily stored on Site in a central waste area that is weatherproof and scavenger-proof, and which the Engineer has approved.

All solid waste shall be disposed of offsite at an approved landfill site. The Contractor shall supply the Engineer with a certificate of disposal.

2.4.9.1 Shutter oil and curing compound

Shutter oil and curing compound pose a risk of causing water and soil contamination and accordingly are regarded as potential hazardous substances. The Contractor shall ensure that shutter oil and curing compound containers in use are stored within the fuel bund. The remaining containers shall be inspected regularly to ensure that no leakage occurs. When shutter oil or curing compound is dispensed, the proper dispensing equipment shall be used, and the storage container shall not be tipped in order to dispense the oil/compound. The dispensing mechanism of the shutter oil/curing compound storage container shall be stored in a waterproof container when not in use.

Shutter oil and curing shall be used in moderation and shall be applied under controlled conditions using appropriate equipment. The Contractor shall take all reasonable precautions to prevent accidental and incidental spillage during the application of these compounds.

In the event of a shutter oil or curing compound spill, the source of the spillage shall be isolated, and the spillage contained. The Contractor shall clean up the spill, either by removing the contaminated soil or by the application of absorbent material in the event of a larger spill. Treatment and remediation of the spill area shall be undertaken to the reasonable satisfaction of the Engineer.

2.4.9.2 Bitumen

The Engineer shall be advised of the area that the Contractor intends using for the storage of bitumen drums/ products. The storage area shall have a smooth impermeable (concrete or 250 µm plastic covered in sand) floor. The floor shall be bunded and sloped towards a sump to contain any spillages of substances. The bund shall be inspected and emptied daily, and serviced when necessary. The bund shall be closely monitored during rain events to ensure that it does not overflow.

2.4.9.3 Hazardous substances

Procedures detailed in the Material Safety Data Sheets (MSDSs) shall be followed in the event of an emergency situation.

Petroleum, chemicals, harmful and hazardous waste shall be stored in an enclosed and bunded area. This area shall be subject to the approval of the Engineer. The waste shall be disposed of at a hazardous waste disposal site as approved by the Engineer.

2.4.10 Workshop, equipment maintenance and storage

The Contractor shall ensure that all items of plant and equipment are inspected daily prior to commencement. Any maintenance requirements shall be seen to before start-up. Inspection checklists shall be retained and submitted to the Engineer on request.

Leaking equipment shall be repaired immediately or removed from the Site. Where practical, all maintenance of equipment and vehicles on Site shall be performed off Site or in the workshop. If it is necessary to do maintenance outside of the workshop area, the Contractor shall obtain the approval of the Engineer prior to commencing activities. The Contractor shall ensure that in his workshop and other plant maintenance facilities, including those areas where, after obtaining the Engineer's approval, the Contractor carries out emergency plant maintenance, there is no contamination of the soil or vegetation. The workshop shall have a smooth impermeable (concrete or 250 µm plastic covered with sand) floor. The floor shall be bunded and sloped towards an oil trap or sump to contain any spillages of substances (e.g. oil).

When servicing equipment on site, drip trays shall be used to collect the waste oil and other lubricants. Drip trays shall also be provided in construction areas for stationary plant (such as generators, pumps and compressors) and for Transport and Earthmoving Equipment (such as scrapers, diggers, loaders, trucks, cranes, etc.). Drip trays shall be inspected and emptied daily. Drip trays shall be closely monitored during rain events to ensure that they do not overflow. Where practical, the Contractor shall ensure that equipment is covered so that rainwater is excluded from the drip trays.

The washing of equipment shall be restricted to urgent or preventative maintenance requirements only. All washing shall be undertaken off Site or in the workshop. The use of detergents for washing shall be restricted to low phosphate and nitrate containing, low sudsing-type detergents.

2.4.11 Materials handling, use and storage

The Contractor shall ensure that any delivery drivers are informed of all procedures and restrictions (including "no go" areas) required to comply with the Specifications. The Contractor shall ensure that these delivery drivers are supervised during off loading, by someone with an adequate understanding of the requirements of the Specifications.

Materials shall be appropriately secured to ensure safe passage between destinations. Loads including, but not limited to sand, stone chips, fine vegetation, refuse, paper and cement, shall have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor shall be responsible for any clean-up resulting from the failure by his employees or suppliers to properly secure transported materials.

2.4.12 Dust

The Contractor shall take reasonable measures to minimise the generation of dust as a result of construction activities to the satisfaction of the Engineer. The Contractor’s dust management planning shall, as a minimum, take cognisance of the following:

- Schedule of spraying water on unpaved roads paying due attention to control of runoff.
- Speed limits for vehicles on unpaved roads and minimisation of haul distances.
- Measures to ensure that material loads are properly covered during transportation.
- Schedule for wheel cleaning and measures to clean up public roads that may be soiled by construction vehicles.
- Minimisation of the areas disturbed at any one time and protection of exposed soil against wind erosion, e.g. by dampening with water or covering with straw
- Location and treatment of material stockpiles taking into consideration prevailing wind directions and location of sensitive receptors.
- Controlled blasting techniques to minimise dust and fly rock during blasting.
- Adherence to the dust loads and protective gear stipulated in the Occupational Health and Safety Act.
- Reporting mechanism and action plan in case of excessive wind and dust conditions.

During dry and, or windy periods, a water tanker shall be available for the control of dust, and the Contractor shall ensure that the sprays do not generate excess run off.

During high wind conditions, the Contractor shall comply with the Engineer's instructions regarding dust-damping measures. The Engineer may request the temporary cessation of all construction activities where wind speeds are unacceptably high, and until such time as dust levels return to acceptable levels.

As required by the National Dust Control Regulations, promulgated in terms of section 53(o) of National Environmental Air Quality Act (Act 39 of 2004) the Contractor shall establish of a network of dust monitoring points using method ASTM D1739: 1970[2] (or equivalent), sufficient in number to establish the contribution of the person to dustfall in residential and non-residential areas in the vicinity of the premises, to monitor identified or likely sensitive receptor locations, and to establish the baseline dustfall for the district.. The following standards will apply:

- For residential areas the dust fallout may not exceed 600mg/m^2/day (on a 30 day average) more than two times a year and not on sequential months.
- For non-residential areas the dust fallout may not exceed 1200mg/m^2/day (on a 30 day average) more than two times a year and not on sequential months.

All items of plant capable of generating significant volumes of dust (i.e. crusher plants, concrete batching plants) shall be equipped with necessary equipment (Bag filters in cement silos, sprayers and conveyor transfer and fall points and hoppers) to ensure that fugitive dust is minimised.

2.4.13 Aesthetics

All site establishment components (as well as equipment) shall be positioned to limit visual intrusion on neighbours and the size of area disturbed. The type and colour of roofing and cladding materials to the Contractor's temporary structures shall be selected to reduce reflection.

The Contractor shall take reasonable measures to ensure that construction activities do not have an unreasonable impact on the aesthetics of the area. Measures will be taken to obscure construction yards and associated plant and equipment from onlookers as far as is reasonable. Refer also to 2.4.4 regarding requirements for lighting.

2.4.14 Disruption to existing and neighbouring land use activities

The Contractor shall take measures to limit the disruption of any existing land use activities occurring on the site or neighbouring sites as far as reasonable. Where construction may impact on access routes, safe alternative access shall be provided to the satisfaction of the Engineer. Refer also to clauses 2.4.4, 2.4.5, 2.4.11 and 2.4.13 regarding dust, noise, lighting and aesthetics. Where construction will result in disruptions to activities, the Contractor shall notify the affected landowner and inform him of the construction activity, the program and what mitigations measures will be implement to minimise the disruptions. The Client, Contractor and Engineer shall make compensations and or accommodate landowner's requests and to maintain the *status quo,* as far as is reasonable.

2.4.15 Temporary site closure

If the site is closed for a period exceeding one week, the Contractor, in consultation with the Engineer shall carry out the following checklist procedure.

Hazardous materials stores:

- Outlet secure / locked.
- Bund empty (where applicable).
- Fire extinguishers serviced and accessible.
- Secure area from accidental damage e.g. vehicle collision.
- Emergency and contact details displayed.
- Adequate ventilation.

Safety:

[2] American Standard for Testing and Materials method D1739

- All trenches and manholes secured.
- Fencing and barriers in place as per the Occupational Health and Safety Act (No 85 of 1193).
- Emergency and management contact details for at least two standby staff displayed.
- Pipe stockpile wedged/ secured.
- Emergency equipment, including firefighting and spill response materials and equipment remain readily accessible to standby staff.
- Site security measures in place.
- All plant and equipment have their keys removed or are disabled to prevent unauthorised start-up / theft.

Erosion:

- Wind and dust mitigation in place.
- Slopes and stockpiles at stable angle.
- Revegetated areas watering schedules and supply secured.

Water contamination and pollution:

- Cement and materials stores secured.
- Toilets empty and secured.
- Refuse bins empty and secured.
- Drip trays empty and secure (where possible).
- Structures vulnerable to high winds secure.
- All plant and equipment not in use are withdrawn from areas prone to flooding.

2.4.16 Public roads

The Contractor shall control the movement of all vehicles and plant including that of his suppliers so that they remain on designated routes, are distributed so as not to cause an undue concentration of traffic and that all relevant laws are complied with. . In addition such vehicles and plant shall be so routed and operated as to minimise disruption to regular users of the routes not on the Site. Where road safety may be impacted on the Contractor shall notify the relevant roads authority and arrange for the necessary road warning signage and appoint trained points men to control traffic around any hazards. Any damage caused to the public road system as a result of construction or as a direct result of construction vehicles and equipment shall be repaired to the satisfaction of the Engineer.

On gravel or earth roads on Site and within 500 m of the Site, the vehicles of the Contractor and his suppliers shall not exceed a speed of 20 km/h. Mud and sand deposited onto public roads by construction activities shall be cleared on a daily basis.

2.4.17 Security and access control

The Contractor shall ensure that access to the Site and associated infrastructure and equipment is off-limits to the public at all times during construction. If so required, as directed by the Engineer, the Contractor shall fence the site to ensure effective control of access to the site. This fence shall be a diamond mesh fence or similar with a minimum height of 1.8 m, and it shall be erected around the site and shall be maintained for the duration of construction.

All authorised personal and visitors shall be issued with an identification card (or similar) to ensure that the security personnel may identify authorised persons.

2.4.18 Access routes / haul roads

Access to the Construction camp and working areas shall utilise existing roads or tracks as far as possible. Entry/exit points onto public roads shall take cognisance of traffic safety. Traffic safety measures shall include appropriate signage and signalmen where relevant.

Where temporary roads are required for construction the route, design and layout shall be subject to the approval of the Engineer. Roads shall be routed to limit environmental impact by avoiding sensitive environmental features including rivers, wetlands, areas of botanical significance or any other areas as identified through environmental planning processes. Roads shall follow routes that minimise stormwater related risks (i.e. steep gradients, cuts and fills, drainage lines, marshy areas). Where temporary roads cross

drainage lines (which must be an approved, see Activity 18 of R 544 of NEMA) the reasonable provision shall be made to accommodate flooding without structural damages to the road crossing, approaches or to the river banks, the design of crossings shall be subject to approval by the Engineer. Subject to the preceding requirements, roads shall be designed to have the least possible footprint needed to meet project objectives. All temporary roads shall undergo full rehabilitation at project completion and the expense of such shall be to the Contractor's account. Unless inside the urban edge or part of an environmental authorisation in terms of NEMA R544 Activity No. 22.(II) no new construction road shall exceed 8m or where such road already exists be widened by more than 6m or lengthened by more than 1000m.

2.4.19 Housekeeping

The Contractor shall make available the time and resources need to undertake routine housekeeping of the works areas and site establishment areas at a minimum of a weekly interval. Housekeeping shall include maintenance of barriers, structures, signage, material stockpiles to ensure that they are safe and aesthetically acceptable and to the satisfaction of the Engineer. Construction materials shall be stacked in a safe, neat and orderly fashion and shall comply with the requirements of the OHSA. Windblown litter, construction debris and spoil shall be collected and removed for disposal.

2.4.20 Ablution facilities

The Contractor shall deploy an adequate number (As per the requirements of the OHSA) of portable toilets at the various works areas and site establishment area, including provision for security and access control personal. Toilets should not be located further than 100m from the place of work. Toilets should be placed in shaded areas wherever possible. The Contractor shall make provision to have the toilets cleaned and maintained in a hygienic fashion and shall supply toilet paper. Toilets shall be secured to the ground to ensure they are not blown over during high winds or bumped over by some other means. The Contractor shall also make available a hand washing facility. Where portable toilets are located within view of the public or neighbouring residences or places of business, efforts should be taken to screen such facilities from view and provide privacy to users.

The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied and that the contents are properly stored and removed from Site. Discharge of waste from toilets into the environment and burial of waste is strictly prohibited and must be treated at a registered waste water treatment works. The Contractor shall keep record, and provided such records upon request, of the location and volumes of waste disposed. The use of pit latrines and soak-a-ways is prohibited unless approved by the Engineer.

Washing, whether of the person or of personal effects and acts of excretion and urination are strictly prohibited other than at the facilities provided. The Contractor shall take disciplinary action against any staff member found in contravention of this requirement.

2.4.21 Recess areas and canteens

The Contractor shall provide covered recess areas at the site establishment area and at various working areas, which are situated too far from the site establishment area to allow staff to return for recesses. The recess area should be located in an area that provides natural shade but should not be located within 32m of a drainage lines or wetland, in or adjacent a "no go" area, in dense combustible vegetation or near any neighbour or activity to which they may cause disturbance. The recess areas should also be located away from construction noise, dust, waste storage areas, hazardous materials stores, fuel storage and dispensing areas and any other activity that may contaminate food or impair comfort. The recess areas shall provide adequate seating to accommodate the staff stationed at that area of the works. Recess areas shall be located near, but not next to, ablution and hand washing facilities. Recess areas should also have an adequate supply of cool potable water, as determined by the number of staff working in that area. An adequate number of rubbish bins shall be provided to contain the waste generate by this facility in a day. The recess areas shall make provision for a smoking area, including seating and a fire proof sand filled container for extinguishing cigarettes. Smoking shall otherwise be prohibited across the site and in the works areas. The recess areas shall be equipped with an appropriate sized fire extinguisher to deal with a fire at this location. Subject to implementation of reasonable fire protection measures and the presence of fight fighting equipment, the Contractor may establish a purpose built warming or cooking fire in an area cleared of all combustible material near the recess area (Note in terms of Clause 2.4.2 however that firewood may not be collected for the surrounding area). Staff shall not be permitted to eat or rest during recess times in any other

areas other than the designated recess or canteen area.

The following specifications will apply to a site canteen. The Canteen will be situated according to the principles for recess areas, as provided above. The Canteen will shall be designed to ensure the hygienic preparation of food and cleaning of cooking utensils cutlery and crockery. Water decanted from cooking processes or that from the washing shall not be disposed of into the environment but rather via a storage tank and then the sewage disposal system. The Canteen shall be equipped with the appropriate size and type of fire extinguished needed to deal with type and nature of fire that may arise. The Canteen shall have an adequate number of scavenger and weather proof rubbish bins needed to deal with the days' waste. Rubbish bins shall be cleared daily to the central waste storage area. The Contractor shall take measure to ensure that housekeeping and maintenance of hygienic conditions are strictly observed..

2.4.22 Site clinic or first aid station

Should the scale of construction warrant the need for a first aid station (clinic, sick bay, medical bay) the following requirements shall apply. The design and maintenance of the first aid station shall be such that the hygienic safety of the patients can be assured. The first aid station shall be operated by a certified first aider or paramedic. All waste arising from the first aid station or site ambulance shall be treated as hazardous waste and shall not be disposed of via the domestic waste system. . A safe potable water supply shall be provided. Effluents from washing shall be direct to a tank, collected and disposed via the sewage disposal system.

2.5 Emergency procedures

In addition to the emergency procedures set out in the Contractor method statement titled Emergency preparedness and response plan as dealt with under Item 2) of Clause 2.2, the Contractor's procedures for the following emergencies shall include:

2.5.1.1 Fire

No fires may be lit on site. Any fires that occur shall be reported to the Engineer immediately. Smoking shall not be permitted in those areas where it is a fire hazard. Such areas shall include the workshop and fuel storage areas and any areas where the vegetation or other material is such as to make liable the rapid spread of an initial flame. In terms of the Atmospheric Pollution Prevention Act (No. 45 of 1965), burning is not permitted as a disposal method.

The Contractor shall ensure that there is basic fire-fighting equipment available on Site at all times. This shall include at least rubber beaters when working in urban open spaces and fynbos areas, and at least one fire extinguisher of the appropriate type when welding or other "hot" activities are undertaken.

The Contractor shall advise the relevant authority of a fire as soon as one starts and shall not wait until he can no longer control it. The Contractor shall ensure that his employees are aware of the procedure to be followed in the event of a fire. The Contractor shall provide adequate fire protection measures at each work area and the site establishment area to deal with the type and nature of fire that may arise. On large construction site located in a wilderness area or adjoin commercial forestry of agricultural land use that may be prone to and susceptible to veld fires the Engineer may specify that the Contractor install fire breaks along boundary fences together with any other fire protection measure deemed necessary to protect property and lives of site staff and neighbours.

2.5.1.2 Accidental leaks and spillages

The Contractor shall ensure that his employees are aware of the emergency procedure(s) to be followed for dealing with spills and leaks, which shall include notifying the Engineer and the relevant authorities. The Contractor shall ensure that the necessary materials and equipment for dealing with spills and leaks is available on Site at all times. Treatment and remediation of the spill areas shall be undertaken to the reasonable satisfaction of the Engineer.

In the event of a hydrocarbon spill, the source of the spillage shall be isolated, and the spillage contained. The area shall be cordoned off and secured. The Contractor shall ensure that there is always a supply of absorbent material readily available to absorb/ breakdown and where possible be designed to encapsulate minor hydrocarbon spillage. The quantity of such materials shall be able to handle a minimum of 200 ℓ of

hydrocarbon liquid spill.

2.6 Community relations

The Contractor shall erect and maintain information boards in the position, quantity, design and dimensions specified. Such boards shall include contact details for complaints by members of the public in accordance with details provided by the Engineer.

The Contractor shall keep a "Complaints Register" on Site. The Register shall contain all contact details of the person who made the complaint, and information regarding the complaint itself and any measures or agreements made in resolution to such complaint.

The Contractor shall develop an employment policy and shall disseminate this to interested communities, informing them of how many opportunities are available and the skills required for such opportunities. Depending on the scale of the project and the proximity and populace of nearby communities, the Contractor shall consider appointing a community liaison officer and an employment desk in the interested communities to manage the recruitment of staff. Local South Africans should be given first priority with regard to any employment opportunities and the Contractor's recruitment policy and nature and number of job opportunities should be communicated timeously and clearly to manage expectations and avoid conflict.

2.7 Construction Methods and procedures

2.7.1 Site clearance

The Contractor shall ensure that the clearance of vegetation is restricted to that required to facilitate the execution of the Works. Site clearance shall occur in a planned manner, and cleared areas shall be stabilised as soon as possible. The detail of vegetation clearing shall be to the Engineer's approval. All cleared vegetation shall either be mulched and mixed into the topsoil stockpiles or disposed of at an approved disposal site. The disposal of vegetation by burying or burning is prohibited without the requisite permit from the local authority.

The Contractor shall strip the Topmaterial within the working areas. The Topmaterial shall be stockpiled separately from subsoil and used for subsequent rehabilitation and revegetation. Topmaterial stockpiles shall not be compacted.

Should fauna be encountered during site clearance, earthworks shall cease until fauna have been safely relocated.

2.7.2 Demolition

Hazardous and non-hazardous materials shall be separated at site and disposed of in a manner approved by the Engineer.

All buildings older than 60 years require a permit from South African Heritage Resources Agency in terms of the National Heritage Resources Act (no. 25 of 1999). A demolition permit is also required from the local authority in terms of the National Building Regulations.

2.7.3 Cement and concrete batching

Where applicable, the location of the batching plant (including the location of cement stores, sand and aggregate stockpiles) shall be as approved by the Engineer. The concrete/cement batching plant shall be kept neat and clean at all times.

No batching activities shall occur directly on unprotected ground. The batching plant shall be located on a smooth impermeable surface (concrete or 250 µm plastic covered with 5 cm of sand). The area shall be bunded and sloped towards a sump to contain spillages of substances. All wastewater resulting from batching of concrete shall be disposed of via the contaminated water management system and shall not be discharged into the environment. Contaminated water storage areas shall not be allowed to overflow and appropriate protection from rain and flooding shall be implemented

Empty cement bags shall be stored in weatherproof containers to prevent wind blown cement dust and water contamination. Empty cement bags shall be disposed of on a regular basis via the solid waste management

system, and shall not be used for any other purpose. Unused cement bags shall be stored so as not to be affected by rain or runoff events. In this regard, closed steel containers shall be used for the storage of cement powder and any additives. The Contractor shall ensure that sand, aggregate, cement or additives used during the mixing process are contained and covered to prevent contamination of the surrounding environment.

The Contractor shall take all reasonable measures to prevent the spillage of cement/ concrete during batching and construction operations. During pouring, the soil surface shall be protected using plastic and all visible remains of concrete shall be physically removed on completion of the cement/ concrete pour and appropriately disposed of. All spoiled and excess aggregate/ cement/ concrete shall be removed and disposed of via the solid waste management system.

Where "readymix" concrete is used, the Contractor shall ensure that the delivery vehicles do not wash their chutes directly onto the ground. Any spillage resulting from the "readymix" delivery shall be immediately cleared and disposed of via the solid waste management system. Readymix trucks shall not be permitted to dump drum wash on site unless into contaminated water pond which must be fully rehabilitated at completion and the sediment collected for disposal.

2.7.4 Earthworks

All earthworks shall be undertaken in such a manner so as to minimise the extent of any impacts caused by such activities, particularly with regards to erosion and dust generation. No equipment associated with earthworks shall be allowed outside of the Site and defined access routes unless expressly permitted by the Engineer.

2.7.5 Dewatering

Pumps shall be placed over a drip tray in order to contain fuel spills and leaks. Pumps shall be located sufficiently above the water line to ensure that that it does not become inundated if pumping is discontinued. The Contractor shall take all reasonable precautions to prevent spillage during the refuelling of these pumps.

The Contractor shall ensure that, unless of similar to the upstream water quality, none of the water pumped during any dewatering activities, including well points, is released into the environment without the Engineer's approval. The Engineer's approval is required prior to the discharge of this water into the Municipal sewer system.

2.7.6 Bitumen

Over spray of bitumen products outside of the road surface and onto roadside vegetation or the surrounding environment shall be prevented using a method approved by the Engineer.

When heating bitumen products, the Contractor shall take cognisance of appropriate fire risk controls. Heating of bitumen products shall only be undertaken using LPG or similar zero emission fuels and appropriate fire fighting equipment shall be readily available.

Stone chip/gravel excess shall not be left on road / paved area verges. This shall be swept / raked into piles and removed to an area approved by the Engineer.

Water quality from runoff from new/ fresh bitumen surfaces will be monitored visually by the Engineer and remedial actions taken where necessary by the Contractor.

2.7.7 Erosion and sedimentation control

The Contractor shall take all reasonable measures to limit erosion and sedimentation due to the construction activities. Where erosion and/or sedimentation, whether on or off the Site, occurs despite the Contractor complying with the foregoing, rectification shall be carried out in accordance with details specified by the Engineer. Where erosion and/or sedimentation occur due to the fault of the Contractor, rectification shall be carried out to the reasonable requirements of the Engineer.

Any runnels or erosion channels developed during construction or during the defects liability period shall be backfilled and compacted. Stabilisation of cleared areas to prevent and control erosion shall be actively managed. Consideration and provision shall be made for various methods, namely, brushcut packing, mulch

or chip cover, straw stabilising (at a rate of one bale/ 20 m^2 and rotovated into the top 100 mm of the completed earthworks), watering, soil binders and anti-erosion compounds, mechanical cover or packing structures (e.g. Hessian cover).

Traffic and movement over stabilised areas shall be restricted and controlled, and damage to stabilised area shall be repaired and maintained to the satisfaction of the Engineer.

2.7.8 Crane operations

Drive plants shall be well maintained and drip trays shall be positioned at potential leak areas. Over-greasing of crane cables shall be avoided.

Movement and lifting of hazardous materials shall be undertaken such that they do not cause a pollution, spillage or safety risk (in particular were concrete buckets are in use).

2.7.9 Trenching

Trenching for services shall be undertaken in accordance with the engineering specifications with the following environmental amplifications, where applicable:

- Topsoil shall be removed and stockpiled separately from and not mixed with the subsoil. Preferably topsoil should be placed on the upslope side of the trench which subsoil is placed on the downslope side of the trench, levelled and used for construction access. The areas used for topsoil and subsoil stockpiling should not be cleared of shorter herbaceous vegetation and must not be grubbed. Only once the trench is backfilled and shaped will the topsoil be spread across the trench area,
- Soil shall be excavated and used for refilling trenches i.e. soil from the first trench shall be excavated and stockpiled, thereafter soil from the second excavated trench length shall be used to backfill the trench behind it once the services have been laid. The last trench shall be filled using the soil stockpiled from the first trench.
- Trench lengths shall be kept as short as practically possible before backfilling and compacting.
- Trenches shall be re-filled to the same level as (or slightly higher to allow for settlement) the surrounding land surface to minimise erosion.
- Stormwater control measures shall be used to reduce the ingress of stormwater into the trench. Where needed the Contractor shall provide temporary stormwater pipes to allow stormwater to cross the open trench.

2.7.10 Drilling and jack hammering

The Contractor shall take all reasonable measures to limit dust generation and noise as a result of drilling operations. The Contractor shall ensure that no pollution results from drilling operations, either as a result of oil and fuel drips, or from drilling fluid.

Any areas or structures damaged by the drilling and associated activities shall be rehabilitated by the Contractor to the satisfaction of the Engineer.

2.7.11 Stockpiling

The Engineer will identify suitable sites for stockpiling. Stockpiles shall be convex in shape and shall be limited in height so that it does not result in undue visual impacts or significant dust, as approved by the Eengineer. Stockpiles shall be so placed to occupy minimum width compatible with the natural angle of repose of material, and measures shall be taken to prevent the material from being spread over too wide a surface. Unless otherwise stipulated, areas for temporary stockpiling will not be cleared of shorter herbaceous vegetation as this compacted vegetation layer will serve protect the topsoil and serve as a marker during stockpile reclamation. Where required, appropriate precautions shall be taken to prevent the erosion and limit the compaction of the stockpiles. The Contractor shall ensure that all stockpiles do not result in the damming of water or run off, or is itself washed away.

Top material stockpiles shall not be covered with any material (e.g. plastic) that may kill seeds or cause it to compost. If the stockpiles start to erode significantly or cause dust problems, they shall be covered with hessian. Where practical, Topmaterial shall not be left for longer than six to eight months before being used for rehabilitation. If stored for longer than six months, the Topmaterial shall be analysed and, if necessary, ameliorated before use in rehabilitation works.

2.7.12 Site closure and rehabilitation

Any areas that the Engineer believes may have been impacted upon or disturbed, shall be rehabilitated to the satisfaction of the Engineer, which includes all areas where Topmaterial has been stripped or compacted. Once construction is complete the Contractor shall clear all construction debris and materials from the Site not forming part of the Permanent Works. The area to be rehabilitated shall first be landscaped to match the topography of the surrounding area as it was prior to construction. The composition of vegetation to be used for any rehabilitation shall be specified.

The Contractor may not use herbicides, pesticides, fertilisers or other poisonous substances for the rehabilitation process unless otherwise agreed with the Engineer.

All rehabilitated areas shall be considered "no go" areas and the Contractor shall ensure that none of his staff or equipment enters these areas. The Contractor shall undertake irrigation of rehabilitated areas for a minimum period of six to eight weeks to encourage germination. They may elect to extend the irrigation programme or the Engineer may specify ongoing irrigation programme if required. However any irrigation programme must taper off over a period of four to eight weeks before complete cessation as an abrupt cessation is likely to result in high seeding mortality rates (depending on local soil and climatological factors).

The Contractor shall undertake to remove all alien vegetation re-establishing on the area and shall implement the necessary temporary or permanent measures to combat soil erosion.

2.7.13 Temporary revegetation of the areas disturbed by construction

Where there is likely to be a delay of greater than two weeks in the landscaping and revegetation of a disturbed area or where that site is likely to be the subject of further construction activities at a later stage, the Contractor shall ensure that the area is temporarily revegetated to combat dust generation and prevent erosion. This revegetation shall occur incrementally immediately upon completion of the construction activities at the subject location.

Prior to revegetation structures and material not forming part of the Permanent Works, including remnants of building materials, concrete foundations, timber and foreign debris, shall be removed and disposed of via the solid waste management system. The area shall be revegetated as follows:

a) Compacted areas, such as roads, stockpile areas and construction platforms shall be ripped or scarified to depth of 300mm.

b) The surface shall be levelled by hand or machine as far as practically possible.

c) Alien vegetation shall be cleared by cutting the plants off at ground level, and painting the stump with 0.5% Garlon in diesel.

d) For areas with a slope of greater than 1:3, straw shall be utilised as a binding material to stabilise the soil during revegetation and rehabilitation of the site. Straw shall consist of natural, dried fibres of hay or chaff of various lengths between 50mm and 400mm, delivered to Site in bales and shall be applied evenly by hand or machine at a rate of 1 bale per 20m^2 over the area to be revegetated. It shall then immediately be rotovated into the upper 100 mm layer of soil.

e) The prepared area shall be hydro- or hand-seeded at a rate of 40 kg/ha using a suitable indigenous grass species or Rye grass (*Lolium multiflorum*). In the event of hand-seeding, the seed mixture as specified shall be mixed with two parts per volume of clean dry plaster sand, then divided in half and applied evenly in two successive applications, one after the other, by means of an approved hand seeding machine (known colloquially as a "tefsaaier"). On completion of the seeding the surface shall be lightly raked to cover the seed with no more than 5 mm of soil.

f) Water used for the irrigation of vegetated areas shall be free of pollutants that will have a detrimental effect on the plants. The vegetated area shall only be watered once, immediately following seeding. Watering should be carried out from a tanker, using a fine nozzle spray to avoid erosion and disturbance of the vegetation. Water for irrigation purposes may must be from an approved source.

No construction equipment, vehicles or unauthorised personnel shall be allowed onto areas that have been vegetated. Only persons or equipment required for the preparation of areas, application of fertiliser and

maintenance of revegetated area shall be allowed to operate on these areas.

3 COMPLIANCE WITH REQUIREMENTS AND PENALTIES

3.1 Compliance

Environmental management is concerned not only with the final results of the Contractor's operations to carry out the Works but also with the control of how those operations are carried out. Tolerance with respect to environmental matters applies not only to the finished product but also to the standard of the day-to-day operations required to complete the Works.

It is thus required that the Contractor shall comply with the environmental requirements on an ongoing basis and any failure on his part to do so will entitle the Engineer to certify the imposition of a penalty as detailed below.

3.2 Penalties

Penalties will be issued for certain transgressions. Penalties may be issued per incident at the discretion of the Engineer. Such penalties will be issued in addition to any remedial costs incurred as a result of non-compliance with this Specification. The Engineer will inform the Contractor of the contravention and the amount of the penalty, and shall be entitled to deduct the amount from monies due under the Contract.

3.3 Removal from site and suspension of Works

The Engineer may instruct the Contractor to remove from Site any person(s) who in their opinion is guilty of misconduct, or is incompetent, negligent or constitutes an undesirable presence on Site. Subclause 2.4.10 of this Specification requires that all Plant be in good working order, and accordingly the Engineer may order that any Plant not complying with the Specifications be removed from Site. Where the Engineer deems the Contractor to be in breach of any of the requirements of this Specification, he may order the Contractor to suspend the progress of the Works or any part thereof.

4 MEASUREMENT AND PAYMENT

4.1 Basic principles

4.1.1 General

Except as specified below, or in the Specification Data or as billed, no separate measurement and payment will be made to cover the costs of complying with the provisions of this Specification and such costs shall be deemed to be covered by the rates tendered for the items in the Bill of Quantities completed by the Contractor when submitting his tender.

4.1.2 All requirements of the environmental management specification

All work not measured elsewhere, associated with complying with any requirement of this Environmental Management specification will be measured and paid as a sum.

The tendered sum shall cover the cost of with complying with the environmental management specification and shall include for all materials, labour and plant required to execute and complete the Works as specified, described in the Bill of Quantities or shown on the Drawing(s).

4.1.3 Work "required by the Engineer"

Where a clause in this Specification includes a requirement as "required by the Engineer", measurement and payment for compliance with that requirement shall be in accordance with the relevant measurement and payment clause of the Project Specifications.

4.2 Billed items

4.2.1 Method Statements: Additional work

No separate measurement and payment will be made for the provision of Method Statements but, where the Engineer requires a change on the basis of his opinion that the proposal may result in, or carries a greater than warranted risk of damage to the environment in excess of that warranted by the Specifications, then any additional work required, provided it could not reasonably have been foreseen by an experienced contractor, shall be valued in accordance with the Clause in the General Conditions of Contract dealing with Provisional Sums.

A stated sum is provided in the Bill of Quantities to cover payment for such additional work.

4.2.2 All requirements of the environmental management specification

Unit: Sum

All other work not measured elsewhere, associated with complying with any requirement of the environmental management specification shall be measured as a sum.

The tendered rate shall cover any cost associated with complying with the environmental management specification and shall include for all materials, labour and plant required to execute and complete the work as specified, described in the Bill of Quantities or shown on the drawing(s).

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APPENDIX C

BOTANICAL INPUT INCLUDING ALIEN CLEARING PLAN, REHABILITATION PLAN AND PLANT AND RESCUE PLAN

Alien Invasive Management Plan, Plant Rescue and Protection Plan and Vegetation Rehabilitation Plan for the Mulilo Sonnedix Prieska PV Solar Power Project at Hoekplaas Farm near Copperton, Northern Cape

bergwind
Botanical Surveys & Tours

Report by Dr David J. McDonald
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Report prepared for Aurecon SA (Pty) Ltd

Client: Mulilo Sonnedix Prieska PV (Pty) Ltd

National Legislation and Regulations governing this report

This is a 'specialist report' and is compiled in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2010.

Appointment of Specialist

David J. McDonald of Bergwind Botanical Surveys & Tours CC was appointed by AURECON South Africa (Pty) Ltd on behalf of Mulilo Sonnedix Prieska (Pty) Ltd to provide specialist botanical consulting services for the vegetation rehabilitation required for the solar power project at the farm Hoekplaas near Copperton, Northern Cape Province.

Details of Specialist

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Expertise

Dr David J. McDonald:

- Qualifications: BSc. Hons. (Botany), MSc (Botany) and PhD (Botany)
- Botanical ecologist with over 30 years' experience in the field of Vegetation Science.
- Founded Bergwind Botanical Surveys & Tours CC in 2006
- Has conducted over 300 specialist botanical / ecological studies.
- Has published numerous scientific papers and attended numerous conferences both nationally and internationally (details available on request).

Independence

The views expressed in the document are the objective, independent views of Dr McDonald and the survey was carried out under the aegis of, Bergwind Botanical Surveys and Tours CC. Neither Dr McDonald nor Bergwind Botanical Surveys and Tours CC have any business, personal, financial or other interest in the proposed development apart from fair remuneration for the work performed.

Conditions relating to this report

The content of this report is based on the author's best scientific and professional knowledge as well as available information. Bergwind Botanical Surveys & Tours CC, its staff and appointed associates, reserve the right to modify the report in any way deemed fit should new, relevant or previously unavailable or undisclosed information become known to the author from on-going research or further work in this field, or pertaining to this investigation

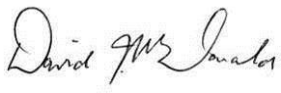
This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of the report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I **David Jury McDonald**, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

Note: The terms of reference must be attached.



Signature of the specialist:

Bergwind Botanical Surveys & Tours CC

Name of company:

18 February 2014

Date:

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/
NEAS Reference Number:	DEAT/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

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CONTENTS

1. Introduction

A vegetation survey to inform the environmental application process for the proposed solar power project at Hoekplaas (Remainder of Farm 146) near Copperton, Northern Cape Province was carried out by McDonald (2012). Environmental Authorization (EA) has been granted and to obtain final authorisation for the project to go ahead certain requirements must be met, amongst them a vegetation rehabilitation plan for the area affected by the proposed installation of photovoltaic panels. The report that follows includes the ***Plant Rescue and Protection Plan*** in Section 7; the ***Alien Invasive Management Plan*** in Section 8 and the ***Re-vegetation and Habitat Rehabilitation Plan*** in Section 9.

Bergwind Botanical Surveys & Tours CC was appointed to provide a brief vegetation rehabilitation plan. The plan is based on the information obtained in the study area during two field-surveys (November 2011 and April 2013) as reported by McDonald (2012; 2013).

2. Terms of Reference

The terms of reference are as follows:

- Provide a rehabilitation plan for those areas of Hoekplaas affected by construction activities.
- Provide directions for the relocation and conservation of any sensitive, threatened or protected plant species.
- Provide directions for the removal and control of alien invasive plant species.

3. Location

Hoekplaas (Remainder of Farm 146) is located 14 km southeast of Copperton and approximately 55 km southwest of Prieska in the in Northern Cape Province (Figure 1). The farm has a multi-angled polygon shape and covers an area of 4 164 ha. The Mulilo Sonnedix Prieska PV area is more-or-less centrally located on the Hoekplaas farm (Figure 2).

Hoekplaas falls within the Nama Karoo Biome, Bushmanland Bioregion which covers a large part of the Northern Cape Province. The Bushmanland Bioregion extends from the eastern part of Namaqualand in the west to near Prieska in the east and from Upington in the north to the Brandlvlei / Sak River area in the south (Rutherford, Mucina & Powrie, 2006).

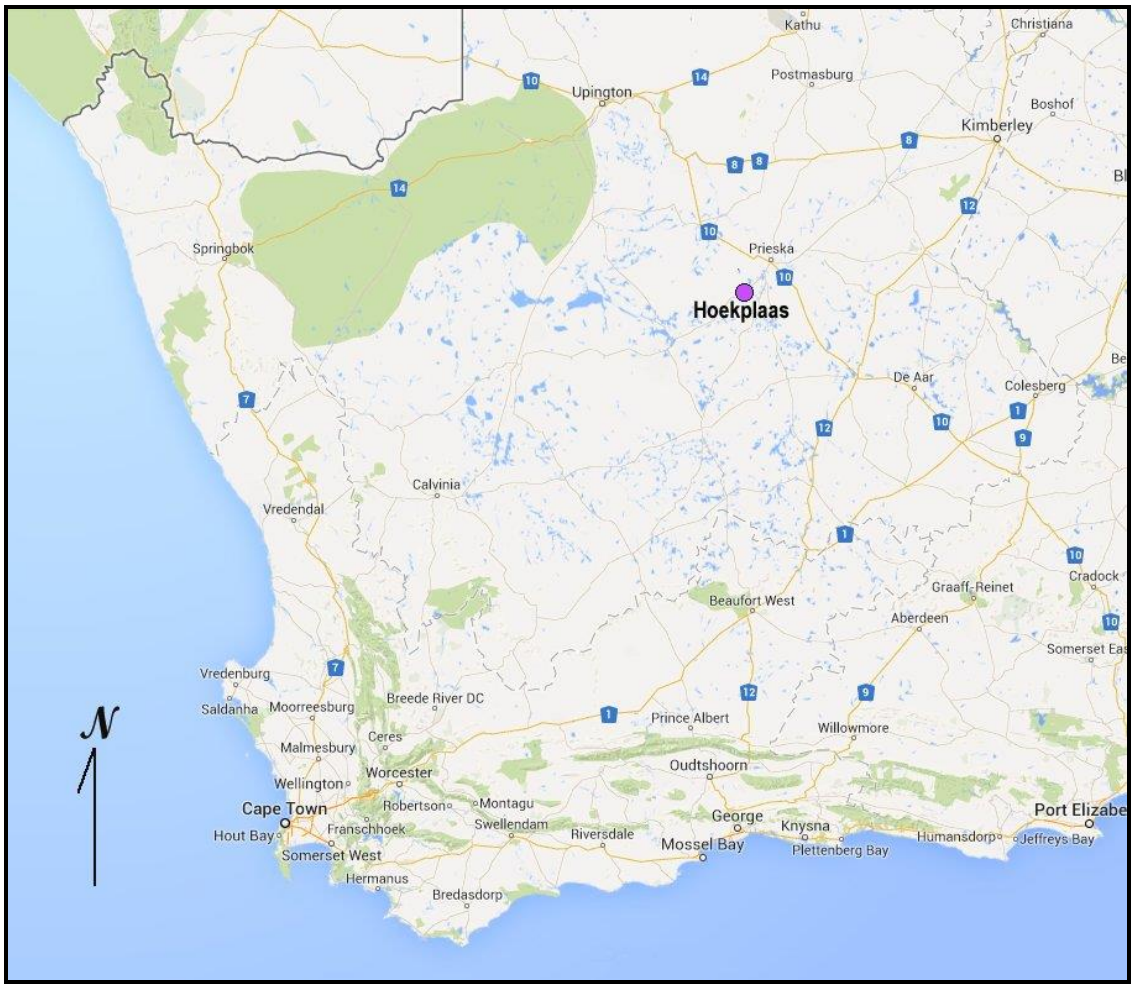

Figure 1. The location of Hoekplaas (mauve dot) in the Northern Cape Province south-west of Prieska.

4. Project layout

The solar installations at Hoekplaas will be located on rangelands with low vegetation, avoiding watercourses or major drainage line and endorheic pans. The proposed layout of the photovoltaic (PV) panels for Mulilo Sonnedix Prieska PV is given in Figure 2.

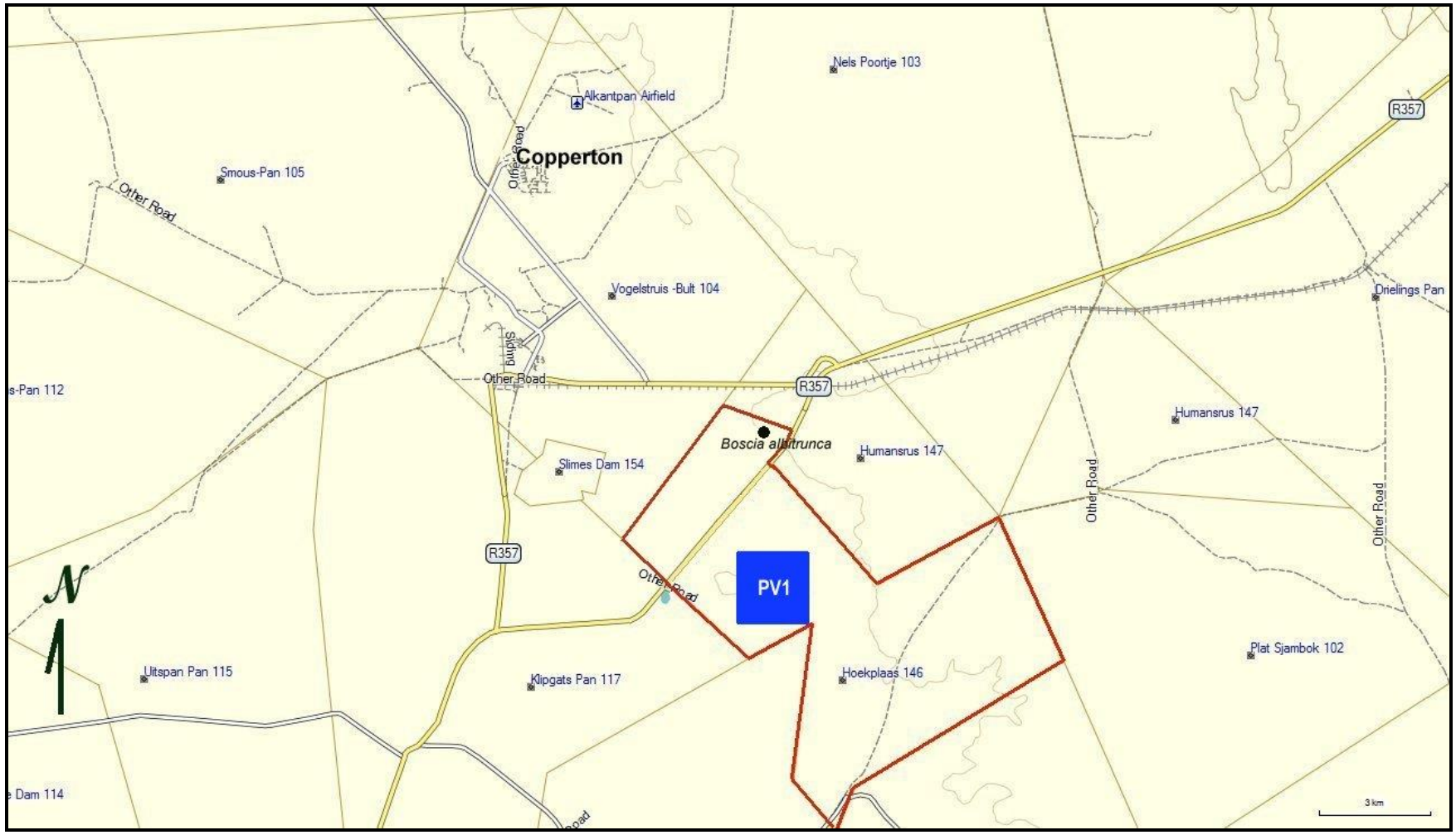

Figure 2. Hoekplaas (red boundary) with the PV1 area more-or-less centrally located (blue square). The one occurrence of a protected *Boscia albitrunca* tree is in the northern part of Hoekplaas and not in the PV1 area.

5. The Vegetation

Only one vegetation type will be affected by the proposed project, namely Bushmanland Basin Shrubland (Figures 3 & 4) (Mucina *et al.* 2006). This vegetation type occurs extensively in the Northern Cape Province and is not threatened in any way.

In the botanical impact assessment for Hoekplaas (McDonald, 2013) noted that there is little variation in the vegetation. Within the broader Bushmanland Basin Shrubland vegetation type six (6) sub-types or communities were described namely (1) *Rhigozum trichotomum* Shrubland, (2) Asteraceous Shrubland, (3) the *Salsola* spp. – *Pentzia incana* Shrubland, (4) the 'Leegte' Shrubland, (5) *Psilocaulon junceum* – *Lycium* spp. Shrubland and (6) Endorheic Pans.

The vegetation is short and coarse with most shrubs not exceeding 40 cm in height but some species such as *Rhigozum trichotomum* (driedoring) up to 150 cm. The vegetation is also not species rich and does not have any threatened (Red List) plant species.

Figure 3. Low "bossieveld" typical of areas where the solar PV1 installations will be constructed at Hoekplaas.

Figure 4. Exposure of calcrete with a capping of shallow soil on a track at Hoekplaas. The medium-height vegetation alongside the track is dominated by driedoring (*Rhigozum trichotomum*).

6. Background to Rehabilitation Plan

6.1 Veld condition

Within-site variation in the vegetation at Hoekplaas is related to small-scale changes in topography and soils e.g. shallow drainage lines with sandy soils and low ridges and convex slopes with calcrete hardpan and shallow, rocky soils (lithosols). In the original botanical surveys (McDonald, 2011; 2013) the drainage lines were recommended for exclusion as potential construction areas and are therefore to be avoided. No rehabilitation of vegetation in drainage lines would thus be required. Instead focus will be on open, rocky areas where the vegetation is low.

Owing to its extensive distribution the Bushmanland Basin Shrubland at Hoekplaas is not threatened. It is a karroid vegetation type and typical of the Nama Karoo Biome. However, at a local scale changes in management regime

can result in dramatic changes in cover and plant species composition. Incorrect management can lead to severe degradation of the veld.

Esler *et al.* (2006) recognized five veld condition 'states' in Karoo ecosystems: (1) **severely degraded** (only unpalatable shrub species, ruderals or 'opslag', much bare ground, capping and erosion); (2) **poor** (mostly unpalatable shrubs, ruderals, low cover and low grazing capacity); (3) **intermediate** (many unpalatable shrub seedlings and desirable plants not reseeding); (4) **good** (good mix of plant species and cover temporarily low) and (5) **excellent** (good cover and good species composition). Presently Hoekplaas is a sheep-farm and managed for grazing of small livestock. The current objective in this practice is to increase or at least maintain the proportion of palatable (desirable) species to unpalatable species (undesirable) which are often poisonous. Although the impacts on natural shrubland vegetation at Hoekplaas as a result of the construction of the proposed solar power project are predicted to be **LOW NEGATIVE** (based on the extensive distribution of the vegetation type as a whole), the new and untested impact of installation of solar panels will have a marked influence on the vegetation at a local scale. The general veld condition at Hoekplaas at present is **good** to **excellent** but there is little doubt that it will change rapidly to the negative end of the scale, at least in the construction areas, to **poor** or even **severely degraded**, once construction of the solar panels begins.

When the solar installation is in place, management would not necessarily be directed at good to excellent veld condition for the sake of livestock grazing and maintaining a good carrying capacity. However, it must be the objective of the managers of the solar PV site to maintain the veld in good condition as far as possible. This would prevent both wind and water erosion and in the long-term would provide a source of seed for re-colonization of areas disturbed or laid bare by construction activities.

Most available literature (see Esler *et al.* 2006 for references) deals with veld management from an agricultural perspective and not from the perspective of large scale clearing and then interventions to attempt to restore the vegetation. The installation of PV panels over large areas is likely to cause significant

changes in vegetation cover and composition which has not previously been documented in karroid ecosystems. The result is that the recommendations in this report are based on available literature pertaining to agriculture. The predicted outcome in the short- to medium-term and even long-term of disturbance due to construction of solar PV installations is somewhat speculative since no documentation for such outcomes exists.

Major limitations to restoration of vegetation in the PV1 focus area at Hoekplaas are (I) climate and (II) the slow-growing nature of the shrub component.

I. Limitations imposed by climate

The rainfall at Hoekplaas is low and erratic, occurring mostly as showers in the autumn months. The environment may be described as arid, presenting a major challenge in terms of rehabilitation since germination of seeds and establishment of plants will only occur after significant rainfall events. Such rainfall events may be widely separated in time and recruitment of young plants can consequently be low (see Esler *et al.* 2006).

II. Slow-growing shrubs

Karoo shrubs or 'bossies' comprising the low shrubland at Hoekplaas are very slow growing and very old, with many of the low shrubs estimated to be three hundred years and older. Re-establishment of vegetation cover once removed is therefore very slow.

6.2 Removal of vegetation

Removal of vegetation (uprooting) must be kept to a minimum. Only those areas where it is imperative to remove vegetation i.e. construction areas, identified storage areas, roads and minor tracks should be cleared. All other areas should remain vegetated. If brush-cutting is required as a minimum intervention, this should be applied with discretion; however, it would always be preferred to uprooting.

If vehicle movement is required off designated roads and tracks, it would be advisable to drive over the shrubs (crush) rather than to uproot them. This would prevent loss of these shrubs since they would be able to regrow if not uprooted.

In places where shrubs are uprooted, the plant material must be stockpiled and retained for rehabilitation purposes.

6.3 Road-building

Building of roads should be restricted as far as possible to existing tracks. Where it is necessary to build roads care must be taken to ensure that drainage is not impeded from one side of the road to the other e.g. on slopes and across drainage lines. The roads themselves should also be correctly drained to ensure that runoff does not cause erosion. Vegetation should be allowed to persist along roads to assist with management of water runoff.

7. Plant Rescue and Protection Plan

7.1 Sensitive and protected plants

Boscia albitrunca is the only protected tree species found in the Hoekplaas area. Only one specimen was found in the northern part of Hoekplaas (McDonald, 2013) and this species was not found in the PV1 construction area. There will therefore be no impact on this species by the PV1 construction and consequently no permit according to the National Forests Act, 1998 (Act No. 84 of 1998) would be required to remove such trees.

Aloe claviflora (kraalaalwyn) (Figure 5), a protected species in the Northern Cape Province, occurs sporadically on Hoekplaas RE/146 but is not common. It was not encountered in the survey of the Hoekplaas PV 1 area (McDonald, 2012) but there is a chance that it may have been missed.

7.2 Relocation of sensitive plants species

Aloe claviflora is the only relocatable plant species of concern. If it is encountered (a low probability) during the construction phase the plants should be removed and relocated elsewhere in similar habitat which would not be affected by construction. This would, however, require a permit from the Department of Environment and Nature Conservation, Northern Cape in terms of the Northern Cape Nature Conservation Act 2009 (Act 9 of 2009).

Figure 5. *Aloe claviflora* – kraalaalwyn which occurs sporadically at Hoekplaas.

8. Alien Invasive Management Plan

Disturbance of the land either by livestock or by other factors such as vehicle tracks, clearing etc. often results in the invasion of the site by alien invasive plant species or indigenous pioneer plant species that grow quickly, are often unpalatable and undesirable and outcompete more desirable plant species. Two principal plant species that could become invasive at Hoekplaas are the exotic species *Prosopis glandulosa var. torreyana* (mesquite) and the indigenous *Galenia africana* (kraalbos).

P. glandulosus (Figure 6) is a thorny shrub which develops into large trees. The species has been controlled well at Hoekplaas but could be transported into the PV1 construction area in sand and soil from elsewhere. It is imperative that there should be awareness of this species which is invasive in arid areas. Monitoring should take place every three (3) months at all construction areas, roads and tracks to ensure that this species does not gain a foothold.

G. africana is a yellow-green shrub up to 1.5 m (Figures 7 & 8) which has very fine seed which can be blown by the wind. It is therefore difficult to control its dispersal. There is no effective way to control this dispersal apart from destroying the source plants. Kraalbos is toxic to livestock but also inhibits growth of other more desirable plant species (Esler *et al.*, 2006). It tends to aggressively invade disturbed sites e.g. disturbed but unused cattle or sheep kraals and is a likely invader into any sites disturbed by construction at Hoekplaas. It is recommended that wherever kraalbos starts to grow it should be quickly eradicated by uprooting and burning at a suitable site to ensure that it does not become established. Once established it is difficult to eradicate since it produces copious seed and will also re-sprout (coppice) from old wood. Costly herbicidal treatment would then be required for its control and if necessary would be required to be applied according to manufacturers' specifications.

Figure 6. Mesquite *(Prosopis glandulosa* var. *torreyana*) trees as found in the Copperton area.

Figure 7. Kraalbos (*Galenia africana*)

Figure 8. Close-up of leaves and flowers of *Galenia africana*.

Other plant species that could invade disturbed areas include bitterbos (*Chrysocoma ciliata*), *Senecio* spp., *Moraea* spp., dubbeltjie (*Tribulus terrestris*) (Figure 9), vermeerbos (*Geigeria* spp.) and slangkop (*Ornithogalum* spp.) (Shearing, 2008). The exotic grass, *Pennisetum setaceum* (fountain grass) (Figure 10) could also be a problem invader and its presence should be monitored. If found these species should be uprooted and destroyed.

Figure 9. *Tribulus terrestris* (dubbeltjie) – a poisonous, creeping forb.

Figure 10. Exotic *Pennisetum setaceum* (fountain grass)

At Hoekplaas, in areas near stock watering points where there is intense trampling and at sites where there is high activity of small fossorial mammals such as at old termite mounds, asbos (*Psilocaulon* sp.) (Figure 11) may be prevalent. This species is not harmful and can be used effectively to stabilize soil in disturbed areas.

Figure 11. A stand of asbos [*Psilocaulon* sp.] (centre) on an old termite mound.

9. Re-vegetation and Habitat Rehabilitation Plan

The first principal must be to disturb the smallest area possible. Construction should be restricted to areas approved for construction and all other areas should be considered 'No Go' areas for vehicles and pedestrians.

9.1 Soil preparation

Areas required for storing equipment and materials, if cleared, should once construction is completed, be restored following a four-pronged approach:
(1) The disturbed areas should be scarified using a mechanical agricultural ripper (vlekploeg) to break up the compacted soil. This should be done immediately prior to the rainy season (autumn) for best results.
(2) If necessary gypsum should be added to the soil to enhance water infiltration in areas that have been compacted by vehicles.
(3) Stockpiled plant material removed from the cleared areas should be chipped to form coarse mulch that can be distributed over the disturbed areas.
(4) If necessary (to be determined by the Environmental Control Officer [ECO]), pitter basins (Figure 13) should be made using a pitter plough or 'happloeg'. Such pitter basins would trap rainwater and assist infiltration of water into the soil as well as stimulating seed germination (Esler *et al*., 2006).

Figure 13. Pitter basins with trapped water in fine-grained soil of the Karoo near Beaufort West. Photo: S.J. Milton in Esler *et al.* 2006.

9.2 Re-vegetation

In many instances there is an assumption that active intervention is required to re-vegetate disturbed sites i.e. by replanting or sowing seed. This is not always advisable and in the case of Hoekplaas it would be only part of the solution to restoring plant cover on disturbed areas.

9.2.1 Re-seeding

Esler *et al.* (2006) provide a number of points with respect to reseeding. They are summarized as follows (with comment on how this would apply at Mulilo Sonnedix Prieska PV in square brackets):

- When there are few or no palatable plants left in the veld it would be necessary to reseed. [At Hoekplaas this may be necessary in cleared or highly disturbed areas]
- Sowing of veld is expensive and it is therefore important to select species (locally indigenous) that are suitable for the local soil and climate. [A qualified restoration practitioner should be appointed to identify suitable local species and implement a reseeding programme if required].
- The best time to collect seed varies with plant species but is usually 6 to 8 weeks after a major spring or autumn rainfall event. [Seed collection timing is vitally important to obtain an optimal seed mix.]
- Seeds can be picked by hand or sucked up with a modified vacuum cleaner. The seeds should be kept completely dry in hessian bags and stored in a cool, dry place. Seeds should be sown within a year of collection. [Only seed from local sources should be used at Hoekplaas. No foreign grass species e.g. commercially available *Eragrostis curvula* should be introduced.]
- The timing of sowing is important. If seed is sown many weeks before rain falls it will be eaten by ants and birds or will die in the hot sun. Ideally fresh seed should be sown just before rainstorms. Given the unpredictable nature of Karoo rainfall, this is hard to achieve. [This would be the ideal at Hoekplaas but probably not a practical solution].

- Partly cleared and reseeded areas should be protected from grazing for at least three years to allow the new seedlings to establish and release their first seeds. [It would be imperative to exclude livestock from any areas where rehabilitation is underway].

9.2.2 Minimal intervention approach

An alternative approach which may be suitable for some areas at Hoekplaas would be a 'minimal intervention' approach. In this case there would be no active re-seeding or re-vegetation but only preparation of the soil as described above. In this approach, which is much less labour intensive and less costly, reliance is placed on the natural colonization of disturbed areas by plant species in adjacent undisturbed areas. The negative side to this approach would be that restoration which is already a long-term process would take even longer. The minimum intervention approach would also necessitate careful monitoring to ensure that undesirable species such as kraalbos do not dominate and oust other more desirable plant species.

It is possible with the minimal intervention approach at Hoekplaas that grasses, particularly *Stipagrostis* spp., would rapidly colonize disturbed areas that have been ripped and de-compacted. These grasses would produce organic matter or mulch which would then promote growth of perennial shrubs in a natural succession process.

9.2.3 Erosion

Questions around erosion are closely linked to cover over the soil. The topography at Hoekplaas in the PV1 construction area is relatively even with not a great deal of relief. Erosion from both wind and water is, however, highly likely on disturbed areas. The objective would be to minimize water run-off and wind-blown dust. Specific interventions such as the use of geotextile 'sausages' or 'brush traps' may be necessary to curb runoff. Such interventions would only be determined in the event of being necessary and should be determined by the ECO on site during and after the construction phase.

10. Recommendations

Some general restoration principles for Karoo ecosystems are applicable at Hoekplaas and some interventions specific to the Hoekplaas PV construction areas would be necessary. The following recommendations apply to Hoekplaas and may be considered to be the "rehabilitation plan".

- Construction and "No Go" green areas or corridors are to be carefully marked.
- Vehicles to remain on designated tracks and roads and may not enter "No Go" green areas.
- Vegetation should not be uprooted as far as possible.
- All vegetation that is removed (uprooted) should be stockpiled at a suitable site where it can be stored until required for restoration purposes. The same would apply for any brush-cut material.
- No herbicides should be used for clearing. The only time herbicides should be used is for control of alien invasive plant species e.g. mesquite.
- Cleared areas must be continuously monitored to invasion by undesirable species such as *Prosopis glandulosa var. torreyana* (mesquite), *Galenia africana* (kraalbos) and *Pennisetum setaceum* (fountain grass) or any other species that may appear to be negatively invasive.
- Alien invasive species should be eradicated using mechanical means and where appropriate herbicide to ensure no coppicing (re-sprouting).
- Any plants of protected species that can be relocated e.g. *Aloe claviflora* should be identified before or at least during any clearing operation and relocated to similar habitat that will not be disturbed. (A permit would be required).
- A permit would be required to remove any protected tree species, notably *Boscia albitrunca*, if encountered in the construction area.
- Post-construction restoration should include de-compaction of soil by ripping; application of gypsum if necessary and mulching using chipped plant material from stockpiles. Mulch or other dry plant material such as brush or grass reduces the force of raindrops and diminishes clay dispersion in the soil.

- Pitter basins would be advocated to promote water retention from rain and germination of seeds.
- Re-seeding should only be considered if sufficient seed can be obtained locally. This would be time-consuming and costly and therefore as an initial approach a 'minimum intervention' method should be employed once the soil has been prepared. If obtainable, locally sourced grass could be used as mulch to promote germination of seeds of perennial shrubs.
- A minimum intervention approach may be too slow at Mulilo Sonnedix Prieska PV and therefore it is recommended that mulching and re-seeding should be applied as a basic requirement. It will be essential that locally sourced seed is used.

11. Conclusions

The environment into which the Hoekplaas Solar Project (PV1) will be installed is karroid and arid with low "bossieveld" vegetation. The vegetation is not sensitive on a broad scale due to being extensively distributed. However, at a local small scale the impact of clearing vegetation is predicted to have marked and long-lasting effects. Apart from information available for rangeland management (i.e. grazing management) and restoration of veld after poor land husbandry (see Esler *et al*. 2006) there is virtually no information available for restoration of sites cleared for construction of solar installations or similar infrastructure. Such installations are a relatively new phenomenon in South Africa and particularly Karoo ecosystems and their short to long-term environmental effects have yet to be documented. Consequently the recommendations presented in this 'vegetation rehabilitation plan' are based on restorative agricultural practices and the author's own field observations.

There is no "quick-fix" in Karoo ecosystems as far as restoration of vegetation cover and ecological processes are concerned. Cover will return to disturbed areas slowly once construction is completed and only after several years would it be possible to consider those areas to be adequately restored.

The solar plant developer has expressed the intention to apply a "light-on-land" approach which would attempt to make the installation of solar panels

compatible with good veld management practices. This approach is encouraged and commended and together with adequate post-construction rehabilitation should result in vegetation in at least an **intermediate** to **good** state in a few years after construction.

The construction of solar installations such as that envisaged at Mulilo Sonnedix Prieska PV provide a good opportunity to test various restoration methods and that opportunity should be used to inform future operations of this nature.

12. References

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McDonald, D.J. 2013. Botanical Assessment of the proposed solar energy installations at Hoekplaas RE/146, near Copperton, Northern Cape Province. Unpublished report for Aurecon SA (Pty) Ltd.

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Shearing, D. 2008*. Karoo. South African Wild Flower Guide 6* (Third impression). Botanical Society of South Africa, Cape Town.

APPENDIX D

SITE CLEARING PLAN

Prieska 75 MW Site clearing plan

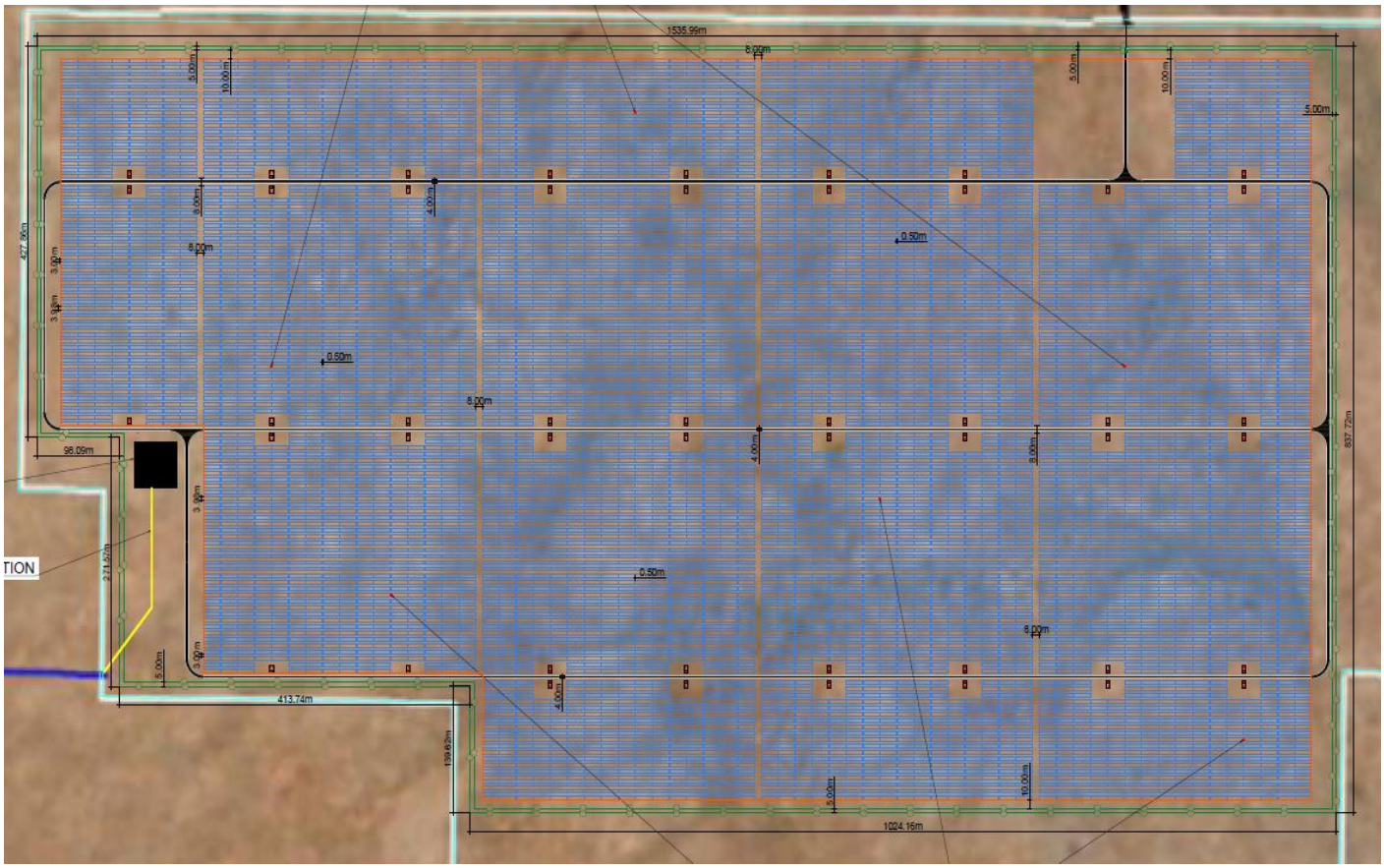

Figure 1: The Prieska PV 3 site layout plan.

- The entire construction area, as marked within the green line above and representing the fence line, will be cordoned off with barrier tape or barrier fencing.
- The perimeter area representing the fence line (green) will be brush- cut using a tractor and mower, or cut by hand to remove any low growing scrub. Since the scrub is brittle in most instances, this is likely to be done using a method, mechanical or other, that will leave the roots in-situ. These plant roots will remain in-situ, unless these must be removed in order for the fencing activities to take place.
- The cleared vegetation will be stockpiled to be used in rehabilitation activities post-construction and is not to be removed from the site.
- No chemicals will be used in any of the vegetation clearing operations, unless the alien invasive mesquite (*Prosopis glandulosus)* are encountered. These will be cut and stump treated in order to prevent coppicing.
- The entire area within the green boundary will not be cleared using bulldozer or grader. Strips of 3m will be cleared, leaving alternating strips of 3.98m for where the modules will be placed as indicated in figure 2. Trenching for cabling will take place within the 3m cleared area (Figure 2 & 3).

Figure 2: A= Fence line clearing; B= 3m cleared strip; C= 3.98m vegetation strip.

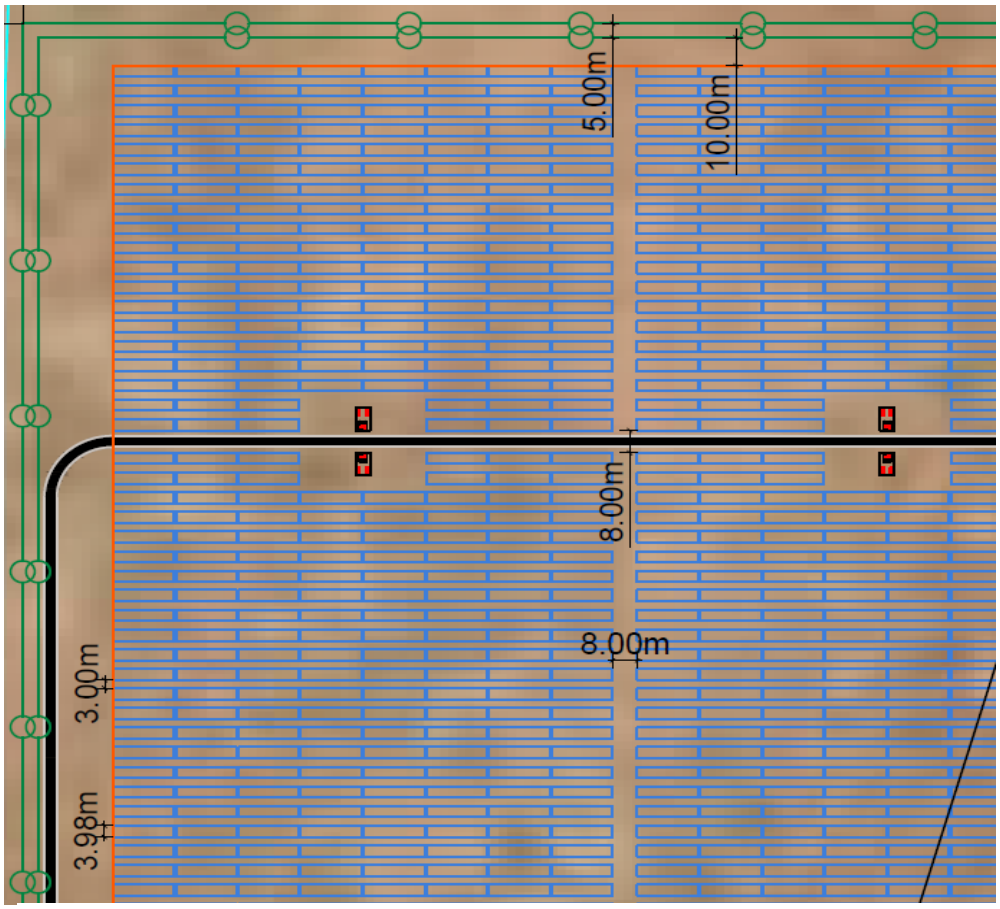

Figure 3: The expanded construction area, indicating the strips of 3 m that will be cleared between modules and strips of 3.98m where the vegetation will remain in-situ.

- Clearing will take in a systematic manner as construction progresses. All efforts will be made to clear the smallest areas needed and not to clear areas unless specifically needed.
- In the 3.98m area where the modules will be installed, wheel loaders and hydraulic pallet lifters will be traveling between 15-20 times to deliver panels and other equipment. Although these areas will not be cleared initially, the trampling of vegetation may be severe in instances and may be completely destroyed. Deliveries of equipment will be encouraged to use the 3m strip between the arrays in order to reduce the trampling.
- Should areas of hardpan, rock or calcrete exist within the construction area that pose a problem to construction, these areas will be demarcated and these areas alone will be removed or levelled using bulldozer or grader. Access for these machines will be along the cleared 8m access roads or existing tracks only.
- Existing tracks will be used where possible but where new tracks / roads are constructed these must have water-bars to prevent rapid runoff of water.
- The primary access roads within the construction area of 8m width will be cleared completely using bulldozer and scraper. These roads will have water- bars to prevent accelerated erosion (figure 2).
- No person shall be permitted allowed to kill any fauna that may be encountered during the clearing of vegetation. Any fauna encountered shall be safely relocated to areas where they do not pose a risk.
- A walk through and rescue shall take place before vegetation clearing to remove any slow moving fauna ie. tortoises.
- On cleared areas where wind or water erosion is potentially a problem, erosion control measures will be instituted. This will be done in consultation with the Environmental Officer.

APPENDIX E

EROSION MANAGEMENT PLAN

EROSION MANAGEMENT PLAN

Anticipated Erosion Impacts

Excessive erosion can lead to land degradation and the reduction of the area's carrying capacity. It is therefore of importance to implement an erosion management plan during the lifespan of the project.

Soil Erosion Mitigation Measures

The following mitigation measures should be implemented:

- Clearing activities shall be kept to a minimum and must only be undertaken during agreed working times, as well as permitted weather conditions. If heavy rains are expected clearing activities shall be put on hold. In this regard, the contractor must be aware of weather forecasts.
- The further unnecessary removal of groundcover vegetation from slopes shall not be allowed, especially on steep slopes. Following the clearing of an area, the surfaces of all exposed slopes shall be roughened to retain water and increase infiltration (especially important during the wet season). Any steep or large embankments that are expected to be exposed during the 'rainy' months shall either be armoured with fascine like structures or vegetated[1].
- If a cleared area is not going to be built on immediately, the top layer (300 mm) of soil shall be removed and stockpiled in a designated area approved by the ECO. Vegetation shall be stripped in a sequential manner as the work proceeds so as to reduce the time that stripped areas are exposed to the elements. Top-soiling and re-vegetation shall start immediately after the completion of an activity and at an agreed distance behind any particular work front.
- Existing farm roads must be used as far as possible, while the additional creation of access roads shall be kept to a minimum.
- Storm water control and wind screening shall be undertaken to prevent soil loss from the site. All embankments shall be protected by a cut off drain to prevent water from running down the face of the embankment, resulting in soil erosion. Typical erosion control measures such as the installation of silt fences, hay bales, EcoLogsTM and Bio JuteTM are recommended if erosion problems are noted during construction and operation phases.

To mitigate soil erosion and an increased loading of suspended solids the following measures should be taken, both as erosion prevention and control measure:

- Straw barriers should be installed in drainage paths to act as a check dam, i.e. to reduce velocity, and as a sediment trap during construction (Figure 1). Suspended solids carried by overland flow will be intercepted. These are erosion barriers placed at intervals of 25-50 m apart in the drainage paths which will intercept suspended solids from entering the natural drainage paths.

[1] A fascine structure usually consists of natural wood material and is used for the strengthening earthen structures or embankments.

- Packed stone (also known as rip-rap) must be placed as liners for channel spines. These comprise packed stones with an average diameter of 100 mm, packed in the channels as lining material to control flow velocities and hence erosion.
- Earth cut-off channels at boundaries of the facility. These will assist in directing flow away from the site and reduce the possibility of flooding from runoff origination from outside the site.
- Provide erosion protection at channel outfalls and positions of high flow concentration. These comprise packed stones with an average diameter of 200 mm, packed in the drainage path to control flow velocities and hence erosion.

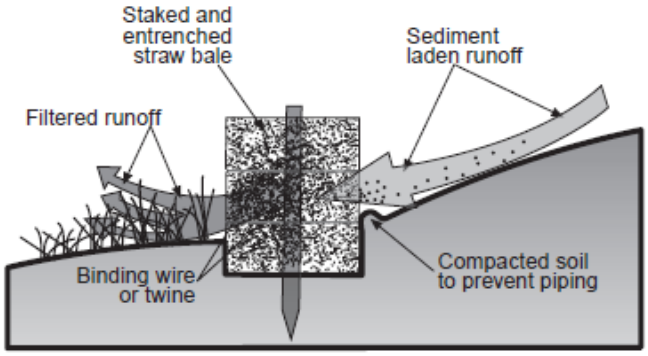

Figure 1 | Cross-sectional view of an installed straw bale

The sediment and erosion control measures should remain in place until construction is complete. The above noted sediment traps will require regular monitoring during construction and reinstatement as necessary.

Soil Erosion Monitoring

Soil erosion shall be monitored visually by the appointed ECO:

- Areas around roads, stockpiles and PV panels shall be visually monitored during audits.
- A photographic record of the on-site conditions shall be kept to aid in the identification of erosion problems.
- Signs of rill and gully erosion shall be remediated as soon as possible. Typical remediation techniques are provided below.

APPENDIX F

ENVIRONMENTAL AUTHORISATIONS AND MITIGATION MEASURES APPROVED DURING EIA

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Fedsure Building · 315 Pretorius Street · PRETORIA
Tel (+ 27 12) 310 3911 · Fax (+ 2712) 322 2682

NEAS Reference: DEAT/EIA/0000605/2011
DEA Reference: 12/12/20/2503
Enquiries: Ms Thulisile Nyalunga
Telephone: 012-310-3249**Fax:** 012-320-7539 **E-mail:** TNyalunga@environment.gov.za

Mr Warren Morse
Mulilo Sonnedix Prieska PV (Pty) Ltd
P.O. Box 50
CAPE TOWN INTERNATIONAL AIRPORT
7525

Tel: (021) 934 5268
Fax: (021) 935 0505
Cell: 083 760 9586
E-mail: warren@mulilo.com

PER FACSIMILE / MAIL

Dear Mr Morse

APPLICATION FOR ENVIRONMENTAL AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998: GN R.543, R.544, R.545 AND R.546: CONSTRUCTION OF A 100MW PHOTOVOLTAIC SOLAR ENERGY FACILITY (PV3) ON THE FARM HOEKPLAAS (REMAINDER OF FARM 146) NEAR COPPERTON, NORTHERN CAPE PROVINCE

With reference to the above application, please be advised that the Department has decided to accept the Final Environmental Impact Report (FEIR) dated April 2012 and grant authorisation. The environmental authorisation (EA) and reasons for the decision are attached herewith.

In terms of regulation 10(2) of the Environmental Impact Assessment Regulations, 2010 (the Regulations), you are instructed to notify all registered interested and affected parties, in writing and within 12 (twelve) days of the date of the EA, of the Department's decision in respect of your application as well as the provisions regarding the submission of appeals that are contained in the Regulations.

Your attention is drawn to Chapter 7 of the Regulations, which prescribes the appeal procedure to be followed. This procedure is summarised in the attached document. Kindly include a copy of this document with the letter of notification to interested and affected parties.

Should the applicant or any other party wish to appeal any aspect of the decision a notice of intention to appeal must be lodged by all prospective appellants with the Minister, within 20 days of the date of the EA, by means of one of the following methods:

By facsimile: 012 320 7561;
By post: Private Bag X447,
Pretoria, 0001; or

By hand: 2nd Floor, Fedsure Building, North Tower,
Cnr. Lilian Ngoyi (Van der Walt) and Pretorius Streets,
Pretoria.

If the applicant wishes to lodge an appeal, it must also serve a copy of the notice of intention to appeal on all registered interested and affected parties as well as a notice indicating where, and for what period, the appeal submission will be available for inspection, should you intend to submit an appeal.

Please include the Department *(Attention: Director: Integrated Environmental Authorisations)* in the list of interested and affected parties, notified through your notification letter to interested and affected parties, for record purposes.

Appeals must be submitted in writing to:

Mr T Zwane, Senior Legal Administration Officer (Appeals), of this Department at the above mentioned addresses or fax number. Mr Zwane can also be contacted at:

Tel: 012-310-3929
Email: tzwane@environment.gov.za

The authorised activities shall not commence within twenty (20) days of the date of signature of the authorisation. Further, please note that the Minister may, on receipt of appeals against the authorisation or conditions thereof suspend the authorisation pending the outcome of the appeals procedure.

Yours sincerely

Mr Mark Gordon
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Date: 21/01/2013

CC:	Ms F Greese	Aurecon South Africa (Pty) Ltd	Tel: 021 526 6071	Fax: 086 667 3532
	Ms A Yaphi	DEA&NC	Tel: 054 332 2885	Fax: 054 331 1155
	Mr G Bessies	Siyathemba Local Municipality	Tel: 053 353 5300	Fax: 053 353 1386
	Mr T Zwane	Appeals Authority (DEA)	Tel: 012-310-3929	Fax: 012-320-7561
	Mr S Malaza	Compliance Monitoring (DEA)	Tel: 012-310-3397	Fax: 012-320-5744

APPEALS PROCEDURE IN TERMS OF CHAPTER 7 OF THE NEMA EIA REGULATIONS, 2010 (THE REGULATIONS) AS PER GN R. 543 OF 2010 TO BE FOLLOWED BY THE APPLICANT AND INTERESTED AND AFFECTED PARTIES UPON RECEIPT OF NOTIFICATION OF AN ENVIRONMENTAL AUTHORISATION (EA)

APPLICANT	INTERESTED AND AFFECTED PARTIES (IAPs)
1. Receive EA from the relevant Competent Authority (the Department of Environmental Affairs [DEA]).	1. Receive EA from Applicant/Consultant.
2. Within 12 days of date of the EA notify all IAPs of the EA and draw their attention to their right to appeal against the EA in terms of Chapter 7 of the Regulations.	2. N/A.
3. If you want to appeal against the EA, submit a notice of intention to appeal within 20 days of the date of the EA with the Minister of Water and Environmental Affairs (the Minister).	3. If you want to appeal against the EA, submit a notice of intention to appeal within 20 days of the date of the EA. with the Minister of Water and Environmental Affairs (the Minister).
4. After having submitted your notice of intention to appeal to the Minister, provide each registered IAP with a copy of the notice of intention to appeal within 10 days of lodging the notice.	4. After having submitted your notice of intention to appeal to the Minister, provide the applicant with a copy of the notice of intention to appeal within 10 days of lodging the notice.
5. The Applicant must also serve on each IAP: • a notice indicating where and for what period the appeal submission will be available for inspection.	5. Appellant must also serve on the Applicant within 10 days of lodging the notice, • a notice indicating where and for what period the appeal submission will be available for inspection by the applicant.
6. The appeal must be submitted in writing to the Minister within 30 days after the lapsing of the period of 20 days provided for the lodging of the notice of intention to appeal.	6. The appeal must be submitted to the Minister within 30 days after the lapsing of the period of 20 days provided for the lodging of the notice of intention to appeal.
7. Any IAP who received a notice of intention to appeal may submit a responding statement to that appeal to the Minister within 30 days from the date that the appeal submission was lodged with the Minister.	7. An Applicant who received notice of intention to may submit a responding statement to the appeal to the Minister within 30 days from the date that the appeal submission was lodged with the Minister.

NOTES:

1. **An appeal against a decision must be lodged with:-**
   a) the Minister of Water and Environmental Affairs if the decision was issued by the Director- General of the Department of Environmental Affairs (or another official) acting in his/ her capacity as the delegated Competent Authority;
   b) the Minister of Justice and Constitutional Development if the applicant is the Department of Water Affairs and the decision was issued by the Director- General of the Department of Environmental Affairs (or another official) acting in his/ her capacity as the delegated Competent Authority;

2. **An appeal lodged with:-**
   a) the Minister of Water and Environmental Affairs must be submitted to the Department of Environmental Affairs;
   b) the Minister of Justice and Constitutional Development must be submitted to the Department of Environmental Affairs;

3. **An appeal must be:-**
   a) submitted in writing;
   b) accompanied by:
   - a statement setting out the grounds of appeal;
   - supporting documentation which is referred to in the appeal; and
   - a statement that the appellant has complied with regulation 62 (2) or (3) together with copies of the notices referred to in regulation 62.

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Environmental Authorisation

In terms of regulation 36 of the Environmental Impact Assessment Regulations, 2010

Construction of a 100MW Photovoltaic (PV) Solar Energy facility (PV3) near Copperton, Northern Cape Province

Pixley ka Seme District Municipality

Authorisation register number:	*12/12/20/2503*
NEAS reference number:	*DEAT/EIA/0000605/2011*
Last amended:	*First issue*
Holder of authorisation:	*Mulilo Sonnedix Prieska PV (Pty) Ltd*
Location of activity:	*NORTHERN CAPE PROVINCE: Within the Siyathemba Local Municipality*

This authorisation does not negate the holder of the authorisation's responsibility to comply with any other statutory requirements that may be applicable to the undertaking of the activity.

Decision

The Department is satisfied, on the basis of information available to it and subject to compliance with the conditions of this environmental authorisation, that the applicant should be authorised to undertake the activities specified below.

Non-compliance with a condition of this authorisation may result in criminal prosecution or other actions provided for in the National Environmental Management Act, 1998 and the EIA regulations.

Details regarding the basis on which the Department reached this decision are set out in Annexure 1.

Activities authorised

By virtue of the powers conferred on it by the National Environmental Management Act, 1998 (Act 107 of 1998) and the Environmental Impact Assessment Regulations, 2010 the Department hereby authorises –

MULILO SONNEDIX PRIESKA PV (PTY) LTD

with the following contact details –

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to undertake the following activities (hereafter referred to as "the activity") indicated in Listing Notices 1, 2 and 3 (GN R. 544, 545 & 546):

Listed activities	**Activity/Project description**
GN R. 544 Item 10: *The construction of facilities or infrastructure for the transmission and distribution of electricity -* *(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.*	A 132kV distribution line would be required to connect into Eskom's Kronos Sub-station.
GN R. 545 Item 1: *The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.*	Construction of a 100MW PV solar energy plant on 300 ha of the farm Hoekplaas (Remainder of Farm 146) near Copperton in the Northern Cape.
GN R. 546 Item 14: *The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetation cover constitutes indigenous vegetation:* ***(a) In Northern Cape*** *(i) All areas outside urban areas.*	Removal of vegetation will be required during the construction phase.

as described in the Environmental Impact Report (EIR) dated April 2012. The corner point co-ordinates of the site are:

Latitude	Longitude
29°58'43.68"S	22° 21'16.92"E
29° 59'04.59"S	22° 22'16.82"E
29° 59'30.82"S	22° 21'59.56"E
30° 01'18.98"S	22° 23'39.46"E
30° 02'21.57"S	22° 21'38.66"E
30° 00"38.61"S	22° 19'45.22"E

- for the construction of a 100MW Photovoltaic (PV) Solar Energy Facility on the farm Hoekplaas (Remainder of Farm 146) near Copperton within the Siyathemba Local Municipality in the Northern Cape Province, hereafter referred to as "the property".

The infrastructure associated with this facility includes:

- Upgrade of existing internal farm roads and construction of new roads to accommodate the construction vehicles and access the site.
- Construction of a 132 kV transmission line, approximately 1.5 km in length, to connect the proposed PV plant with Eskom's grid via the Kronos Substation.
- Other infrastructure includes an office, electric fencing, connection centre and a guard cabin.

Conditions of this Environmental Authorisation

Scope of authorisation

1. The preferred site alternative on the farm Hoekplaas (Remainder of Farm No. 146) near Copperton in the Northern Cape is approved.
2. Authorisation of the activity is subject to the conditions contained in this authorisation, which form part of the environmental authorisation and are binding on the holder of the authorisation.
3. The holder of the authorisation is responsible for ensuring compliance with the conditions contained in this environmental authorisation. This includes any person acting on the holder's behalf, including but not limited to, an agent, servant, contractor, sub-contractor, employee, consultant or person rendering a service to the holder of the authorisation.
4. The activities authorised may only be carried out at the property as described above.
5. Any changes to, or deviations from, the project description set out in this authorisation must be approved, in writing, by the Department before such changes or deviations may be effected. In assessing whether to grant such approval or not, the Department may request such information as it deems necessary to evaluate the significance and impacts of such changes or deviations and it may be necessary for the holder of the authorisation to apply for further authorisation in terms of the regulations.
6. This activity must commence within a period of three (3) years from the date of issue of this authorisation. If commencement of the activity does not occur within that period, the authorisation

lapses and a new application for environmental authorisation must be made in order for the activity to be undertaken.

7. Commencement with one activity listed in terms of this authorisation constitutes commencement of all authorised activities.
8. The holder of an environmental authorisation must notify the competent authority of any alienation, transfer and change of ownership rights in the property on which the activity is to take place.

Notification of authorisation and right to appeal

9. The holder of the authorisation must notify every registered interested and affected party, in writing and within 12 (twelve) calendar days of the date of this environmental authorisation, of the decision to authorise the activity.
10. The notification referred to must –
    10.1. specify the date on which the authorisation was issued;
    10.2. inform the interested and affected party of the appeal procedure provided for in Chapter 7 of the Environmental Impact Assessment (EIA) Regulations, 2010;
    10.3. advise the interested and affected party that a copy of the authorisation will be furnished on request; and
    10.4. give the reasons of the competent authority for the decision.
11. The holder of the authorisation must publish a notice –
    11.1. informing interested and affected parties of the decision;
    11.2. informing interested and affected parties where the decision can be accessed; and
    11.3. drawing the attention of interested and affected parties to the fact that an appeal may be lodged against this decision in the newspaper(s) contemplated and used in terms of regulation 54(2)(c) and (d) and which newspaper was used for the placing of advertisements as part of the public participation process.

Management of the activity

12. A copy of the final development layout map must be submitted to the Department for written approval prior to commencement of the activity. All available biodiversity information must be used in the finalisation of the layout map. Existing infrastructure must be used as far as possible e.g. roads. The layout map must indicate the following:
    12.1 Position of solar facilities and its associated infrastructure;

12.2 Foundation footprint;

12.3 Internal roads indicating width (construction period width and operation period width) and with numbered sections between the other site elements which they serve (to make commenting on sections possible);

12.4 Wetlands, drainage lines, rivers, stream and water crossing of roads and cables indicating the type of bridging structures that will be used;

12.5 All sensitive features e.g. the Martial Eagle nest site, heritage sites, wetlands, pans and drainage channels that will be affected by the facility and associated infrastructure;

12.6 Sub-station(s) inverters and/or transformer(s) sites including their entire footprint;

12.7 Connection routes (including pylon positions) to the distribution/transmission network;

12.8 All existing infrastructure on the site, especially roads;

12.9 Buildings, including accommodation; and

12.10 All "no-go" and buffer areas.

13. The Environmental Management Programme (EMPr) submitted as part of the EIR dated April 2012 is not approved and must be amended to include measures as dictated by the final site lay-out map and micro-siting; and the provisions of this environmental authorisation. The EMPr must be submitted to the Department for written approval prior to commencement of the activity. Once approved the EMPr must be implemented and adhered to.

14. The EMPr is amendable and must be implemented and strictly enforced during all phases of the project. It shall be seen as a dynamic document and shall be included in all contract documentation for all phases of the development when approved.

15. Changes to the EMPr, which are environmentally defendable, shall be submitted to this Department for acceptance before such changes could be effected.

16. The Department reserves the right to amend the EMPr should any impacts that were not anticipated or covered in the EIR dated April 2012 be discovered.

17. The provisions of the approved EMPr including recommendations and mitigation measures in the EIR dated April 2012 and specialist' studies shall be an extension of the conditions of this EA and therefore noncompliance with them would constitute noncompliance with the EA.

18. The EMPr amendment must include the following:

18.1 All recommendations and mitigation measures recorded in the EIR dated April 2012.

18.2 The requirements and conditions of this authorisation.

18.3 The final site layout map.

18.4 An alien invasive management plan to be implemented during construction and operation of the facility. The plan must include mitigation measures to reduce the invasion of alien

species and ensure that the continuous monitoring and removal of alien species is undertaken.

18.5 A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed. This plan must be compiled by a vegetation specialist familiar with the site in consultation with the ECO and be implemented prior to commencement of the construction phase.

18.6 A re-vegetation and habitat rehabilitation plan to be implemented during the construction and operation of the facility. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.

18.7 A traffic management plan for the site access roads to ensure that no hazards would results from the increased truck traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters e.g. limiting construction vehicles travelling on public roadways during the morning and late afternoon commute time and avoid using roads through densely populated built-up areas so as not to disturb existing retail and commercial operations.

18.8 A storm water management plan to be implemented during the construction and operation of the facility. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. Drainage measures must promote the dissipation of storm water run-off.

18.9 An erosion management plan for monitoring and rehabilitating erosion events associated with the facility. Appropriate erosion mitigation must form part of this plan to prevent and reduce the risk of any potential erosion.

18.10 An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems.

18.11 Measures to protect hydrological features such as streams, rivers, pans, wetlands, dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.

18.12 An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.

18.13 A map combining the final layout map superimposed (overlain) on the environmental sensitivity map. This map must reflect the proposed location of PV as stated in the EIR dated April 2012 and this authorisation.

Environmental Control Officer (ECO) and duties

19. The holder of this authorisation must appoint a suitably experienced independent Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the conditions referred to in this authorisation are implemented and to ensure compliance with the provisions of the EMPr.
20. The ECO shall be appointed before commencement of any authorised activity.
21. Once appointed, the name and contact details of the ECO must be submitted to the Director: Compliance Monitoring of the Department.
22. The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is ready for operation.
23. The ECO must:
    - 23.1 Keep record of all activities on site, problems identified, transgressions noted and a schedule of tasks undertaken by the ECO.
    - 23.2 Keep and maintain a detailed incident (including spillage of bitumen, fuels, chemicals, or any other material) and complaint register on site indicating how these issues were addressed, what rehabilitation measures were taken and what preventative measures were implemented to avoid re-occurrence of incidents/complaints.
    - 23.3 Keep and maintain a daily site diary.
    - 23.4 Keep copies of all reports submitted to the Department.
    - 23.5 Keep and maintain a schedule of current site activities including the monitoring of such activities.
    - 23.6 Obtain and keep record of all documentation, permits, licences and authorisations required by this facility.
    - 23.7 Compile a monthly monitoring report.

Environmental audit report

24. The holder of the authorisation must submit an environmental audit report to the *Director: Compliance Monitoring* of the Department within 30 days of completion of the construction phase (i.e. within 30 days of site handover) and within 30 days of completion of rehabilitation activities.
25. The environmental audit report must:
    - 25.1 Be compiled by an independent environmental auditor;
    - 25.2 Indicate the date of the audit, the name of the auditor and the outcome of the audit;
    - 25.3 Evaluate compliance with the requirements of the approved EMPr and this environmental authorisation;
    - 25.4 Include measures to be implemented to attend to any non-compliances or degradation noted;
    - 25.5 Include copies of any approvals granted by other authorities relevant to the development for the reporting period;
    - 25.6 Highlight any outstanding environmental issues that must be addressed, along with recommendations for ensuring these issues are appropriately addressed;
    - 25.7 Include a copy of this authorisation and the approved EMPr.
    - 25.8 Include all documentation pertaining to this authorisation.
    - 25.9 Include evidence of adherence to the conditions of this authorisation and the EMPr where relevant such as training records and attendance records.

Commencement of the activity

26. The authorised activity shall not commence within twenty (20) days of the date of signature of the authorisation.
27. An appeal under section 43 of the National Environmental Management Act (NEMA), Act 107 of 1998 (as amended), does not suspend an environmental authorisation or exemption, or any provisions or conditions attached thereto, or any directive, unless the Minister, MEC or delegated organ of state directs otherwise.
28. Should you be notified by the Minister of a suspension of the authorisation pending appeal procedures, you may not commence with the activity until such time that the Minister allows you to commence with such an activity in writing.

Notification to authorities

29. Fourteen (14) days written notice must be given to the Department that the activity will commence. Commencement for the purposes of this condition includes site preparation. The notice must include a date on which it is anticipated that the activity will commence, as well as a reference number. This notification period may coincide with the Notice of Intent to Appeal period.

Operation of the activity

30. Fourteen (14) days written notice must be given to the Department that the activity operational phase will commence.

Site closure and decommissioning

31. Should the activity ever cease or become redundant, the holder of this authorisation shall undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered by any relevant and competent authority at that time.

Specific conditions

32. A 12 months pre- and post-construction avifauna monitoring programme must be implemented to document the effect of the operation of the PV solar facility on avifauna. The monitoring programme must be in terms of the methodology as recommended on pages 19-20 of the Avifauna Impact Assessment Report which forms part of the EIA dated April 2012.
33. The results of the pre- and post-construction avifauna monitoring programme must inform the final layout and the construction schedule of the PV solar facility.
34. Reports regarding bird monitoring must be submitted to the Northern Cape Department of Environment and Nature Conservation (DENC), BirdLife South Africa, the Endangered Wildlife Trust (EWT) and this Department on a quarterly basis. The report will assist all stakeholders in identifying potential and additional mitigation measures and to establish protocols for bird monitoring programmes for PV solar energy development in the country.

35. A 1 km radius buffer must be implemented around any occupied and active Martial Eagle nest within which there must be no development or disturbance associated with either of the proposed PV plants. This buffer area must remain undisturbed and undeveloped.
36. Anti-collision devices such as bird flappers must be installed where powerline crosses avifaunal corridors, as recommended by the avifaunal specialist. The input of an avifaunal specialist must be obtained for the fitting of the anti-collision devices onto specific sections of the line once the exact positions of the towers have been surveyed and pegged.
37. Transmission lines must stay at least 100m away from the edge of any pans.
38. The holder of this authorisation must obtain a Water Use Licence from the Department of Water Affairs (DWA) prior to the commencement of the project should the applicant impact on any wetland or water resource. A copy of the license must be kept by the ECO on site.
39. No exotic plants may be used for rehabilitation purposes. Only indigenous plants of the area may be utilised.
40. The holder of the authorisation must consult a lighting engineer to assist in the planning and placement of light fixtures in order to reduce the impacts associated with glare and light trespass.
41. An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling, re-use and disposal where appropriate. Any solid waste shall be disposed of at a landfill licensed in terms of section 20 (b) of the National Environment Management Waste Act, 2008 (Act No. 59 of 2008). Copies of all waste disposal certificates must be kept on site.
42. Vegetation clearing must be limited to the required footprint. Mitigation measures must be implemented to reduce the risk of erosion and the invasion of alien species.
43. Before the clearing of the site, the appropriate permits must be obtained from the Department of Agriculture, Forestry and Fisheries (DAFF) for the removal of plants listed in the National Forest Act 87 of 1998 and from the relevant provincial department for the destruction of species protected in terms of the specific provincial legislation.
44. Cleared alien vegetation must not be dumped on adjacent intact vegetation during clearing but should be temporarily stored in a demarcated area.
45. Removal of alien invasive species or other vegetation and follow-up procedures must be in accordance with the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983).
46. Any shrubs or trees of mesquite within 250 m of the boundary of the PV plant footprint and the power-line route must be eradicated by cutting and treating with herbicide to prevent coppicing.
47. A buffer zone of 50m must be maintained from the drainage areas and endorheic pans which have been identified as no-go area in the Aquatic Specialist Report dated January 2012.

48. The pan located at waypoint HP8 at the north end of the proposed solar plant must be avoided with no construction within 30 m of the 'ring' of tall shrubs fringing the pan.
49. Test excavations around the pan must be done to check for buried archaeological material (if development encroaches within 100 m of the pan margin but excluding for access roads);
50. The applicant must ensure that all the "No-go" areas are clearly demarcated (using fencing and appropriate signage) before construction commences.
51. Construction activities must be restricted to demarcated areas to restrict impact on vegetation, birds and animals. Contractors and construction workers must be clearly informed of the no-go areas.
52. Roads must be designed so that changes to surface water runoff are avoided and erosion is not initiated.
53. Should any archaeological sites, artefacts, paleontological fossils or graves be exposed during construction work, work in the immediate vicinity of the find must be stopped, the South African Heritage Resources Agency (SAHRA) must be informed and the services of an accredited heritage professional obtained for an assessment of the heritage resources must be made.
54. Appropriate dust suppression techniques must be implemented on all exposed surfaces to minimise and control airborne dust. Such measures must include wet suppression, chemical stabilization, the use of a wind fence, covering surfaces with straw chippings and re-vegetation of open areas.
55. Erosion and loss of soil must be prevented by minimizing the construction site exposed to surface water run-off. Where necessary erosion stabilizing actions such as gabions or re-vegetation must be implemented to prevent further habitat deterioration.
56. The holder of this authorisation must train safety representatives, managers and workers in workplace safety. All applicable safety standards and regulations, including for subcontractors must be enforced.
57. Potentials interference with public safety communication systems (e.g. radio traffic related to emergency activities) must be avoided.
58. The holder of the authorisation must ensure that any transmitters that are to be established or have been established at the site for the purposes of voice and data communication must comply with the relevant AGA regulations concerning the restriction of use of the radio frequency spectrum that applies in the area concern.
59. The holder of the authorisation must ensure that the construction and operation activities of the PV facility do not pose any significant impact to the Meerkat and or SKA facilities.
60. The holder of the authorisation must obtain a written permit or approval from the South Africa Civil Aviation Authority that the PV facility will not interfere with the performance of aerodrome radio

Communication, Navigation and Surveillance (CNS) equipment especially the radar prior to commencement of the activity.

61. The holder of the authorisation must obtain a written approval from the South African SKA Project Office (SASPO), confirming that the operation of the PV facility will not result in detrimental radio frequency interference to the SKA.
62. The holder of this authorisation must provide sanitation facilities within the construction camps and along the road so that workers do not pollute the surrounding environment. These facilities must be removed from the site when the construction phase is completed as well as associated waste to be disposed of at a registered waste disposal site.
63. The holder of this authorisation must take note that no temporary site camps will be allowed outside the footprint of the development area as the establishment of such structures might trigger a listed activity as defined in the Environmental Impact Assessment Regulations, 2010.
64. The holder of this authorisations, contractors and sub-contractors working on site must ensure that oil, fuel and chemicals are confined to specific and secured areas throughout the construction period. These materials must be stored in a bunded area with adequate containment for potential spills and leaks.

General

65. A copy of this authorisation and the approved EMPr must be kept at the property where the activity will be undertaken. The environmental authorisation as well as any amendment to the environmental authorisation and approved EMPr must be provided to any authorised official of the Department who requests to see it and must be made available for inspection by any employee or agent of the holder of the environmental authorisation who works or undertakes work at the property.
66. The holder of the authorisation must notify both the *Director: Integrated Environmental Authorisations* and the *Director: Compliance Monitoring* at the Department, in writing and within 48 (forty eight) hours, if any condition of this authorisation cannot be or is not adhered to. Any notification in terms of this condition must be accompanied by reasons for the non-compliance.
67. National government, provincial government, local authorities or committees appointed in terms of the conditions of this authorisation or any other public authority shall not be held responsible for any damages or losses suffered by the holder or his successor in title in any instance where construction or operation subsequent to construction be temporarily or permanently stopped for

reasons of non-compliance by the holder with the conditions of authorisation as set out in this document or any other subsequent document emanating from these conditions of authorisation.

Date of environmental authorisation: 21/01/2013

Mr Mark Gordon

Chief Director: Integrated Environmental Authorisations

Department of Environmental Affairs

Annexure 1: Reasons for Decision

1. Information considered in making the decision

In reaching its decision, the Department took, *inter alia*, the following into consideration -

a) The information contained in the EIR dated April 2012;

b) The comments received from the Department of Water Affairs (DWA), the South African Heritage Resources Agency (SAHRA), the Department of Agriculture Forestry and Fisheries (DAFF), Eskom Holdings SOC Limited, the SKA South Africa and interested and affected parties as included in the EIR dated April 2012;

c) Mitigation measures as proposed in the EIR dated April 2012 and the EMPr;

d) The information contained in the specialist studies contained within Annexure C of the EIR;

e) The objectives and requirements of relevant legislation, policies and guidelines, including section 2 of the National Environmental Management Act, 1998 (Act 107 of 1998).

2. Key factors considered in making the decision

All information presented to the Department was taken into account in the Department's consideration of the application. A summary of the issues which, in the Department's view, were of the most significance is set out below.

a) The findings of all the specialist studies conducted and their recommended mitigation measures.

b) The need for the proposed project stems from the provision of electricity to the national grid in terms of the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) and the provision of electricity from Independent Power Producers (IPPs) as required by the Department of Energy.

c) The EIR dated April 2012 identified all legislation and guidelines that have been considered in the preparation of the EIR dated April 2012

d) The methodology used in assessing the potential impacts identified in the EIR dated April 2012 and the specialist studies have been adequately indicated.

e) A sufficient public participation process was undertaken and the applicant has satisfied the minimum requirements as prescribed in the EIA Regulations, 2010 for public involvement.

3. Findings

After consideration of the information and factors listed above, the Department made the following findings -

a) The identification and assessment of impacts are detailed in the EIR dated April 2012 and sufficient assessment of the key identified issues and impacts have been completed.

b) The procedure followed for impact assessment is adequate for the decision-making process.

c) The proposed mitigation of impacts identified and assessed adequately curtails the identified impacts.

d) EMPr measures for the pre-construction, construction and rehabilitation phases of the development were proposed and included in the EIR dated April 2012 and will be implemented to manage the identified environmental impacts during the construction process.

In view of the above, the Department is satisfied that, subject to compliance with the conditions contained in the environmental authorisation, the proposed activity will not conflict with the general objectives of integrated environmental management laid down in Chapter 5 of the National Environmental Management Act, 1998 and that any potentially detrimental environmental impacts resulting from the proposed activity can be mitigated to acceptable levels. The application is accordingly granted.

MITIGATION MEASURES APPROVED DURING EIA

CONSTRUCTION PHASE IMPACTS

Flora, avifauna and fauna impacts

- Compile and implement a vegetation rehabilitation plan with the aid of a rehabilitation specialist, for inclusion in the Construction EMP. The specialist is to recommend species to be used in rehabilitation as well as any special measures for rehabilitation such as shade-netting and alien vegetation removal;
- The construction phase should be closely monitored by an Environmental Control Officer who should identify any areas that would require rehabilitation in the post-construction phase. The restoration of those areas must follow the construction phase;
- Demarcate no-go areas identified during pre-construction monitoring;
- Low-lying depressions and watercourses should be avoided wherever possible;
- Shallow depressions and well defined pans should be avoided and buffered by at least 50 m;
- The pan located at waypoint at the north end of the proposed solar plant must be avoided with no construction within 50 m of the 'ring' of tall shrubs fringing the pan;
- The site should be cleared in sections as required for construction and not all at once; and
- The top 300 mm of the soil layer shall be stockpiled for rehabilitation purposes.

Sedimentation, erosion and aquatic ecology impacts

- Access roads should be positioned in such a way that no clearing within no-go areas should be necessary and definite drainage areas should be avoided;
- Should additional access roads be required, these will also have to be built with culverts to prevent the impediment of water movement;
- The use of erosion control measures to minimise erosion at excavation / clearing sites or aggregate storage sites is necessary and earth moving construction activities should take place in dry season as far as possible;
- Removal of perennial alien species such as P. glandulosa at sites disturbed or cleared by construction activities;
- Removal of perennial alien species such as P. glandulosa at sites disturbed or cleared by construction activities; and
- Construction of access roads should be designed for minimal impact. All construction should take place within the footprint of the proposed facility. Re-alignment of roads should not cross drainage lines.

Heritage resources (including palaeontology) impacts

- A 100 m buffer zone should be implemented from the edge of the pans for sites situated alongside the pans and for transmission lines;
- Test excavations around the pans should be done to check for buried archaeological material;

- If mitigation by avoiding sensitive archaeological sites is not feasible, sampling and recording of the archaeological site before its destruction must be undertaken; and
- In the event of accidental uncovering of graves or substantial fossil remains (e.g. vertebrate bones and teeth, large blocks of petrified wood), work must stop immediately and SAHRA should be notified. An archaeologist / palaeontologist should be involved to assist with the investigation and procedures to address the situation.

Impacts on local economy (employment) and social conditions

- Give preference to local communities for employment opportunities;
- Base recruitment on sound labour practices and with gender equality in mind; and
- Provide appropriate training, which would enable individuals to apply their skills to other construction and development projects in the region once construction is complete.

Visual impacts

- Minimise the construction period, where possible;
- Access road are to be kept tidy, and measures shall be taken to minimise dust from construction traffic on gravel roads;
- Top soil should be removed, conserved and used for rehabilitation;
- Site offices, if required, should be limited to single storey and they should be sited carefully using temporary screen fencing to screen from the wider landscape; and
- All site operatives should receive training in awareness of issues such as the use of hazardous chemical, proper disposal of waste, etc.

Transportation impacts

- Ensure that road junctions have good sightlines;
- Implement traffic control measures where necessary;
- Transport components overnight as far as possible; and
- Engage with the roads authorities prior to construction to ensure the necessary road upgrades, permits, traffic escorts etc. are scheduled.

Noise impacts

- Implement measures as provided in the EMP, which includes procedures for dealing with noise.

Storage of hazardous substances on site

- Implement measures as provided in the EMP, which inter alia specify the storage details of hazardous compounds and the emergency procedures to follow in the event of a spillage; and
- Comply with the various pieces of legislation controlling the use of hazardous substances at a construction site.

Dust impacts

- Implement measures as provided in the EMP, which includes procedures for dealing with dust pollution events including watering of roads, etc.

OPERATION PHASE IMPACTS

Botanical impacts

- A rehabilitation plan for the site should be compiled with the aid of a rehabilitation specialist and adhered to;
- Shallow depressions and well defined pans should be avoided, with buffer zones of at least 50 m around pans; and
- The botanically important pan specifically the pan shown on Figure 4.2)

Faunal impacts

- Small ground level openings, 20-30 cm in height, should be allowed for in the electrical fence to facilitate the movement of small mammals and reptiles through the site.

Avifaunal (bird) impacts

- Minimize the footprint of the development to the actual area required for the development;
- Minimize noise and disturbance associated with maintenance activities at the plant once it becomes operational;
- Relocate the Martial eagle nest structure to a pylon more than 1 km away in order to put greater distance between the resident eagles and the disturbance sources of the development. This would have to be done outside of the eagle and falcon breeding seasons (i.e. between December/January and February/March, and would involve deconstructing all affected nest structures in the area, and re-building at least one structure in a specially designed galvanized steel basket, and positioning this in the 'waist' area of a tower. Such an exercise would require the cooperation of Eskom, and the practical assistance of their live-line maintenance team, as well as active supervision by an experienced avian specialist at all times. However, if successful it would greatly reduce the potential impact of the proposed solar development, and would have the added benefit of removing the large eagle nest/s from locations above the conductors (where they could cause streamer-related outages) to safe positions below the conductors;
- Use bird-safe structures (ideally with critical air gaps greater than 2 m) for above-ground power lines that exclude birds physically from high risk areas of live infrastructure and comprehensively insulate such areas to avoid bird electrocution;
- Power lines and cables should be belowground. Where this is not possible, all new aboveground lines should be fitted with bird flight diverters. Mark above-ground lines for their entire length as there is currently insufficient data to indicate high risk areas. Recommendations from bird monitoring could indicate high risk areas to remain marked in the future. Where new lines run in parallel with existing, unmarked power lines, this approach has the added benefit of reducing the collision risk posed by the older line; and
- Instituting a comprehensive impact monitoring scheme, and using the results of this scheme to inform and refine a dynamic approach to mitigation.

Surface water impacts

- Monitor both soil chemistry and erosion and mitigate if required;

- Should soil chemistry be affected (this is likely to be an increase in salinity), the nature of the washing mixture could be changed, or acceptable waste treatment employed;
- Install composting toilets that does not require water, septic tanks or soak-aways;
- Channel runoff should be diverted in such a way as to minimise erosion and if necessary, soil stabilising techniques should be implemented in vulnerable areas;
- Removal of perennial alien species such as Prosopis glandulosa at sites disturbed or cleared, or where panel washing occurs;
- Stormwater channels and “mitre” chutes should be constructed to direct the stormwater flows and minimize and control erosion;
- Gravel roads should be graded and shaped with a 2 % crossfall back into the slope, allowing stormwater to be channelled in a controlled manor towards the natural drainage lines;
- Where roads intersect natural, defined drainage lines, suitably sized pipe culverts or drive through causeways should be installed or constructed;
- The minor storm design period should be used to determine the size of the earth channels. A return period of 1:5 years is applicable which approximates to an average intensity of 30 mm/hour; and
- The major storm occurrence (i.e. 1:25 year, 1:50 year & 1:100 year) should be used to calculate culverts in defined drainage lines and determine flood levels where necessary. The intensities for each occurrence are: 1:25 year – 46 mm/hour, 1:50 year – 53 mm/hour and 1:100 year – 61 mm/hour respectively.

Visual impacts

- Roads and hard-standings would be constructed as part of the works;
- The first 50-100 mm of naturally occurring substrate should be retained and then spread over finished areas;
- All excess material shall be removed off-site, and the ground shall be returned to original levels/gradients as far as possible;
- New structures should be placed where they are least visible to the greatest numbers of people, in places where the topography can offer shielding, where possible;
- Visibility of buildings and the local sub-station should be reduced by cladding the buildings in non-reflective colours and materials that will blend in with natural environment. E.g. cladding with local stone or plaster and paint with earthy tones for paint colours, roofs should be grey and non-reflective and doors and window frames should reference either the roof or wall colours;
- Finishing materials of the infrastructure (including support structures) should be of colours that are non-reflective and in dark matte colours such as dark grey or charcoal; and
- Information on the project should be provided to local people, such as through a poster at the entrance to the site.

Impacts on local economy (employment) and social conditions

- Give preference to local communities for employment opportunities;
- Base recruitment on sound labour practices and with gender equality in mind; and

- Provide appropriate training, which would enable individuals to apply their skills to other construction and development projects in the region once construction is complete.

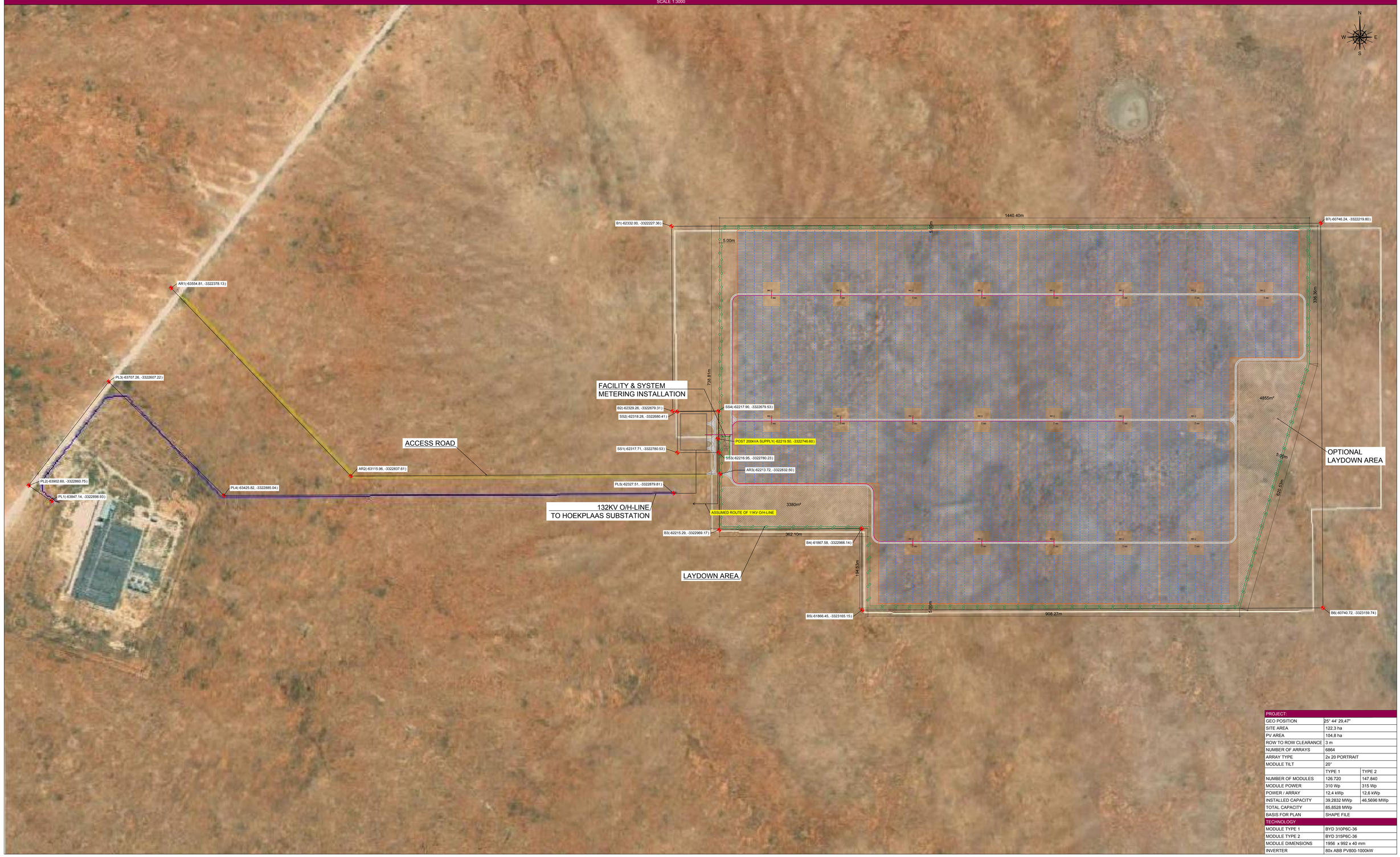
Surrounding land uses impacts

- Implement measures recommended in the modelling study, as agreed to with SKA.

APPENDIX G

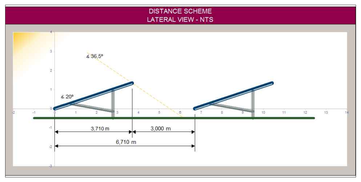
DETAILED DESIGNS

OVERALL SITE PLAN
SCALE 1:3000



PROJECT:		
GEO POSITION	25° 44' 29,47"	
SITE AREA	122,3 ha	
PV AREA	104,8 ha	
ROW TO ROW CLEARANCE	3 m	
NUMBER OF ARRAYS	6864	
ARRAY TYPE	2x 20 PORTRAIT	
MODULE TILT	20°	
	TYPE 1	TYPE 2
NUMBER OF MODULES	126.720	147.840
MODULE POWER	310 Wp	315 Wp
POWER / ARRAY	12,4 kWp	12,6 kWp
INSTALLED CAPACITY	39,2832 MWp	46,5696 MWp
TOTAL CAPACITY	85,8528 MWp	
BASIS FOR PLAN	SHAPE FILE	
TECHNOLOGY		
MODULE TYPE 1	BYD 310P6C-36	
MODULE TYPE 2	BYD 315P6C-36	
MODULE DIMENSIONS	1956 x 992 x 40 mm	
INVERTER	80x ABB PVS800-1000kW	

DISTANCE SCHEME
LATERAL VIEW - NTS



LEGEND

- ARRAY
- POWER STATION (ABB)
- FENCE
- PV AREA
- SITE BOUNDARY

REV	BY	CHECKED	APPROVED	CHANGE	DATE
P4	INGR	HES	-	ADDED COORDINATES	2014-03-17
P3	INGR	FRW	-	UPDATE MODULE LAYOUT	2014-02-28
P2	INGR	FRW	-	UPDATE MODULE LAYOUT	2014-02-05
P1	INGR	AZZ	-	FIRST ISSUE	2013-01-10

PROJECT NUMBER: 40101037
SHEET ID: GI02
DRAWING TITLE: OVERALL SITE PLAN

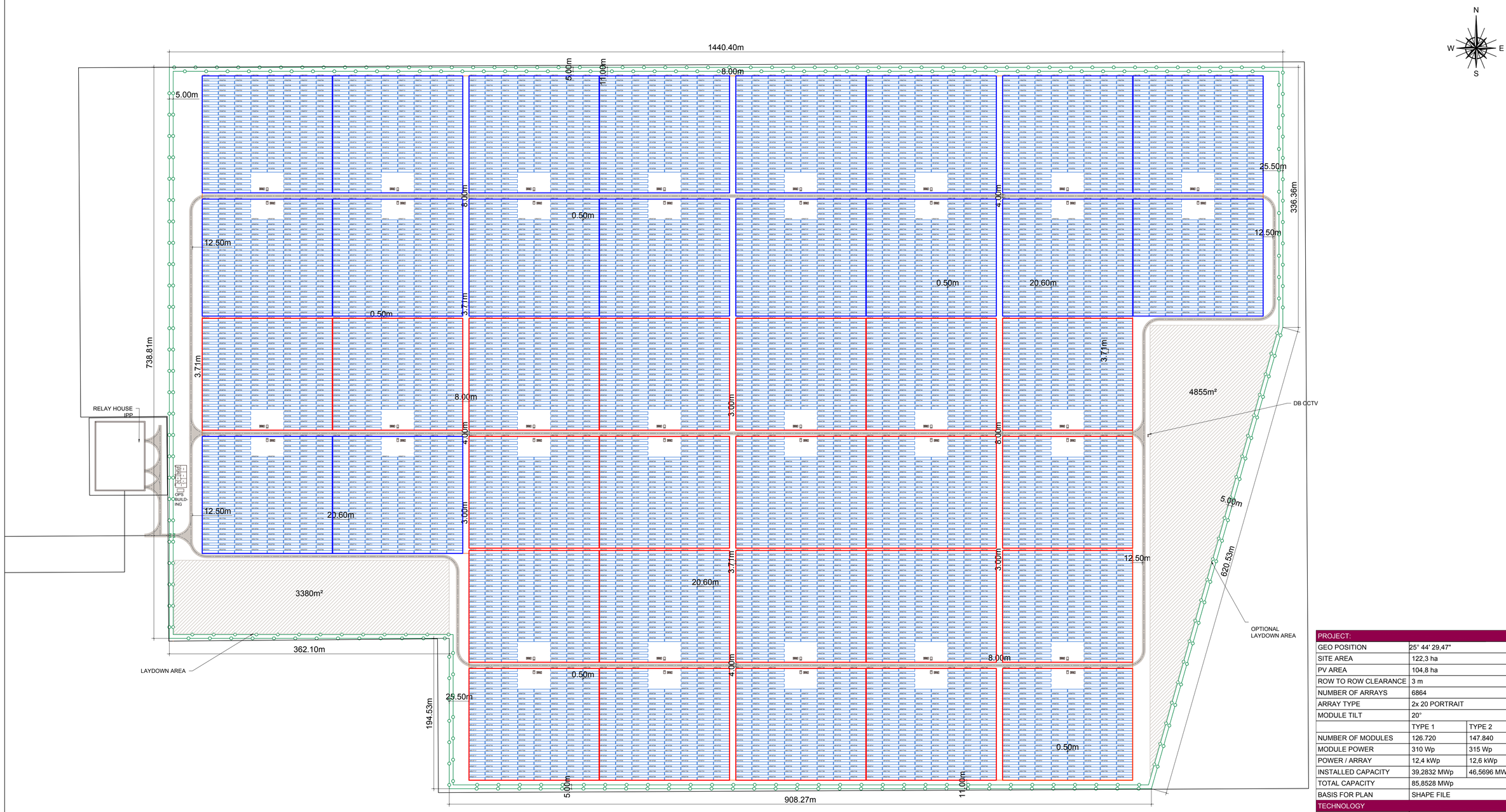
PROJECT NAME & ADDRESS: Mulilo Sonnedix Prieska PV, Copperton, South Africa
CUSTOMER: Mulilo Sonnedix Prieska PV (PtY) Ltd, 57 Great Suffolk Street, London SE OBB, United Kingdom

EPC:
juwi international GmbH
Energie-Allee 1
55286 Wörrstadt - Germany
Phone: +49 - (0) 6732 96 57 0
Telefax: +49 - (0) 6732 96 57 7001

APPROVAL STAMP:
STATUS: PRELIMINARY
SCALE: 1:3000
FORMAT: DIN A0

A0 - 1189 x 841 mm

OVERALL MODULE LAYOUT
SCALE 1:2500



PROJECT:		
GEO POSITION	25° 44' 29,47"	
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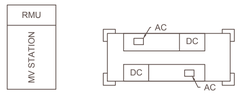
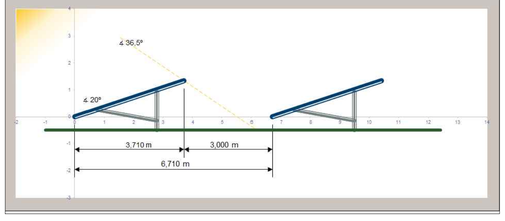
MODULE TYPE 1	BYD 310P6C-36	
MODULE TYPE 2	BYD 315P6C-36	
MODULE DIMENSIONS	1956 x 992 x 40 mm	
INVERTER	80x ABB PV800-1000kW	

POWER STATION
TOP VIEW - SCALE 1:150



DISTANCE SCHEME
LATERAL VIEW - NTS



LEGEND

	ARRAY / MODULE 310 Wp
	ARRAY / MODULE 315 Wp
	POWER STATION (ABB)
	FENCE
	PV AREA
	SITE BOUNDARY

REV	DRAWN	REVIEWED	APPROVED	CHANGE	DATE
P3	INGR	FRW	-	UPDATE MODULE LAYOUT	2014-02-28
P2	INGR	FRW	-	UPDATE MODULE LAYOUT	2014-02-05
P1	INGR	AZZ	-	FIRST ISSUE	2013-01-10

PROJECT NUMBER: 40101037
SHEET ID: W-101
DRAWING TITLE: OVERALL MODULE LAYOUT

PROJECT NAME & ADDRESS:
Mulilo Sonnedix Prieska PV
Copperton
South Africa

CUSTOMER:
Mulilo Sonnedix Prieska PV (PtY) Ltd
57 Great Suffolk Street
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EPC:
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APPROVAL STAMP:

STATUS: PRELIMINARY

SCALE: 1:2500
FORMAT: DIN A1

A1 - (841 x 594)mm

APPENDIX H

TRAFFIC MANAGEMENT PLAN

TRANSPORT STUDY AND TRAFFIC MANAGEMENT PLAN

Reference: 110409

Prepared for: Mulilo Sonnedix Prieska PV (Pty) Ltd

Revision: 2

18 March 2014

Document control record

Document prepared by:

Aurecon South Africa (Pty) Ltd

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Document control						aurecon
Report title		TRANSPORT STUDY AND TRAFFIC MANAGEMENT PLAN				
Document ID		110409/2	**Project number**		110409	
File path		P:\Projects\110409 MuliloPV Solar Prieska Transpt Plan\03 PRJ Del\6 REP\110409-Mulilo Sonnedix Prieska PV_Transport Plan R1.docx				
Client		Mulilo Sonnedix Prieska PV (Pty) Ltd	**Client contact**		**Silvia Sendra Estrella**	
Rev	**Date**	**Revision details/status**	**Prepared by**	**Author**	**Verifier**	**Approver**
0	**25 February 2014**	Draft	HS	HS	JHBC	JHBC
1	**6 March 2014**	Final	HS	HS	JHBC	JHBC
2	**18 March 2014**	Final – Minor amendments	HS	HS	JHBC	JHBC
Current Revision		**2**				

Approval			
Author signature		Approver signature	
Name		Name	
Title		Title	

MULILO SONNEDIX PRIESKA PV

Date 18 March 2014
Reference 110409
Revision 2

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Tables

EXECUTIVE SUMMARY

The transport needs for the proposed PV Plant on the farm Hoekplaas was investigated to confirm access route and site access for the development of a Solar Farm.

The general requirements are:

- Legal limits for normal heavy vehicle freight
- Abnormal Permits required for transport of transformers
- Maximum vertical clearance on most routes is 5,2m for Abnormal Load but should preferably be limited to 4,8m.

The general freight for the solar farms comprise of building materials, solar panels and frames and an 80MVA transformer. The imported freight will be transported from South African ports to the respective sites. Building materials will be transported from sources in surrounding towns while certain elements will be transported from various manufacturing centres in South Africa.

The preferred import origin of the imported elements to the proposed Mulilo Sonnedix Prieska PV facility on the Farm Hoekplaas will be from the Port Elizabeth port. The distance of 725 km comprises of 717km surfaced roads, 6 km gravel road and approximately 2 km of new gravel road (excluding internal roads). However, should this port not be capable of handling the freight, then Cape Town could be used as an alternative port. The transport distance in this case is 947 km.

No toll fees are required except if freight is transported through the Huguenot Tunnel from Cape Town. Abnormal Permits will be required for transport of the transformer in any event.

The route is predominantly on National or Provincial Roads with suitable standards for transport of container freight. It is also suitable for abnormal loads with permits. There is a possibility of limited risk of delays for normal routine maintenance works depending of the time of transport and scheduling of roads contracts.

The transport of element from manufacturing centres within South Africa is predominantly on National and Provincial roads, which presents no limitations for normal freight.

The access position on the gravel surfaced section of R357 (MR771) is at an acceptable safe point with sufficient sight distance and also approximately 400m from the nearest access which is acceptable.

In general no obvious problems are expected with freight transport along the proposed routes to the site necessary for the construction and maintenance of the site.

1 INTRODUCTION

Juwi Renewable Energies (Pty) Ltd has engaged Aurecon to prepare a Transport Management Plan for the implementation of a Solar Power Plant 58km Southwest of Prieska on the farm Hoekplaas next to the R357 (MR771). The site is indicated on the Key Plan below:

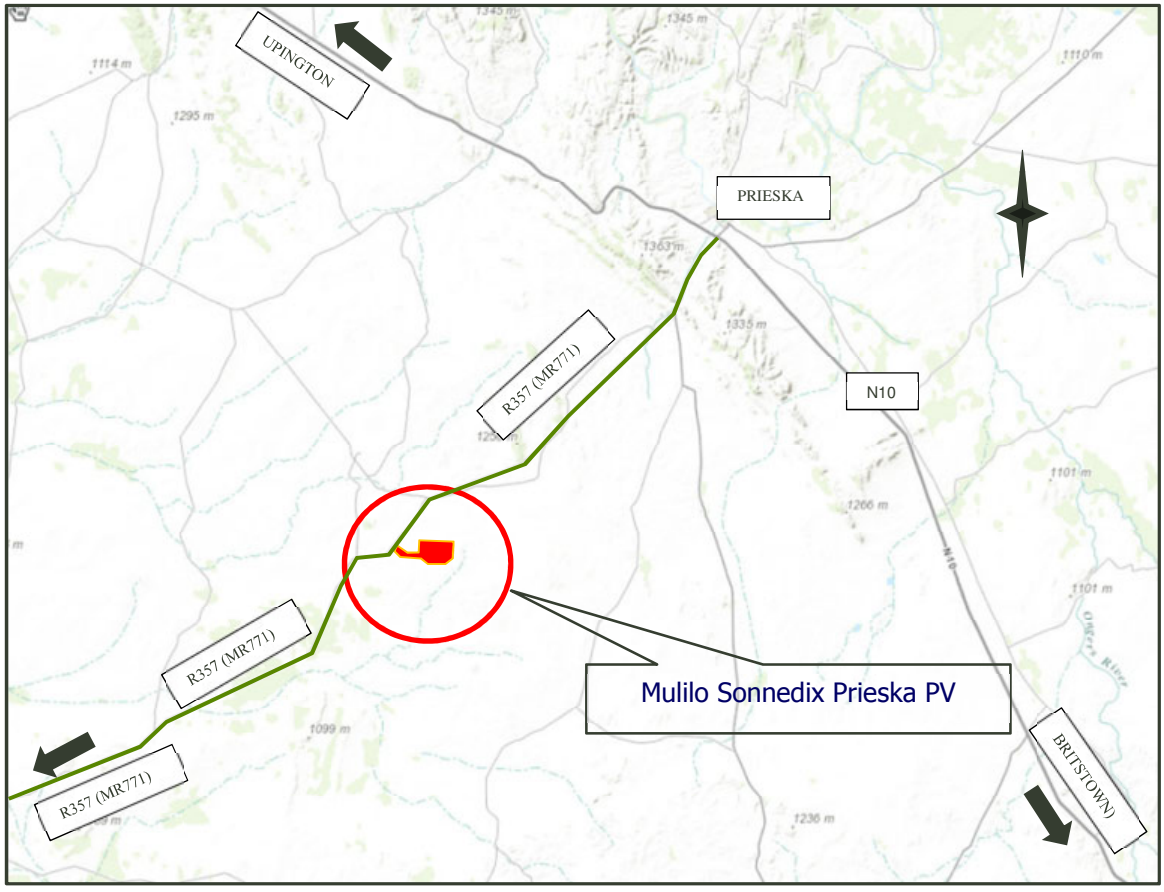


Figure 1: Key Plan

The solar site will be developed to 75 MW capacity.

The scope of the study is to evaluate the transport requirements to support the development of the Mulilo Sonnedix Prieska PV plant. The scope of the Transport Management Plan includes inter alia:

- Determine the access freight routes between points of delivery and departure for the components.
- Confirm the associated clearances required for the necessary equipment to be transported from the point of delivery to the various sites.
- Confirm freight requirements,
- Propose origins and destinations of equipment,
- Determine (Abnormal) Permit requirements if any,
- Apply at Authorities on Access to site off the R 357 (MR771).
- Propose traffic accommodation measures during construction of the access on the Provincial Road.

2 DEFINITIONS / ASSUMPTIONS

The following assumptions are made:

- Imported elements are imported and transported from the nearest South African Port to the site.
- Certain elements are transported from manufacturing centres within South Africa.
- Material for concrete piles and road construction are obtained locally from closest available commercial source.
- The largest potential load will be a single 80MVA transformer with a payload of approximately 70t.
- Foundations will predominantly comprise of concrete piles.
- The access location is approximately at km 59 on the R357 (MR771) based on available information, but will be confirmed.

3 EVALUATION OF SITE TRANSPORT

3.1 General Freight Requirements

3.1.1 Legislation

The general current limitations on road freight transport are:

- Axle load limitation of 7,7t on front axle, 9,0t on single rear axles
- Axle unit limitations are 18t for dual axle unit and 24t for 3 axle unit
- Bridge formula requirements to limit concentration of loads and to regulate load distribution on the vehicle.
- Gross vehicle mass of 56t. This means a typical payload of about 30t.
- Maximum vehicle length of 22m for interlink, 18,5m for horse and trailer and 13,5 for a single unit
- Width limit of 2,6m
- Height limit 4,3m

Abnormal permits are required for vehicles exceeding these limits.

3.1.2 Solar Farm Freight

Materials and equipment transported to the site comprise of:

- Building materials (concrete aggregates, cement and gravel)
- Construction equipment such as piling rigs and cranes
- Solar panels (panels and frames)
- Transformer and cables

The following is anticipated:

a) Building materials comprising of concrete materials for strip footings or piles will be transported using conventional trucks which should adhere to legal limits.

b) Solar Panels and frames will probably be transported in containers using conventional heavy vehicles within the legal limits from nearest South African port. The number of loads will be a function of the capacity of the solar farm and the extent of the frames.

c) Transformers will be transported by abnormal vehicles from the nearest South African port.

3.1.3 Traffic Statement

It is estimated that the number of heavy vehicles per 7MW installation would be between 300 and 400 heavy vehicle trips depending on the site condition and founding requirements. The total trips for the 75MW would be between 3000 and 4000 heavy vehicle trips. These trips would be made over an estimated period of 9 to 12 months.

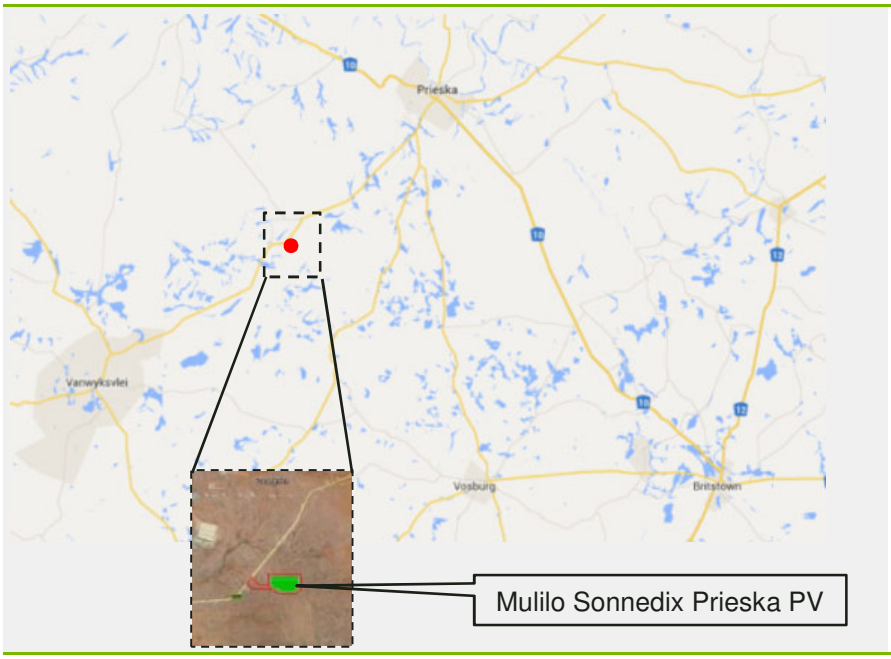
In the worst case the number of heavy vehicle trips per day would be in the order of 15 -20 trips. The impact of this on the general traffic would therefore be negligible as the additional peak hour traffic would be at most 2 trips.

It can therefore be stated that the construction traffic and the post construction traffic would be low without any significant impact on the existing traffic.

3.2 Mulilo Sonnedix Prieska PV Access Route

3.2.1 Site Description and Location

The site Description and Location are as follows:



Location	30° 1'24.07"S 22°21'45.36"E
Distance SW from PRIESKA	58 km
Generation Capacity	75MW
Distance from Ports	
Port Elizabeth	725 km
Cape Town	947 km
Farm	Hoekplaas

Figure 2: Site Description & Location

3.2.2 Preferred Route from port

Proposed route for imported Freight is indicated in the following figure:

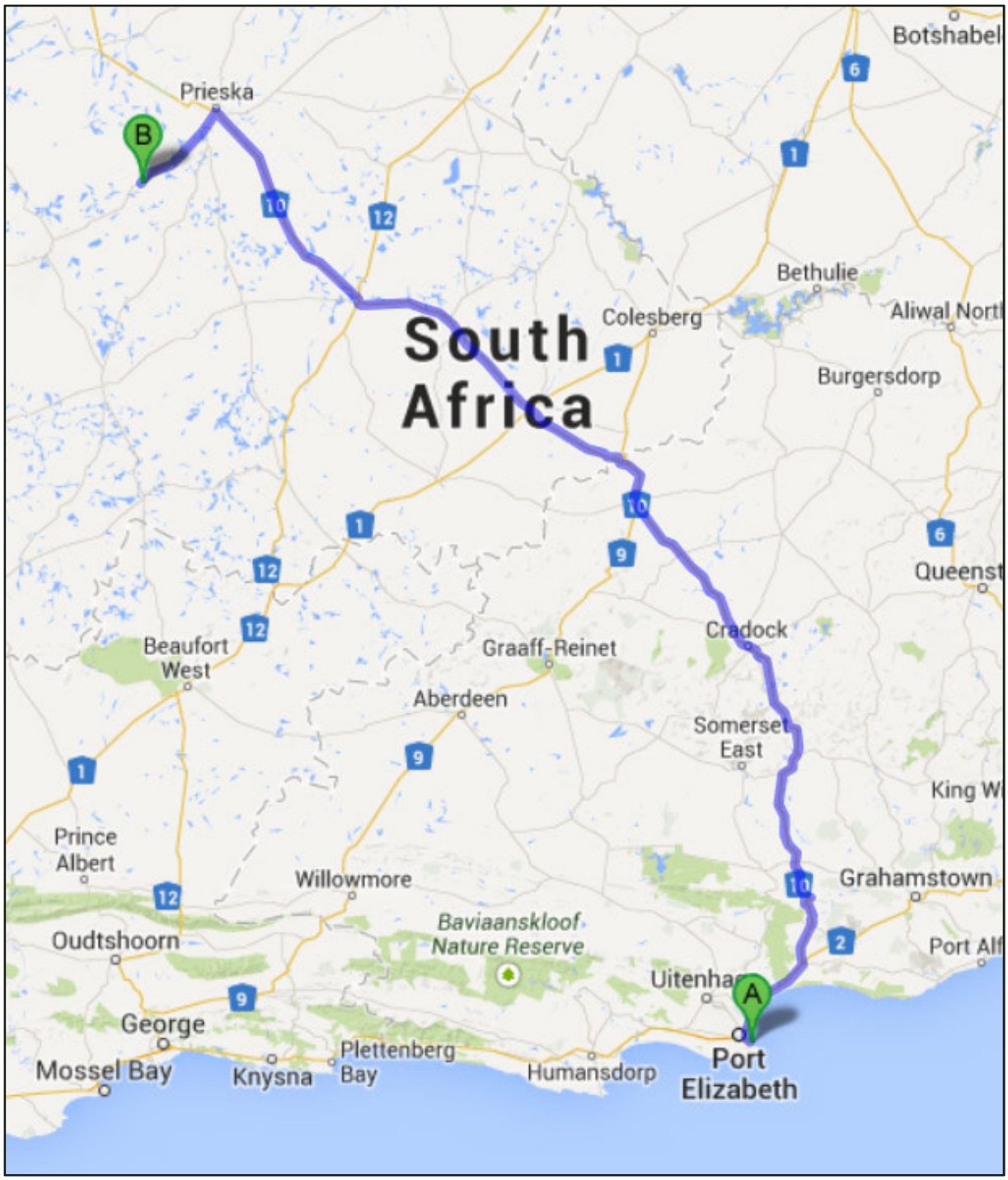
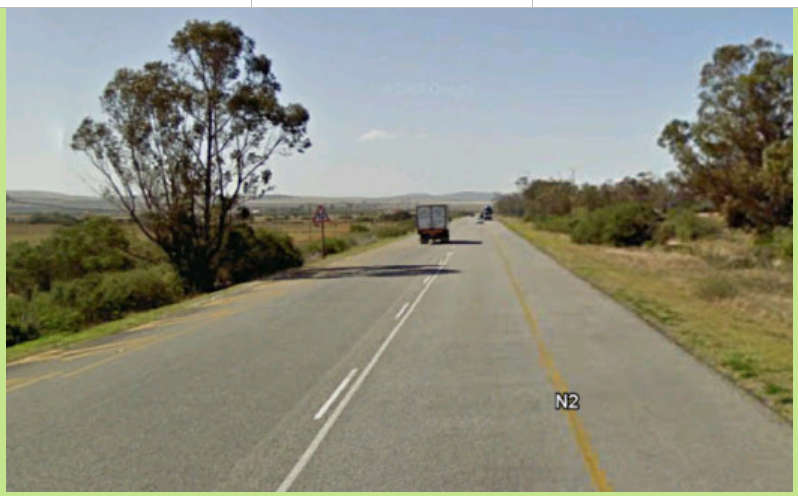
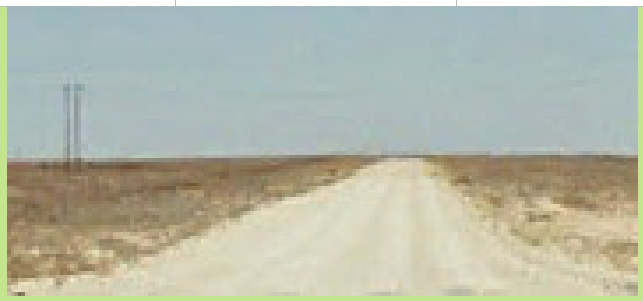


Figure 3: Preferred Freight Route

The route elements are as follows:

Table 1: Route Elements - Details

Element	Route Name	From	To	Distance [km]	Type
1	N2	Port Elizabeth	Nanaga	52	Surfaced National Road
					N2 is a divided or un-divided 4 lane road and becomes a 2 lane road with surfaced shoulders towards Nanaga
2	N10	Nanaga	Prieska	616	Surfaced National Road
					N10 is a surfaced 2 lane road with surfaced shoulders in places

Element	Route Name	From	To	Distance [km]	Type
3	R357 (MR771)	Prieska	Copperton turnoff	49	Surfaced Provincial Road
					R357 is a single carriageway two lane road with surfaced shoulders
4	R357 (MR771)	Copperton Turnoff	Site Access	6	Gravel Provincial Road
					This section of R357 is a gravel 2 lane road with gravel shoulders
5	Site access road	R357	site	2	Gravel Access Road 7m wide
	TOTAL DISTANCE [km]			**725**	

Note: The recommended route indicated in the table

a) Route for Construction materials

Material sources for road building and concrete works is available in Prieska or even Kimberley and all material will probably be transported from these and possibly other surrounding towns on the Provincial and local roads.

3.2.3 Alternative Route from Port

Should the preferred port not be available for any reason – especially in view of the large scale of wind turbine equipment currently imported - , then the Cape Town (or even Saldanha) ports could be used as alternatives. In the case of Cape Town the distance for abnormal loads (bypassing the Huguenot Tunnel) is 947km as shown in the following figure.

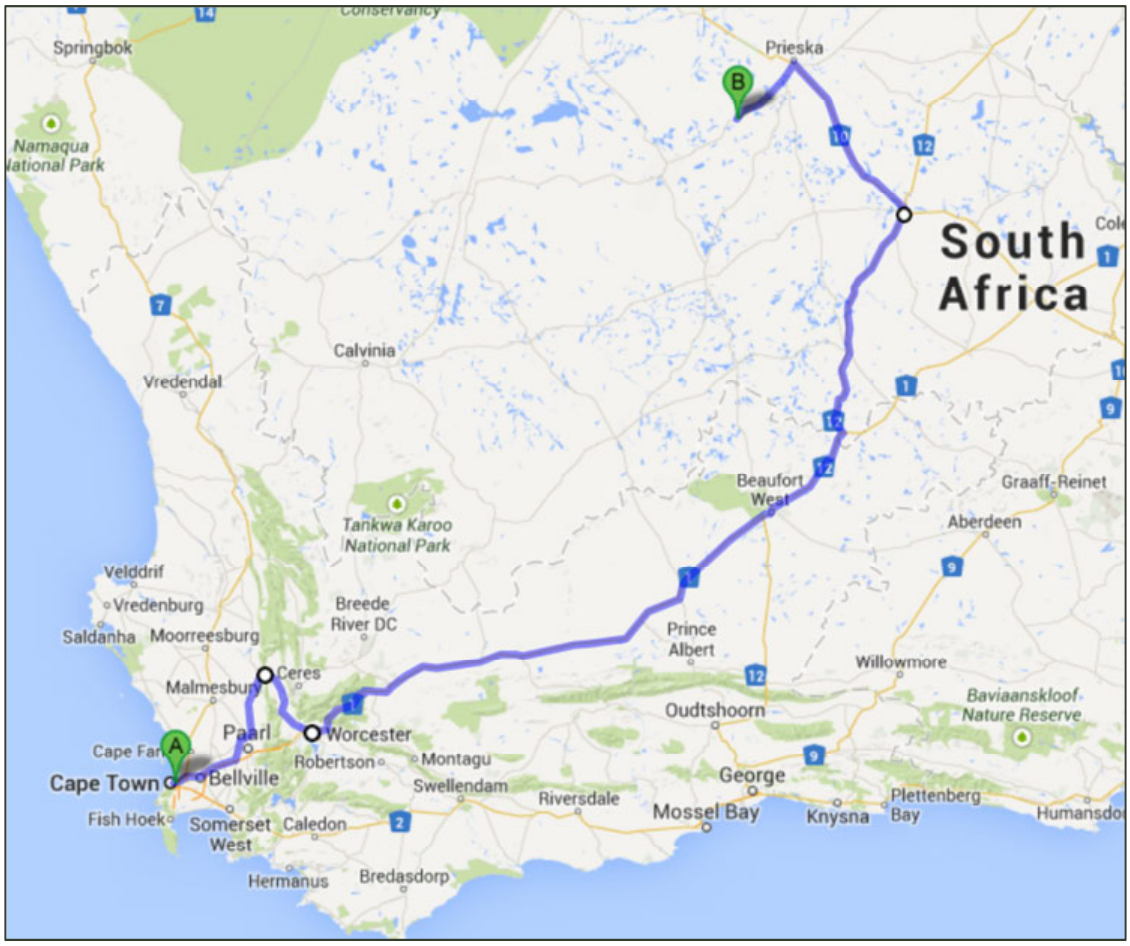


Figure 4 Alternative Port Route

3.2.4 Routes from other Larger Manufacturing Centres

The other main manufacturing centres include

- Gauteng - greater Johannesburg area (Modderfontein, Edenvale, Nigel, Germiston, Brakpan, Elandsfontein) for inverters and support structures
- Pinetown (Kwazulu-Natal) for modules.

The routes to the site from these centres are predominantly on Provincial and National roads. The following figure shows the most probable routes.

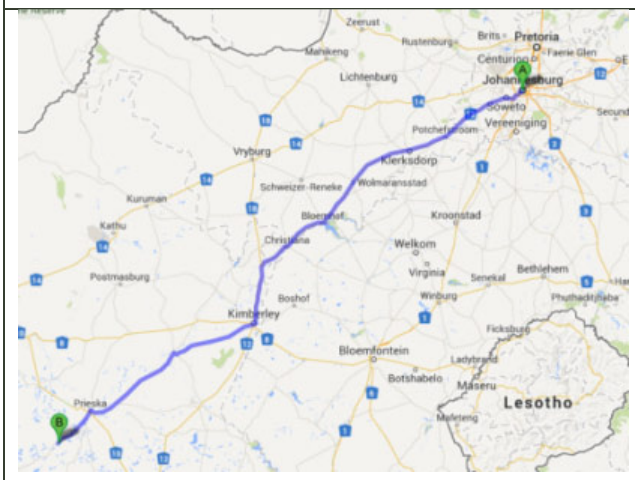
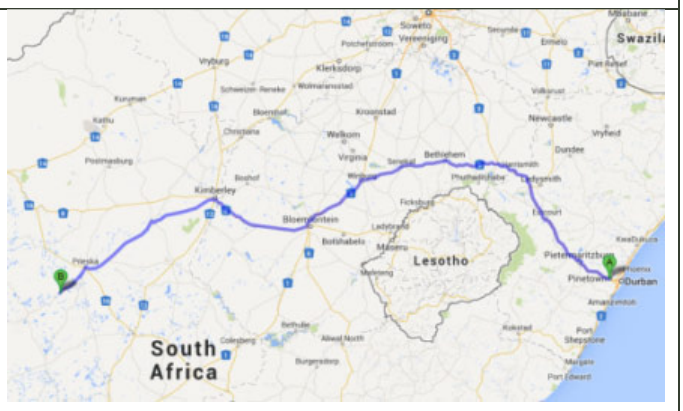
Gauteng to the site	Pinetown to the site
	
Distance : 770 km	Distance : 1060 km

Figure 5 Routes from Other Manufacturing Centres

There are no limitations on normal freight on these routes.

3.2.5 Authority and Permit Requirements

The following is required:

a) No toll fees required on the routes from the port unless the Huguenot Tunnel is used. On the routes from the other manufacturing centres certain portions of the national routes are tolled.

b) Abnormal permit will be required for the transport of the transformer. The estimated permit value will be a function of the actual vehicle configuration but is estimated at R7000 – R9000 per trip.

3.2.6 Route Evaluation of the Preferred Route from the Port

The routes elements are evaluated as follows:

Table 2: Route Elements - Evaluated

Element	Road	Remark	Comment
General		No limitations on normal heavy vehicles Permits required from the Provincial Authorities for abnormal loads for transformer Vertical clearance of bridges in general 5,2m. However, should the transformer exceed 5,2m then the route will have to be confirmed or altered as required but the permit conditions will direct the load on an approved route.	
1	N2	Possible delays due to reconstruction near	

Element	Road	Remark	Comment
		Colchester implemented by SANRAL up to April 2014	
2	N10	Possible delays due to periodic maintenance required by SANRAL	Currently no contracts active.
3	R357 (MR771)	none	Surfaced Section
4	R357 (MR771)	Low possibility of periodic maintenance required by Provincial Government for potential blading/ re-gravelling	Gravel section
5	New Access Road	About 2 km of new gravel road 6m wide	

3.2.7 Road Access

The access to the site is proposed off the Provincial Road R357 (MR771) at km 58.5.

An application has been submitted to the Provincial Roads Department. (Refer Appendix A)

The Provincial road is a gravel road at the proposed access position. Sight distances from the proposed position are in excess of 300m in both directions and therefore considered sufficient.

The closest access is the access at the ESKOM substation approximately 395m from the proposed position towards Vanwyksvlei. This spacing is also acceptable from an access management perspective and could be allowed.

The road drains to the northwest. Suitable drainage elements will be provided at the access point to ensure minimal disturbance of the existing conditions.

3.2.8 Accommodation of Traffic during Construction

During construction of the access, traffic will have to be accommodated as per SADC Road Traffic Signs Manual requirements. The following typical minimum signage requirements will have to be implemented to ensure safety if the road needs closure during construction on the public road.

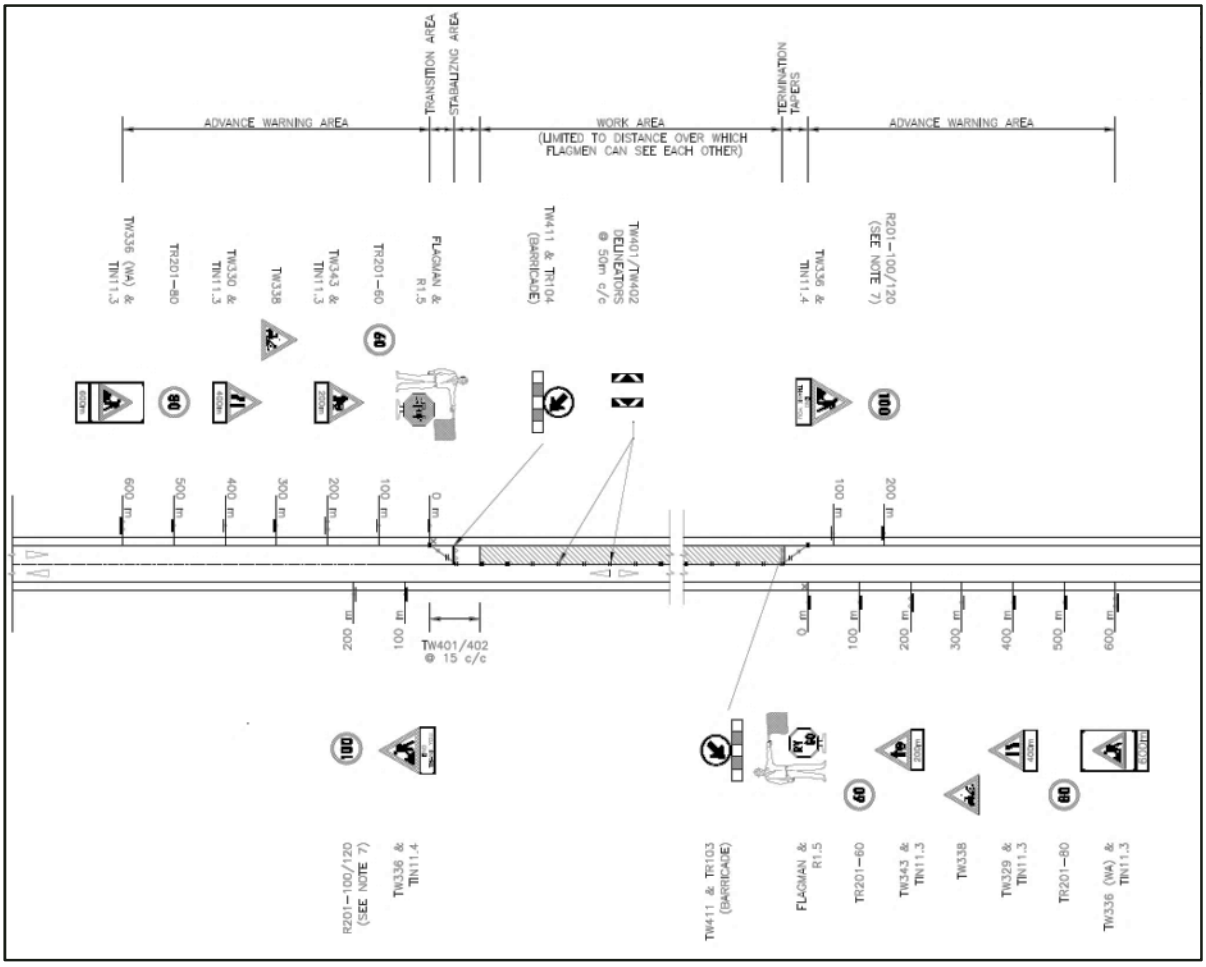


Figure 6: Accommodation of Traffic - Typical Layout

4 CONCLUSION

The transport needs for the proposed PV Plant on the farm Hoekplaas was investigated to confirm access route and site access for the development of a Solar Farm.

The general requirements are:

- Legal limits for normal heavy vehicle freight
- Abnormal Permits required for transport of transformers
- Maximum vertical clearance on most routes is 5,2m for Abnormal Load but should preferably be limited to 4,8m.

The general freight for the solar farms comprise of building materials, solar panels and frames and an 80MVA transformer. The imported freight will be transported from South African ports to the respective sites. Building materials will be transported from sources in surrounding towns while certain elements will be transported from various manufacturing centres in South Africa.

The preferred import origin of the imported elements to the proposed Mulilo Sonnedix Prieska PV facility on the Farm Hoekplaas will be from the Port Elizabeth port. The distance of 725 km comprises of 717km surfaced roads, 6 km gravel road and approximately 2 km of new gravel road (excluding internal roads). However, should this port not be capable of handling the freight, then Cape Town could be used as an alternative port. The transport distance in this case is 947 km.

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The route is predominantly on National or Provincial Roads with suitable standards for transport of container freight. It is also suitable for abnormal loads with permits. There is a possibility of limited risk of delays for normal routine maintenance works depending of the time of transport and scheduling of roads contracts.

The transport of element from manufacturing centres within South Africa is predominantly on National and Provincial roads, which presents no limitations for normal freight.

The access position on the gravel surfaced section of R357 (MR771) is at an acceptable safe point with sufficient sight distance and also approximately 400m from the nearest access which is acceptable.

In general no obvious problems are expected with freight transport along the proposed routes to the site necessary for the construction and maintenance of the site.

APPENDIX A

Access Application - Northern Cape Provincial Administration

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aurecon

Our reference : 110409/01/AA/HS

Date: 25 February 2014

Northern Cape Provincial Government
Department Public Works, Roads and Transport
Director Roads
PO Box 3132
KIMBERLEY
8300

Attention : Mr IA Bulane

Dear Sir

PROPOSED SOLAR FARM: MULILO SONNEDIX PRIESKA PV (NEAR COPPERTON) ON THE FARM HOEKPLAAS: PROVINCIAL ROAD ACCESS APPLICATION

We refer to a proposed Solar Farm of 75MW planned near Copperton on the Farm Hoekplaas next to the R357 (MR771) at approximately km 59 (or about 58km South West from Prieska) in the Northern Cape.

Attached please find the following information for reference:

1. A key plan showing the location of the site
2. A site development Plan of the proposed Solar Farm.
3. A plan showing the access position along the R357 (MR771) at km 58.5. This access is located approximately 395m towards Prieska from the existing ESKOM substation access. This access will be used for initial construction and thereafter during the operational period predominantly by light vehicle access for maintenance of the solar farm.
4. Detail of the proposed accesses.

We also confirm the following as background information:

- The estimated construction period is 9 - 12 months
- The solar panels and supports will be transported to the site in containers by road with heavy vehicles.
- The heavy vehicles will most probably be a horse and trailer configuration carrying containers with an 18m overall length.
- The maximum number of heavy vehicles per day during construction would be less than 20 vehicles. Clearly this volume would have no impact on the general road traffic as the traffic on this section of the R357 (MR771) is low and a maximum of 2 vehicles is expected during peak hours.
- After construction only maintenance vehicles for cleaning the solar panels from time to time and monitoring teams would use the accesses using LDV vehicles.
- During construction of the access, traffic will be accommodated as per SADC Road Traffic Signs Manual requirements.

- The Current business name: Mulilo Sonnedix Prieska PV (Pty) Ltd
- A Record of Decision (ROD) was issued for the construction of the Solar Farm and an extract is also attached for reference.

We herewith on behalf of Mulilo Sonnedix Prieska PV (Pty) Ltd request your approval of the proposed access on the R357 (MR771) at approximately km 59. Detailed drawings of the proposed access will be presented once the access position is approved. Also forward any further conditions for the proposed access if any.

Please contact us should you require any further information for evaluating the application.

Yours faithfully

HJ Steyn
For AURECON

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APPENDIX I

STORMWATER MANAGEMENT PLAN

MULILO SONNEDIX PRIESKA PV STORMWATER MANAGEMENT PLAN

Reference: 110409

Prepared for: Mulilo Sonnedix Prieska PV (Pty) Ltd

Revision: 2

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Current Revision		**2**				

Approval			
Author signature		Approver signature	
Name		Name	
Title		Title	

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Date 27 March 2014
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1 INTRODUCTION

Juwi Renewable Energies (Pty) Ltd has engaged Aurecon to prepare a Stormwater Management Plan (SMP) for the implementation of a Solar Power Plant 58km Southwest of Prieska on the farm Hoekplaas next to the R357. The site is indicated on the Key Plan below:

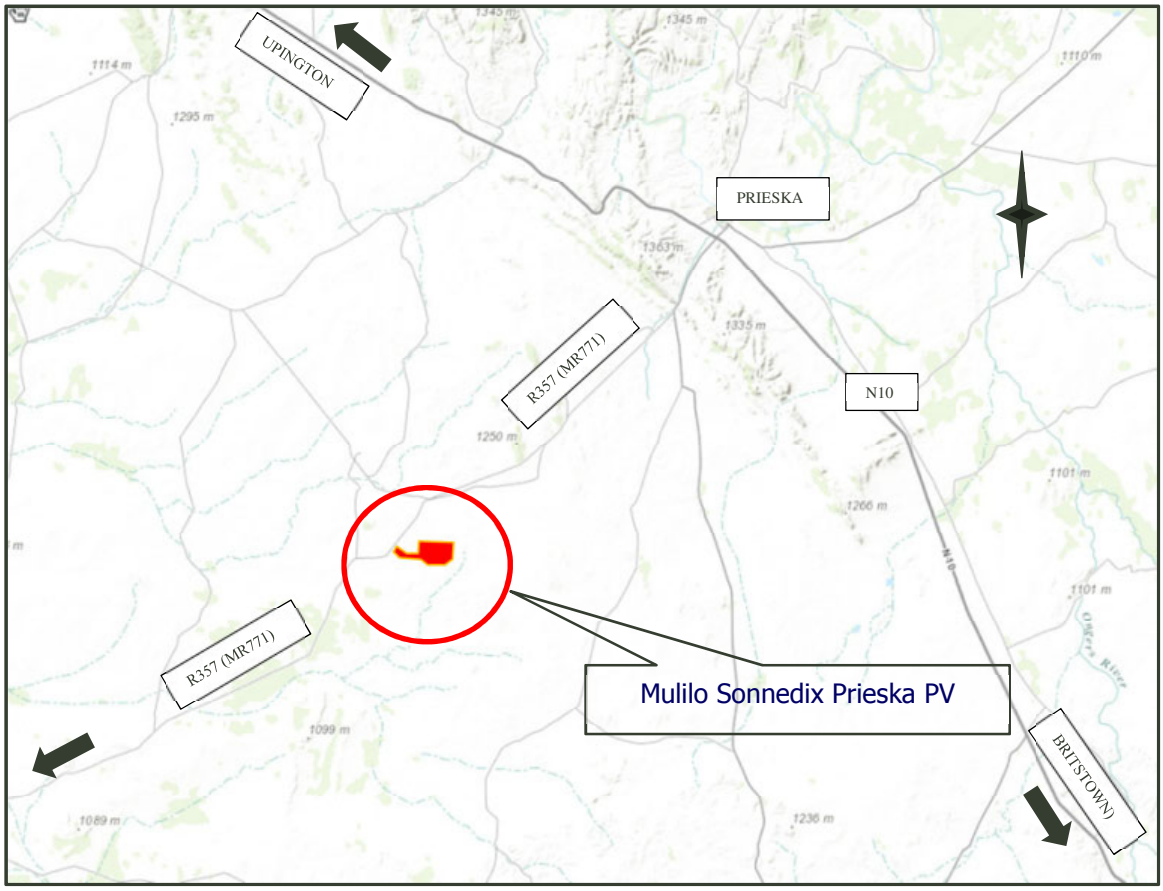

Figure 1: Key Plan

The solar site will be developed to 75 MW capacity.

The scope of the study is to prepare a Stormwater Management Plan (SMP) to support the development of the Mulilo Sonnedix Prieska PV plant. The scope of the Stormwater Management Plan (SMP) includes inter alia:

- Determine catchments for the project site
- Determine run-off volumes for the applicable catchments
- Develop drainage elements such side drains and outlet details to accommodate the flows
- Prepare a drainage layout plan for the project site

2 DEFINITIONS / ASSUMPTIONS

The following assumptions are made (guided by the client requirements):

- The flood calculation method used – Rational Method
- The recurrence period – 1:50 years
- As a principle to minimise earthworks and to minimise changes to the existing drainage patterns, the drainage layout was based on the existing contours. **The adjustments to grade and angle for the PV panels is assumed to be taken up by adjustments in the foundation levels**.

3 SITE STORMWATER

3.1 Climate and Land Use

The proposed site is located in a semi-arid area with typically Karoo type of vegetation.

Figure 2: Typical Vegetation

The main activity in the area is agriculture with sheep and goat farming but game farming is also popular.

The area experiences summer rainfall in the form of thunderstorms with a Mean Annual Precipitation of below 200mm per annum.

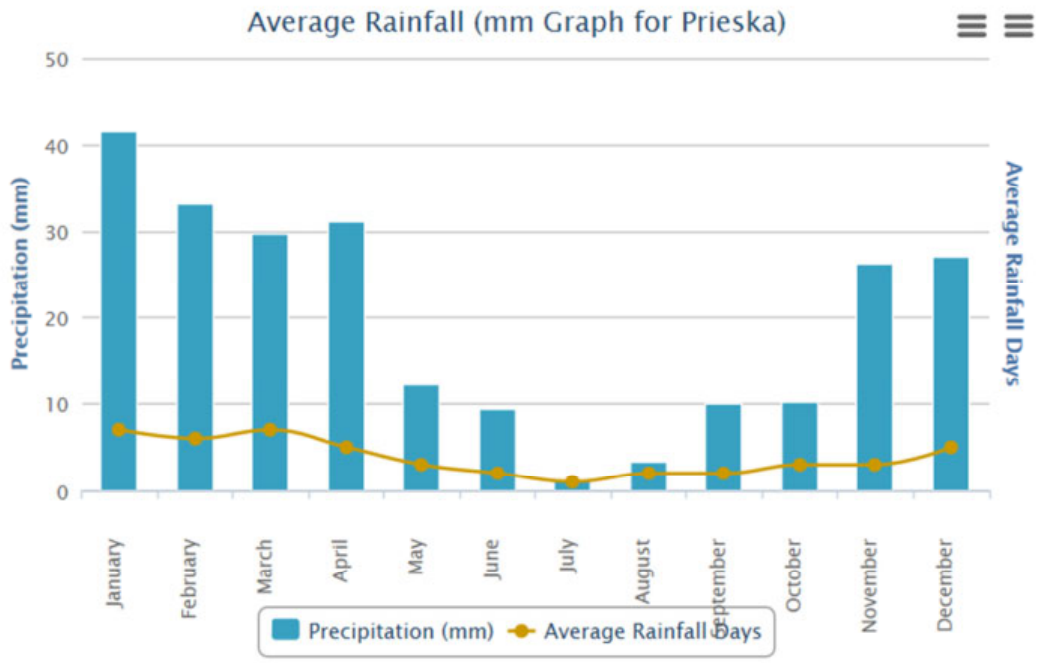

Figure 3: Average Rainfall

The area experience extreme heat in the summer while winters are usually frosty and clear sometimes becoming bitterly cold.

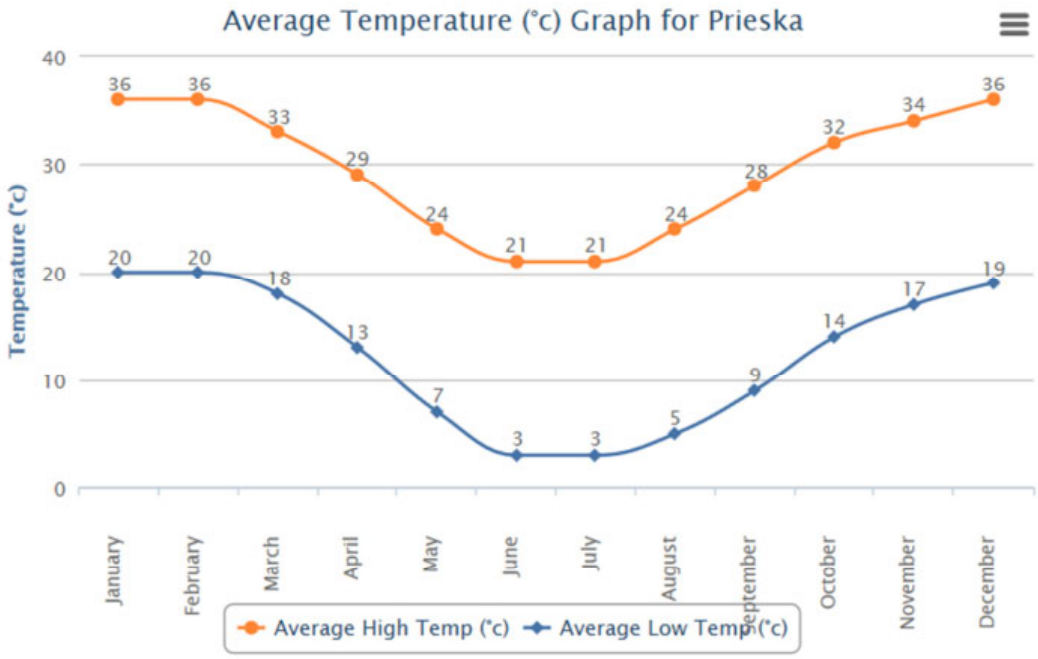

Figure 4: Average Temperature

3.2 Drainage Characteristics

The proposed site is generally flat with gradients ranging from below 0,5% to 2,0% through the site. The PV Area generally drains towards the East and North-East while the access road drains towards the South West. The area has a few natural endorheic pans just outside the project area.

3.2.1 Drainage Patterns

3.2.1.1 PV Area

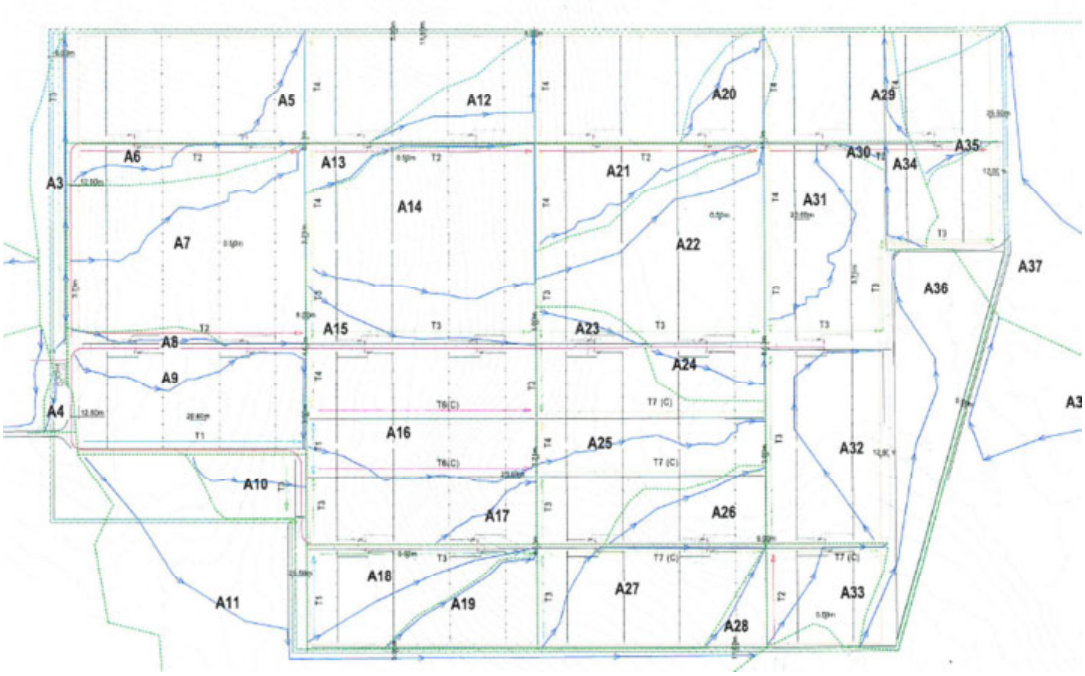

Figure 5: Contour Plan of PV Area and Drainage Pattern.

The catchment areas identified in correlation to the proposed PV layout are:

Table 1: Catchment Areas

Catchment ID	Area (ha)	Catchment ID	Area (ha)
A1*	24.36	**A20**	1.63
A2*	6.36	**A22**	6.95
A3	2.02	**A23**	0.83
A4	0.33	**A24**	1.3
A5	0.76	**A25**	6.85
A6	1.67	**A26**	2.04
A7	8.04	**A27**	4.68
A8	1.25	**A28**	0.73
A9	5.62	**A30**	0.17

Catchment ID	Area	Catchment ID	Area
A10	1.49	**A31**	5.43
A11	27.5	**A31**	5.43
A12	2.09	**A32**	5.4
A13	0.75	**A33**	2.29
A14	8.64	**A29**	0.38
A15	1.19	**A34**	0.98
A16	9.27	**A35**	0.34
A17	0.94	**A36**	6.02
A18	3.44	**A37**	24.56
A19	1.91	**A38**	7.47

Note: Areas indicated with * are on access road

The catchment areas for the PV Area are indicated in the following figure:

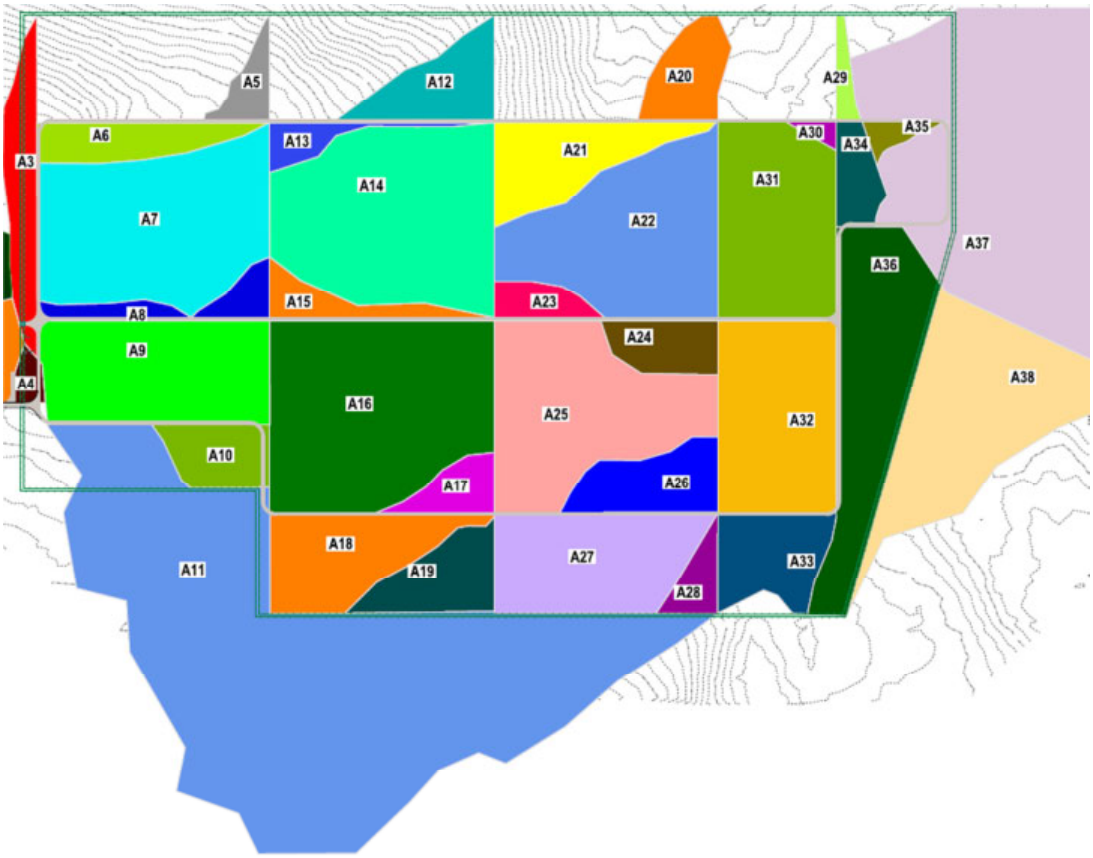

Figure 6: Catchment areas of PV area.

3.2.1.2 Access Road

The catchment areas for the access road are indicated in the following figure:

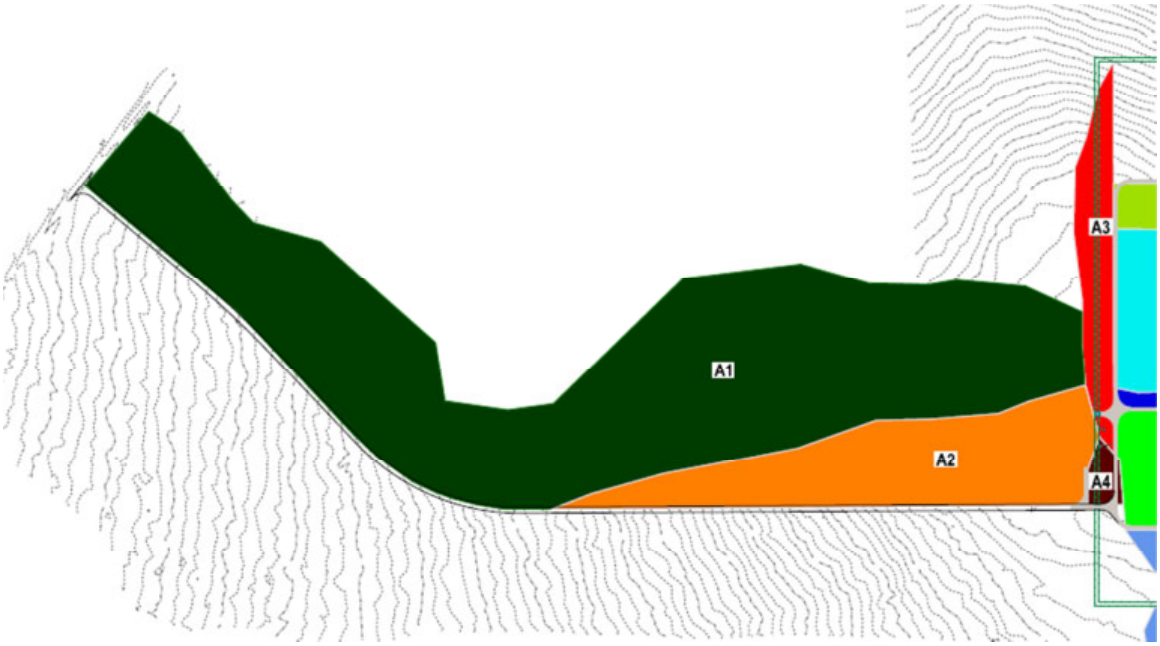

Figure 7: Catchment Areas of Access Road

3.2.2 Runoff characteristics

The scarce vegetation in combination with flat grades and semi permeable soils yield relatively low runoff coefficients.

3.3 Stormwater Calculation

3.3.1 Method and Assumptions

For purposes of the SMP the rational method was used. The runoff parameters were based on the following:

3.3.1.1 Return Period

A 1:50 year return period was considered as per client requirements.

3.3.1.2 Runoff coefficient

The runoff coefficient was based on the following:

Table 2: Runoff Coefficient

Slope	% Area	Permeability	% Applied	Vegetation	% Applied
< 3%	100%	Very		Dense Woods	
3% to 10%		Permeable	50%	Cultivated land	
10% to 30%		Semi Permeable	50%	Grassland	100%
>30%		Non-permeable		Rock	

The runoff coefficient calculated and used in the flood calculations was 0,23.

3.3.1.3 Time of Concentration

Time of concentration is calculated by the widely used USBR stream flow formula:

$$Tc = \left(\frac{0{,}87.L^2}{1000.S}\right)^{0.385}$$

Where Tc = Time of Concentration [hours], L = Length of waterway [km], S = average slope.

3.3.1.4 Point intensity

Point intensity is based on standard time of concentration – rain fall depth graphs.

3.3.2 Runoff

3.3.2.1 PV Area

The runoff distribution for the respective catchment areas is indicated in the following figure:

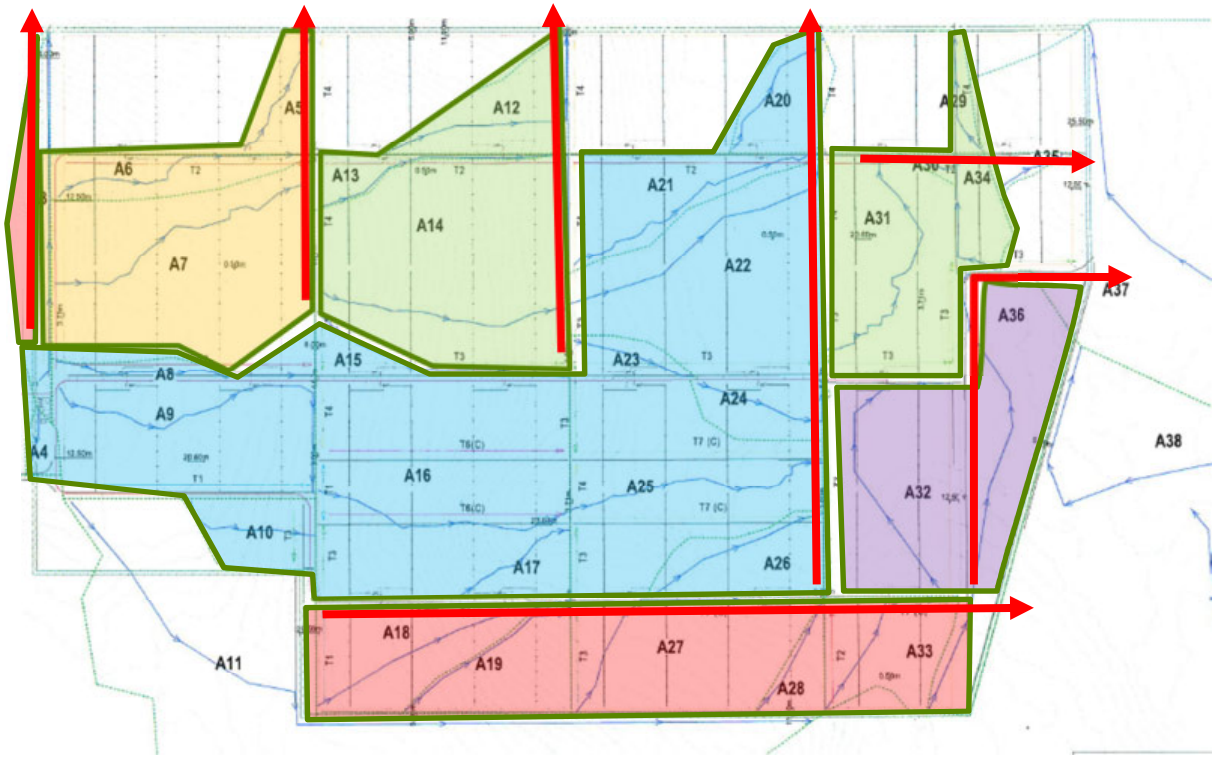

Figure 8: Flow Distribution – Facility

The 1:50 year runoff per catchment area is indicated in the following table:

Table 3: Run-off Calculations

Catchment ID	Method	Runoff Coefficient	Intensity	Time of Concentration	Area	Peak Flow
			(mm/h)	(min)	(ha)	(m3/s)
A1*	Rational	0.23	42.20	54.34	24.36	**0.65**
A2*	Rational	0.23	83.17	19.72	6.36	**0.33**
A3	Rational	0.23	98.21	14.86	2.02	**0.13**
A4	Rational	0.23	30.29	3.68	0.33	**0.01**
A5	Rational	0.23	145.46	6.15	0.76	**0.07**
A6	Rational	0.23	67.26	27.99	1.67	**0.07**
A7	Rational	0.23	103.48	13.71	8.04	**0.53**
A8	Rational	0.23	64.06	29.69	1.25	**0.05**
A9	Rational	0.23	91.89	16.86	5.62	**0.33**
A10	Rational	0.23	144.64	6.28	1.49	**0.14**
A11	Rational	0.23	62.61	30.76	27.5	**1.09**
A12	Rational	0.23	120.16	10.08	2.09	**0.16**
A13	Rational	0.23	127.28	8.96	0.75	**0.06**
A14	Rational	0.23	99.68	14.54	8.64	**0.54**
A15	Rational	0.23	125.57	9.22	1.19	**0.09**
A16	Rational	0.23	127.75	8.89	9.27	**0.75**
A17	Rational	0.23	93.12	16.46	0.94	**0.06**
A18	Rational	0.23	119.63	10.2	3.44	**0.26**
A19	Rational	0.23	137.09	7.44	1.91	**0.17**
A20	Rational	0.23	136.43	7.55	1.63	**0.14**
A21	Rational	0.23	115.21	11.16	2.77	**0.20**
A22	Rational	0.23	109.10	12.49	6.95	**0.48**
A23	Rational	0.23	146.03	6.06	0.83	**0.08**
A24	Rational	0.23	123.29	9.58	1.3	**0.10**
A25	Rational	0.23	49.01	44.18	6.85	**0.21**
A26	Rational	0.23	132.77	8.11	2.04	**0.17**
A27	Rational	0.23	109.42	12.42	4.68	**0.32**
A28	Rational	0.23	147.74	5.8	0.73	**0.07**
A30	Rational	0.23	147.74	5.8	0.17	**0.02**
A31	Rational	0.23	88.32	18.03	5.43	**0.30**
A32	Rational	0.23	82.80	19.84	5.4	**0.28**
A33	Rational	0.23	112.13	11.83	2.29	**0.16**
A29	Rational	0.23	123.81	9.5	0.38	**0.03**
A34	Rational	0.23	115.59	11.08	0.98	**0.07**
A35	Rational	0.23	154.10	4.57	0.34	**0.03**
A36	Rational	0.23	73.78	24.53	6.02	**0.28**
A37	Rational	0.23	76.33	23.18	24.56	**1.19**
A38	Rational	0.23	68.93	27.1	7.47	**0.33**

Note: Areas indicated with * are on access road

3.3.2.2 Access Road

The drainage of the access road is indicated in the following figure:

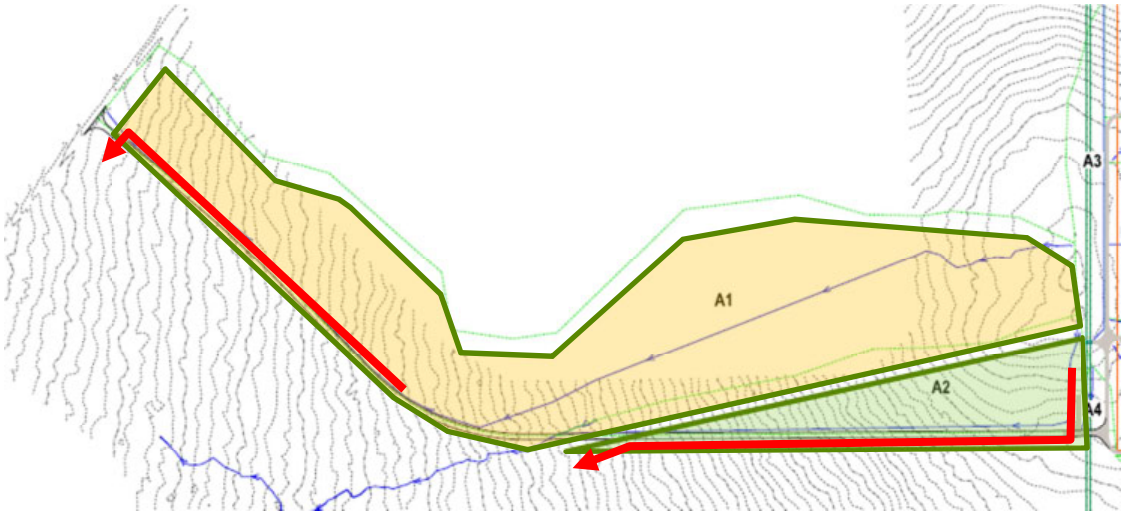

Figure 9: Drainage Pattern - Access Road

Stormwater for the access road is through a few pipes at frequent (300m minimum) spacing. Because of the low profile of the road above NGL, the pipes will have to be encased in concrete to carry the required heavy vehicle loads.

3.3.3 Flow and Outlet Conditions

The flow velocity and depth at the various outlets are given as follows:

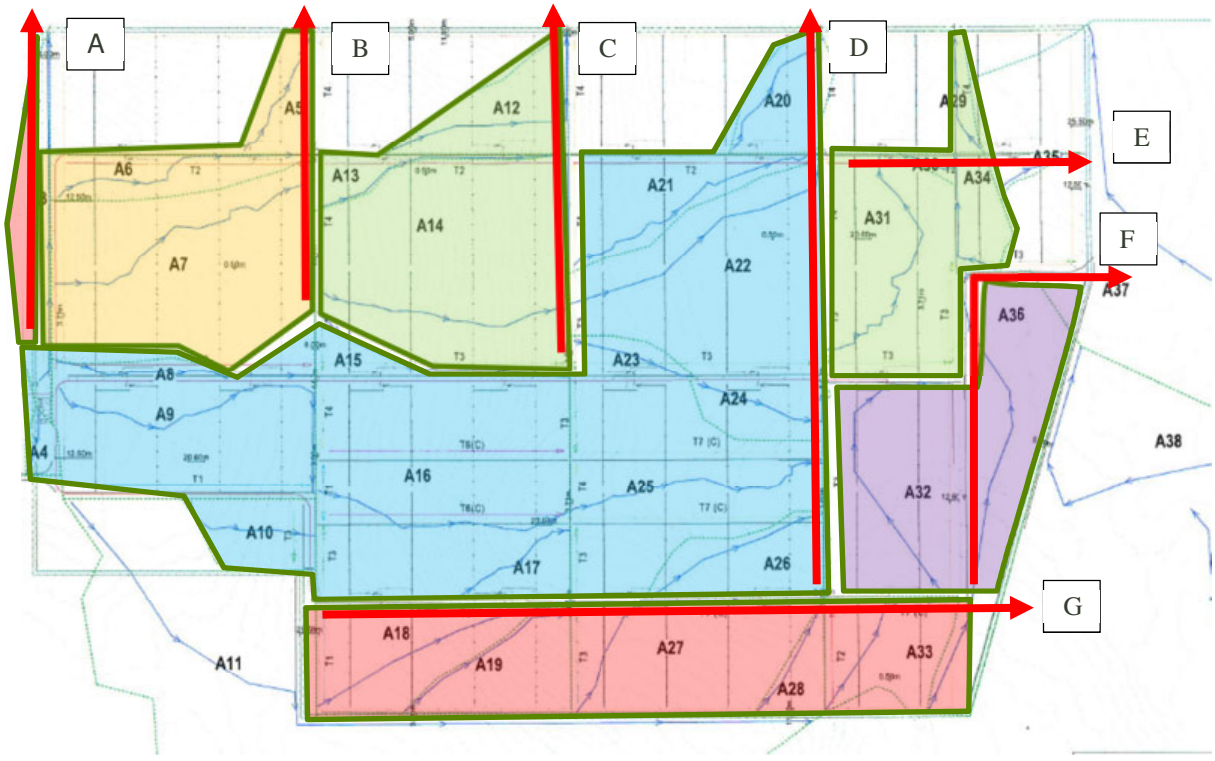

Figure 10: Flow Conditions at Outlets

Table 4: Flow Conditions at Outlets

Outlet	Q [m^3/s]	Velocity [m/s]	Flow Depth [m]
A	0.13	0.6	0.15
B	0.60	1.0	0.25
C	0.62	0.5	0.34
D	1.30	0.7	0.42
E	0.27	0.5	0.23
F	0.38	0.5	0.27
G	0.63	0.6	0.33

It can be seen that due to the very flat slopes, the general flow velocities are low and will not cause erosion of gravel lined drains.

3.4 Proposed Measures for Stormwater Management

3.4.1 General

The existing drainage patterns and characteristics will be preserved to a large extent, which will include the use of the natural ponding areas - endorheic pans.

3.4.2 Side Drains

In general it was decided to provide open drains along the proposed roads or between PV Panels where no other options were possible.

The open drains would be gravel drains with concrete protection at crossings where required.

3.4.2.1 PV Area

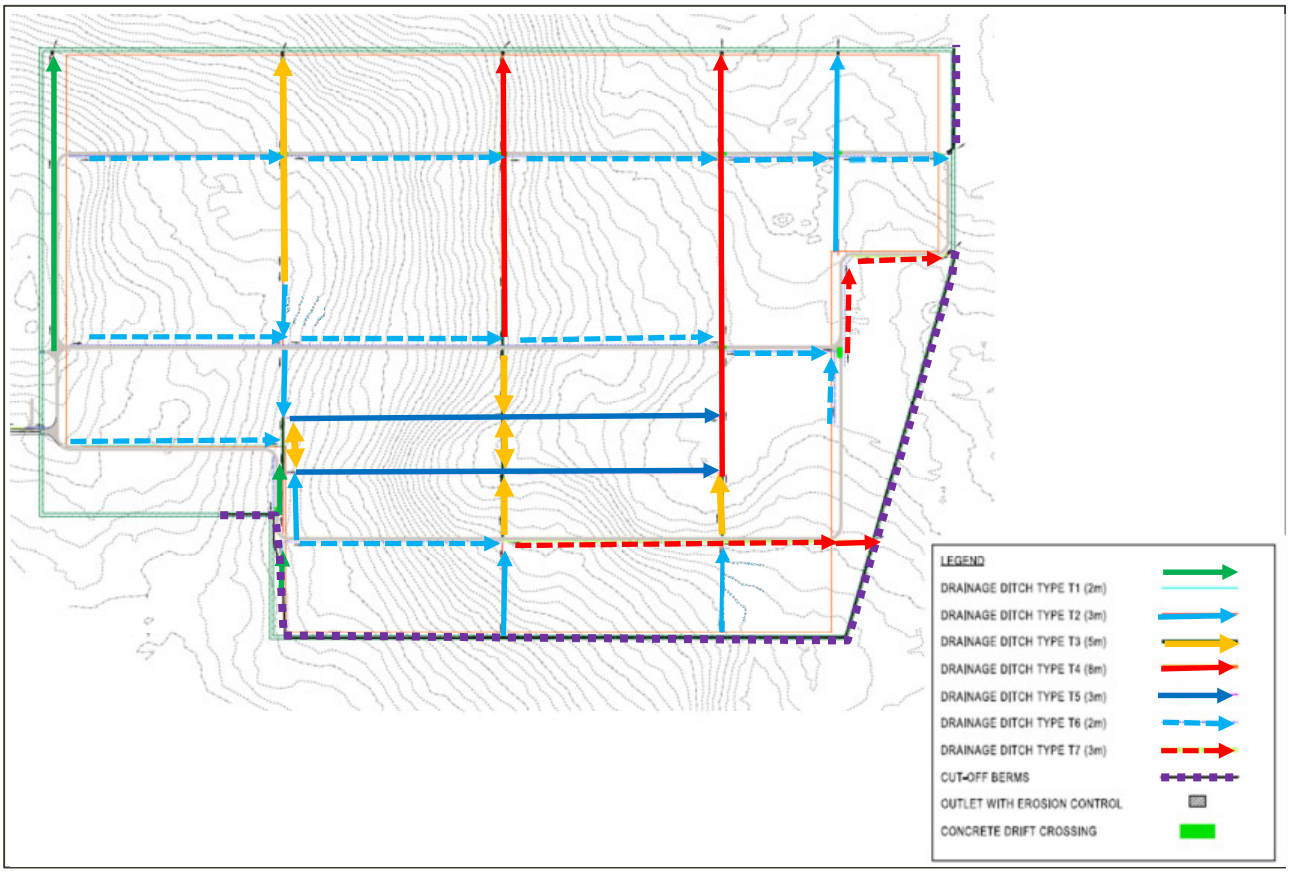

Figure 11: Drainage Elements for PV Area

3.4.2.2 Access road

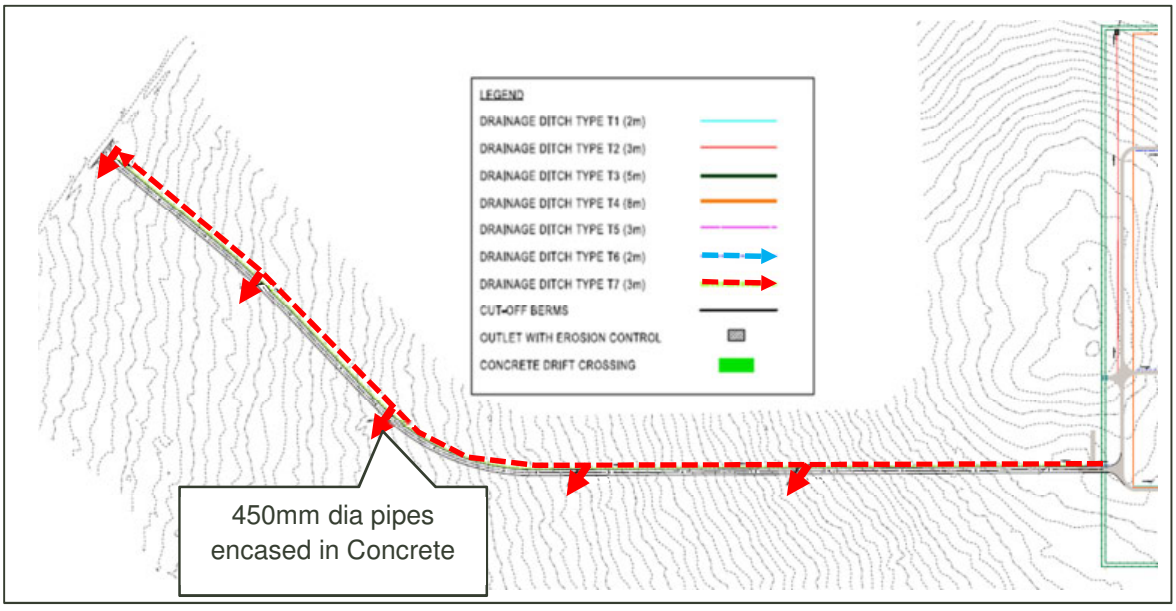

Figure 12: Drainage Elements for Access Road

3.4.3 Berms

Berms are proposed to prevent external water from entering the PV Area and directing flow to suitable areas of release.

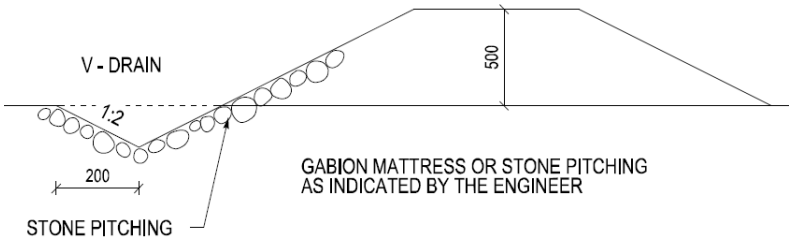

Figure 13: Typical Detail – Berm

3.4.4 Outlets

All culverts located on the access road have concrete outlets with erosion protection as detailed in the typical detail drawing.

Side drain outlets should be terminated as per typical detail with a widening and erosion protection to reduce the velocity and flow depth.

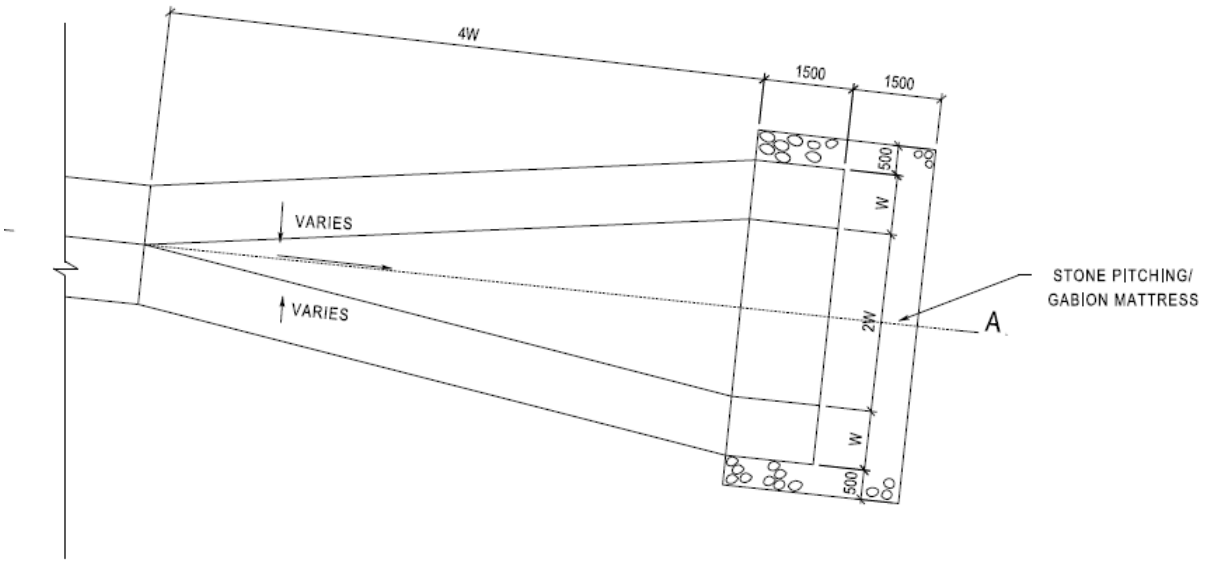

Figure 14: Typical Detail - Outlet with Erosion Protection

4 CONCLUSION

The proposed Stormwater Management Plan presents a layout of drainage elements required to accommodate the stormwater between the PV Panels and for the access road to the facility.

It follows the existing contours to minimise impacts on the existing drainage patterns.

The proposed drainage elements should be included in the detailed design to ensure effective management of the stormwater.

Appendix A : Drawings

1: Catchment Areas

2: Flow Patterns

3: Drainage Layout

4: Typical Drainage Cross Sections – Side Drains

5: Typical Details – General

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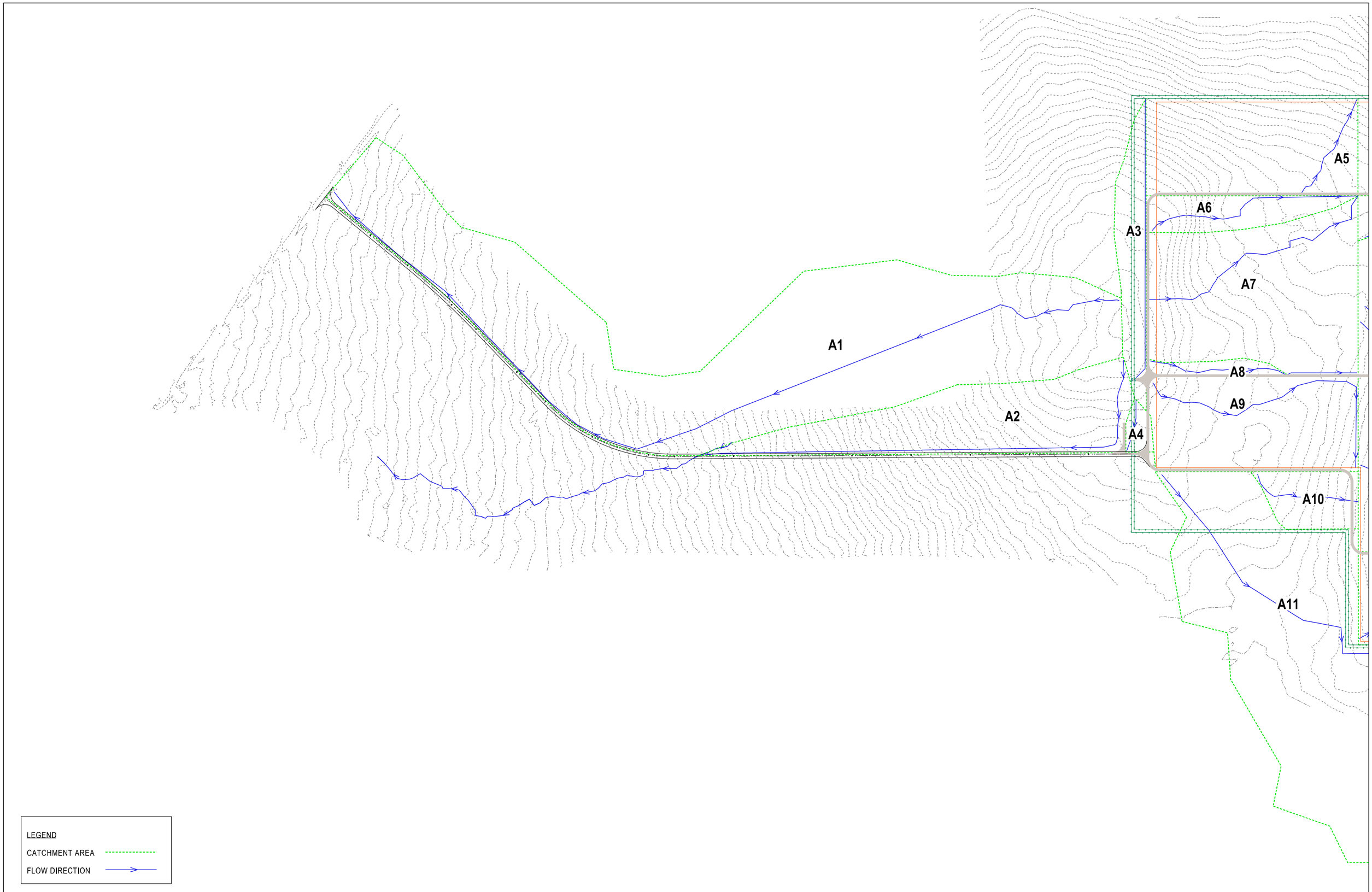

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B	26.03.14	MINOR CHANGE TO BERM AND OUTLET POSITIONS	JHB CONRADIE
A	19.03.14	FOR DISCUSSION ONLY	JHB CONRADIE

DRAWN	DESIGNED
HJ STEYN	HJ STEYN

CHECKED: JHB CONRADIE
APPROVED: DATE

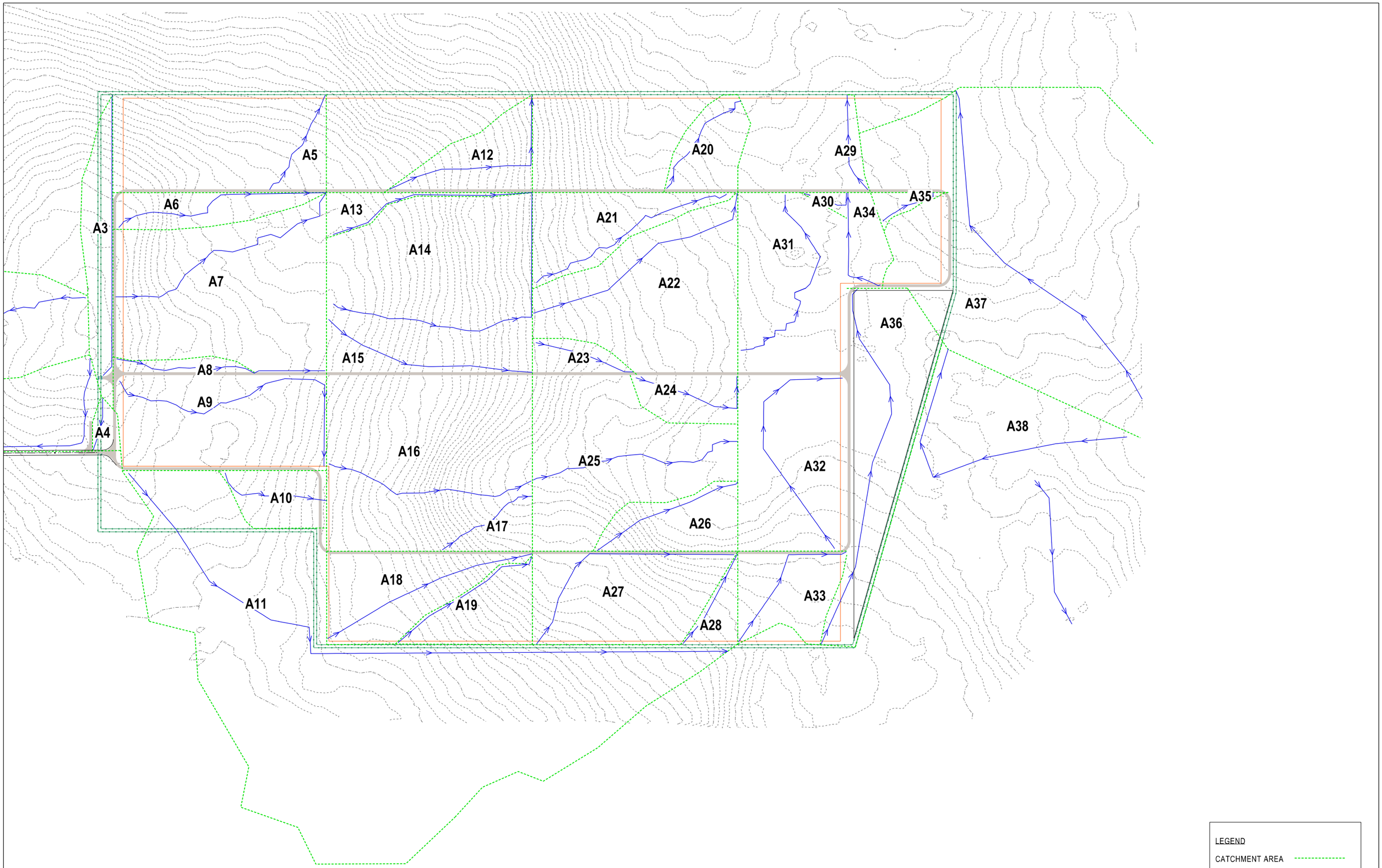
PROJECT: MULILO SONNEDIX PRIESKA PV

TITLE: CATCHMENT AREA-FLOW DIRECTION
ACCESS ROAD - SHEET 1 OF 2

FOR DISCUSSION ONLY

PROJECT No.: 110409
SCALE: 1:2000
SIZE: A0
DRAWING No.:
REV: B

2014/03/26



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JHB CONRADIE	
APPROVED	
DATE	

PROJECT
MULILO SONNEDIX PRIESKA PV

TITLE
CATCHMENT AREA-FLOW DIRECTION
FACILITY - SHEET 2 OF 2

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PROJECT No.
110409

SCALE	SIZE
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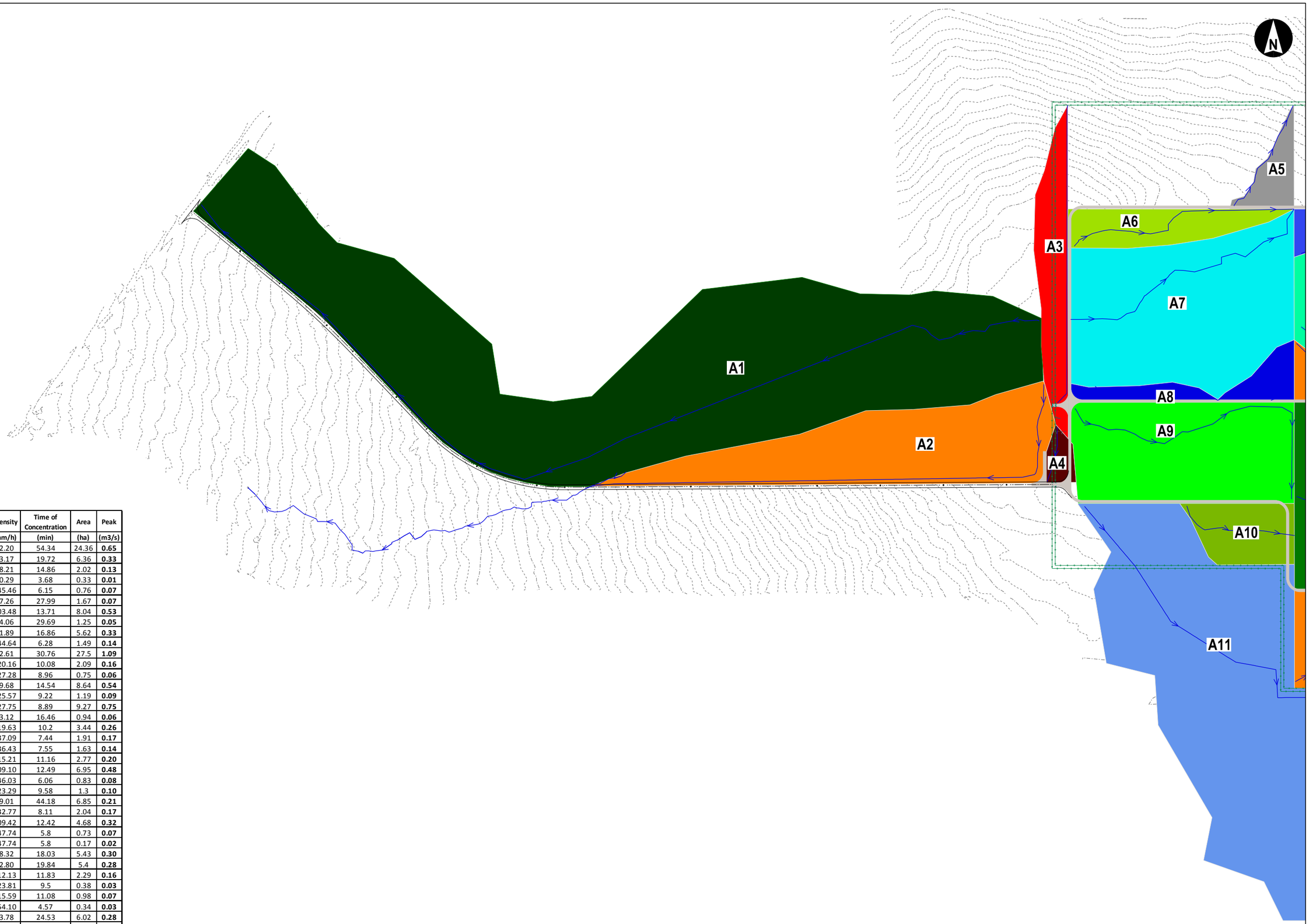
DRAWING No.	REV
	B

2014/03/26



Catchment ID	Method	Runoff Coef	Intensity (mm/h)	Time of Concentration (min)	Area (ha)	Peak (m3/s)
A1	Rational	0.23	42.20	54.34	24.36	**0.65**
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A4	Rational	0.23	30.29	3.68	0.33	**0.01**
A5	Rational	0.23	145.46	6.15	0.76	**0.07**
A6	Rational	0.23	67.26	27.99	1.67	**0.07**
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A9	Rational	0.23	91.89	16.86	5.62	**0.33**
A10	Rational	0.23	144.64	6.28	1.49	**0.14**
A11	Rational	0.23	62.61	30.76	27.5	**1.09**
A12	Rational	0.23	120.16	10.08	2.09	**0.16**
A13	Rational	0.23	127.28	8.96	0.75	**0.06**
A14	Rational	0.23	99.68	14.54	8.64	**0.54**
A15	Rational	0.23	125.57	9.22	1.19	**0.09**
A16	Rational	0.23	127.75	8.89	9.27	**0.75**
A17	Rational	0.23	93.12	16.46	0.94	**0.06**
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A19	Rational	0.23	137.09	7.44	1.91	**0.17**
A20	Rational	0.23	136.43	7.55	1.63	**0.14**
A21	Rational	0.23	115.21	11.16	2.77	**0.20**
A22	Rational	0.23	109.10	12.49	6.95	**0.48**
A23	Rational	0.23	146.03	6.06	0.83	**0.08**
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A25	Rational	0.23	49.01	44.18	6.85	**0.21**
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A30	Rational	0.23	147.74	5.8	0.17	**0.02**
A31	Rational	0.23	88.32	18.03	5.43	**0.30**
A32	Rational	0.23	82.80	19.84	5.4	**0.28**
A33	Rational	0.23	112.13	11.83	2.29	**0.16**
A29	Rational	0.23	123.81	9.5	0.38	**0.03**
A34	Rational	0.23	115.59	11.08	0.98	**0.07**
A35	Rational	0.23	154.10	4.57	0.34	**0.03**
A36	Rational	0.23	73.78	24.53	6.02	**0.28**
A37	Rational	0.23	76.33	23.18	24.56	**1.19**
A38	Rational	0.23	68.93	27.1	7.47	**0.33**

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A	10.03.14	FOR DISCUSSION ONLY	JHB CONRADIE

DRAWN: HJ STEYN | DESIGNED: HJ STEYN
CHECKED: JHB CONRADIE
APPROVED:
DATE:

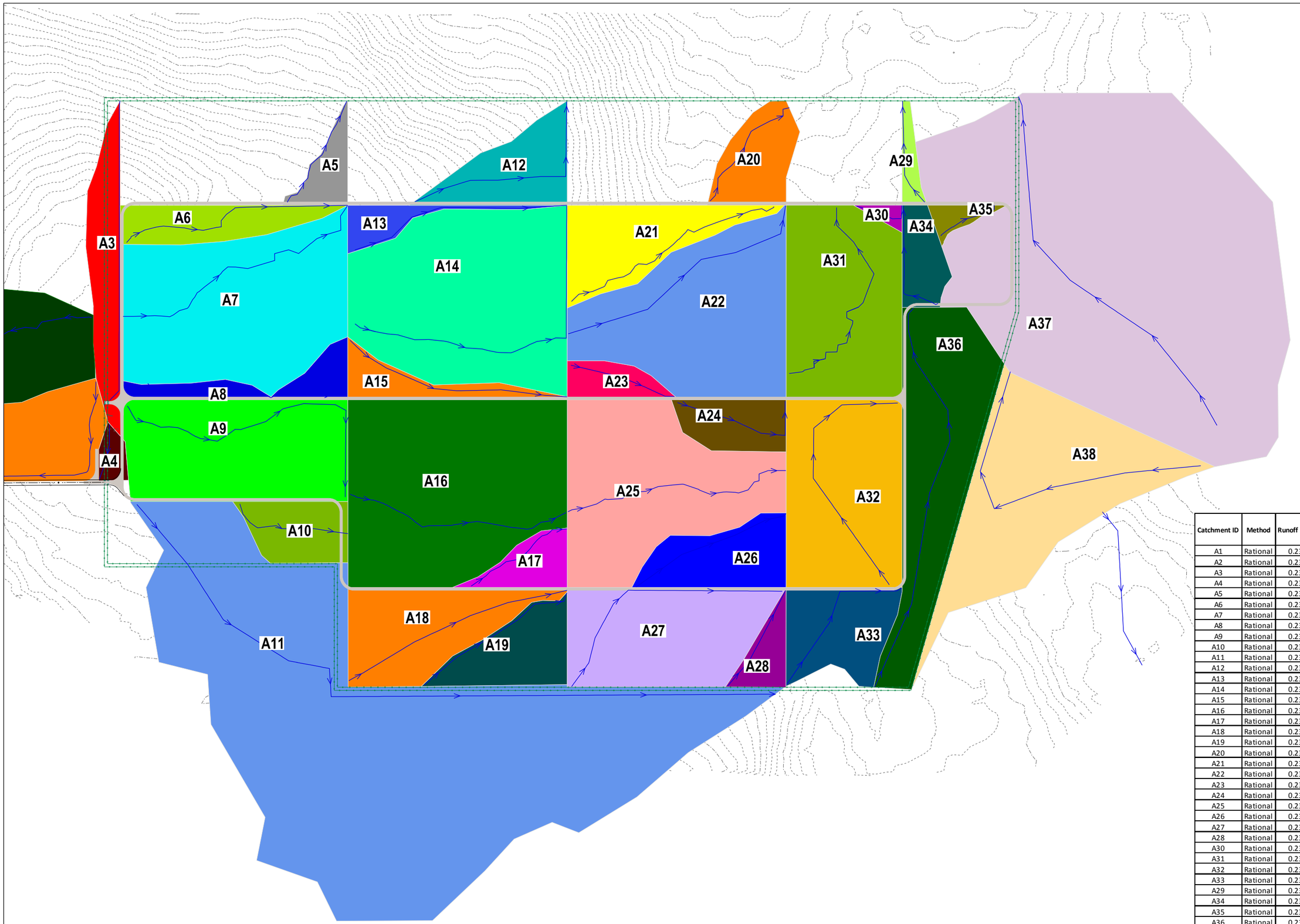
PROJECT: MULILO SONNEDIX PRIESKA PV

TITLE: STORMWATER MANAGEMENT PLAN
ACCESS ROAD - SHEET 1 OF 2

FOR DISCUSSION ONLY

PROJECT No. 110409
SCALE 1:2000 | SIZE A0
DRAWING No. 110409-SC-01 | REV B

2014/03/26



Catchment ID	Method	Runoff Coef	Intensity (mm/h)	Time of Concentration (min)	Area (ha)	Peak (m3/s)
A1	Rational	0.23	42.20	54.34	24.36	**0.65**
A2	Rational	0.23	83.17	19.72	6.36	**0.33**
A3	Rational	0.23	98.21	14.86	2.02	**0.13**
A4	Rational	0.23	30.29	3.68	0.33	**0.01**
A5	Rational	0.23	145.46	6.15	0.76	**0.07**
A6	Rational	0.23	67.26	27.99	1.67	**0.07**
A7	Rational	0.23	103.48	13.71	8.04	**0.53**
A8	Rational	0.23	64.06	29.69	1.25	**0.05**
A9	Rational	0.23	91.89	16.86	5.62	**0.33**
A10	Rational	0.23	144.64	6.28	1.49	**0.14**
A11	Rational	0.23	62.61	30.76	27.5	**1.09**
A12	Rational	0.23	120.16	10.08	2.09	**0.16**
A13	Rational	0.23	127.28	8.96	0.75	**0.06**
A14	Rational	0.23	99.68	14.54	8.64	**0.54**
A15	Rational	0.23	125.57	9.22	1.19	**0.09**
A16	Rational	0.23	127.75	8.89	9.27	**0.75**
A17	Rational	0.23	93.12	16.46	0.94	**0.06**
A18	Rational	0.23	119.63	10.2	3.44	**0.26**
A19	Rational	0.23	137.09	7.44	1.91	**0.17**
A20	Rational	0.23	136.43	7.55	1.63	**0.14**
A21	Rational	0.23	115.21	11.16	2.77	**0.20**
A22	Rational	0.23	109.10	12.49	6.95	**0.48**
A23	Rational	0.23	146.03	6.06	0.83	**0.08**
A24	Rational	0.23	123.29	9.58	1.3	**0.10**
A25	Rational	0.23	49.01	44.18	6.85	**0.21**
A26	Rational	0.23	132.77	8.11	2.04	**0.17**
A27	Rational	0.23	109.42	12.42	4.68	**0.32**
A28	Rational	0.23	147.74	5.8	0.73	**0.07**
A30	Rational	0.23	147.74	5.8	0.17	**0.02**
A31	Rational	0.23	88.32	18.03	5.43	**0.30**
A32	Rational	0.23	82.80	19.84	5.4	**0.28**
A33	Rational	0.23	112.13	11.83	2.29	**0.16**
A29	Rational	0.23	123.81	9.5	0.38	**0.03**
A34	Rational	0.23	115.59	11.08	0.98	**0.07**
A35	Rational	0.23	154.10	4.57	0.34	**0.03**
A36	Rational	0.23	73.78	24.53	6.02	**0.28**
A37	Rational	0.23	76.33	23.18	24.56	**1.19**
A38	Rational	0.23	68.93	27.1	7.47	**0.33**

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REV	DATE	REVISION DETAILS	APPROVED
B	26.03.14	MINOR CHANGE TO BERM AND OUTLET POSITIONS	JHB CONRADIE
A	10.03.14	FOR DISCUSSION ONLY	JHB CONRADIE

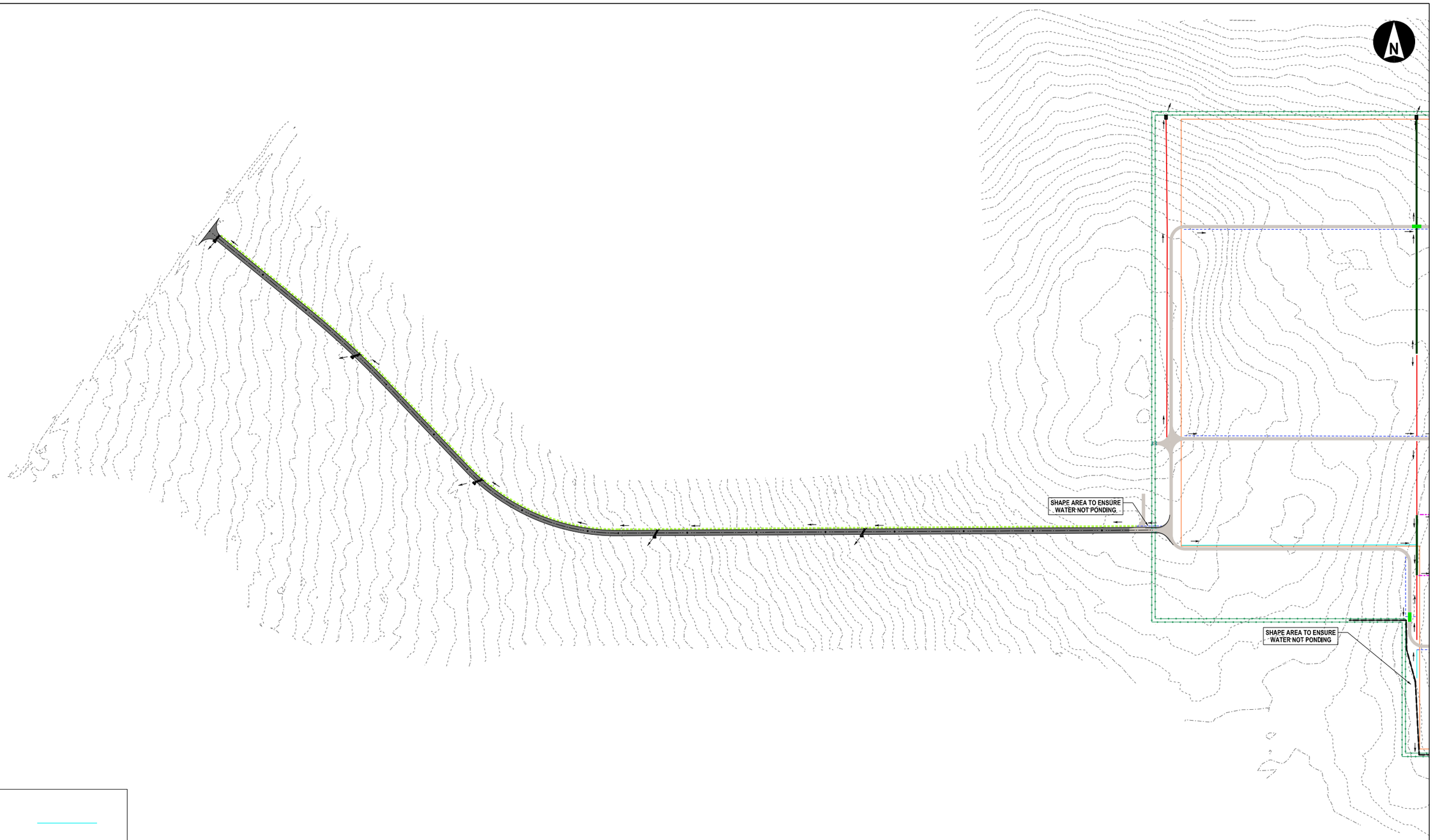
DRAWN: HJ STEYN | DESIGNED: HJ STEYN
CHECKED: JHB CONRADIE
APPROVED: DATE

PROJECT: MULILO SONNEDIX PRIESKA PV

TITLE: STORMWATER CATCHMENT LAYOUT FACILITY - SHEET 2 OF 2

FOR DISCUSSION ONLY
PROJECT No. 110409
SCALE: 1:2000 | SIZE: A0
DRAWING No. 110409-SC-02 | REV: B

2014/03/26



LEGEND

- DRAINAGE DITCH TYPE T1 (2m)
- DRAINAGE DITCH TYPE T2 (3m)
- DRAINAGE DITCH TYPE T3 (5m)
- DRAINAGE DITCH TYPE T4 (8m)
- DRAINAGE DITCH TYPE T5 (3m)
- DRAINAGE DITCH TYPE T6 (2m)
- DRAINAGE DITCH TYPE T7 (3m)
- CUT-OFF BERMS
- OUTLET WITH EROSION CONTROL
- CONCRETE DRIFT CROSSING

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REV	DATE	REVISION DETAILS	APPROVED
C	27.03.14	AMENDMENTS TO LAYOUT	JHB CONRADIE
B	26.03.14	MINOR CHANGE TO BERM AND OUTLET POSITIONS	JHB CONRADIE
A	16.03.14	FOR DISCUSSION ONLY	JHB CONRADIE

DRAWN	DESIGNED
HJ STEYN	HJ STEYN
CHECKED	
JHB CONRADIE	
APPROVED	
DATE	

PROJECT
MULILO SONNEDIX PRIESKA PV

TITLE
STORMWATER MANAGEMENT PLAN
ACCESS ROAD - SHEET 1 OF 2

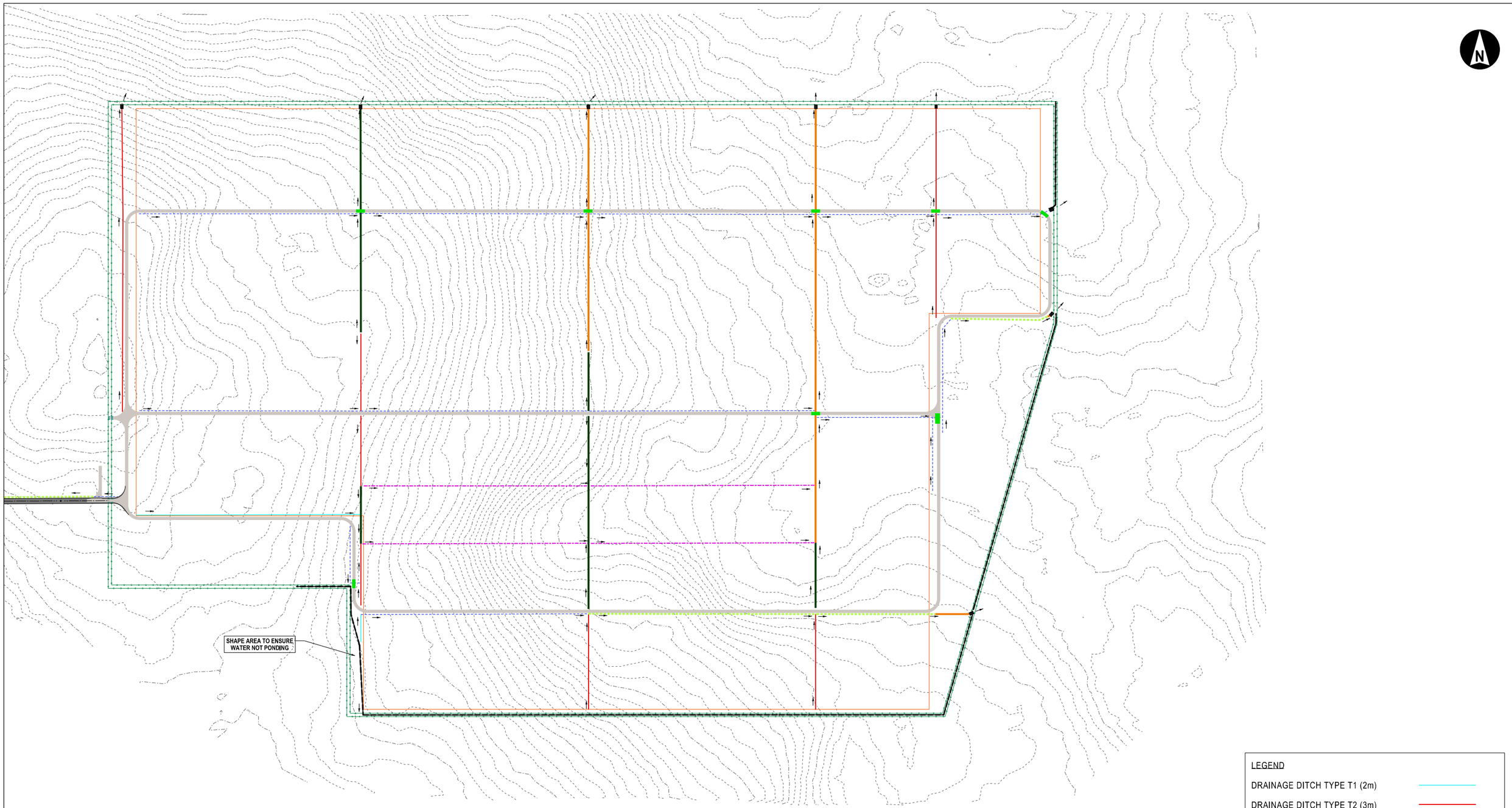
FOR DISCUSSION ONLY

PROJECT No.
110409

SCALE	SIZE
1:2000	A0

DRAWING No.	REV
110409-SMP-01	C

2014/03/27



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DRAWN	DESIGNED
HJ STEYN	HJ STEYN

CHECKED
JHB CONRADIE

APPROVED
DATE

PROJECT
MULILO SONNEDIX PRIESKA PV

TITLE
STORMWATER MANAGEMENT PLAN
FACILITY - SHEET 2 OF 2

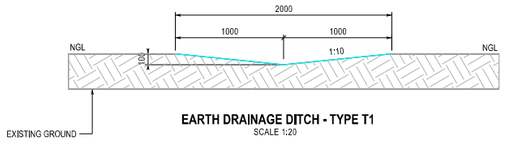
FOR DISCUSSION ONLY

PROJECT No.
110409

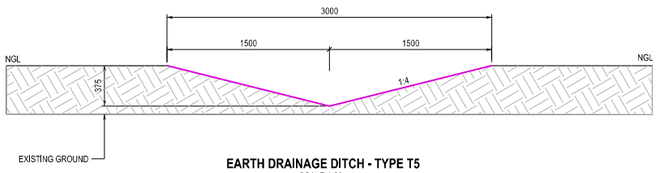
SCALE	SIZE
1:2000	A0

DRAWING No.	REV
110409-SMP-02	C

2014/03/27



EARTH DRAINAGE DITCH - TYPE T1
SCALE 1:20



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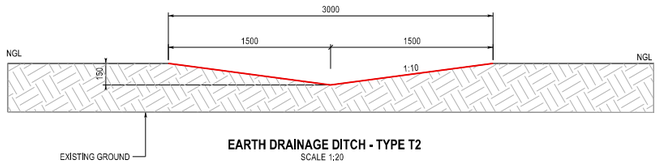

EARTH DRAINAGE DITCH - TYPE T2
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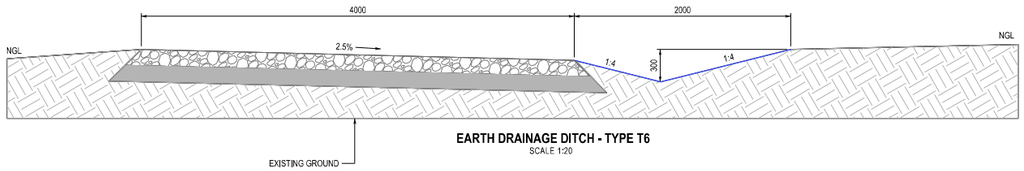
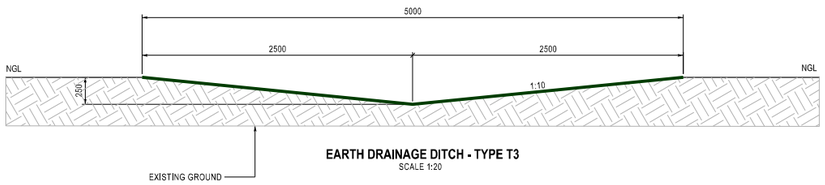
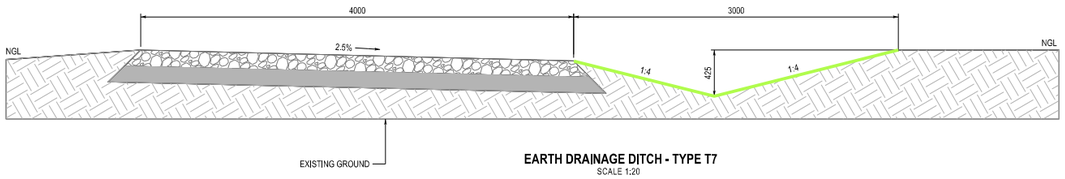


EARTH DRAINAGE DITCH - TYPE T6
SCALE 1:20



EARTH DRAINAGE DITCH - TYPE T3
SCALE 1:20



EARTH DRAINAGE DITCH - TYPE T7
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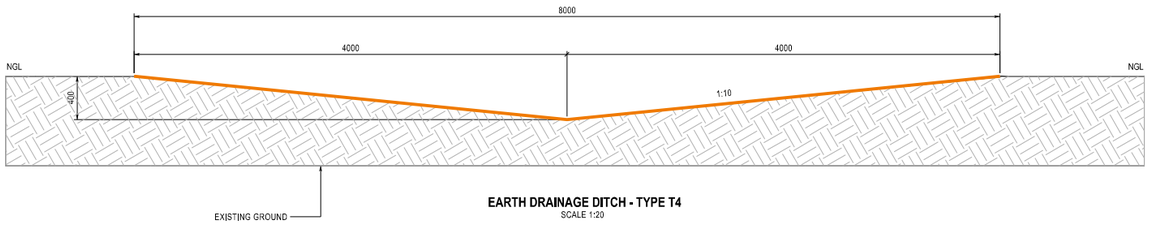
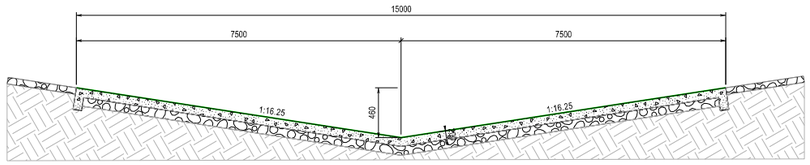


EARTH DRAINAGE DITCH - TYPE T4
SCALE 1:20



CONCRETE DRIFT CROSSING
SCALE 1:50

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REV	DATE	REVISION DETAILS	APPROVED
C	27.03.14	UPDATES TO DETAILS AND DESCRIPTIONS	JHB CONRADIE
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DATE

PROJECT
MULILO SONNEDIX PRIESKA PV

TITLE
TYPICAL DRAINAGE DETAILS - SIDE DRAINS

FOR DISCUSSION ONLY

PROJECT No.
110409

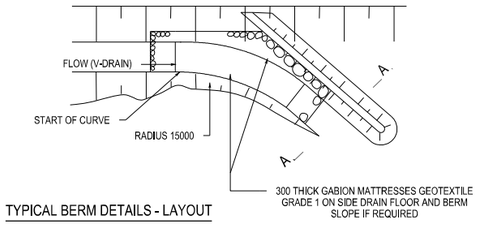
SCALE
AS SHOWN

SIZE
A0

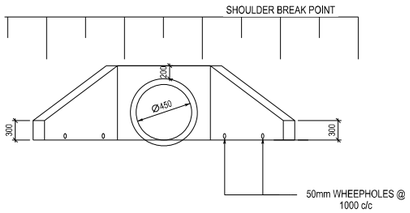
DRAWING No.
110409/TD/02

REV
C

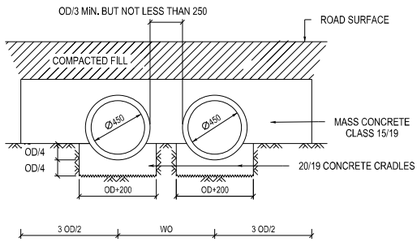
2014/03/27



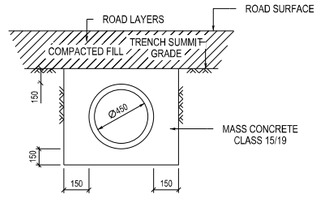
TYPICAL BERM DETAILS - LAYOUT



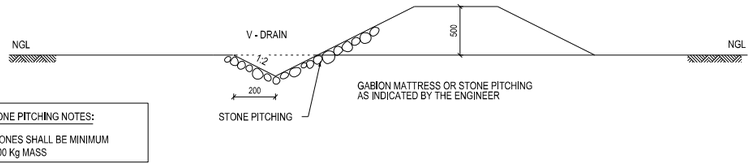
ELEVATION B-B



CONCRETE CASEMENT
SOIL FOUNDATION

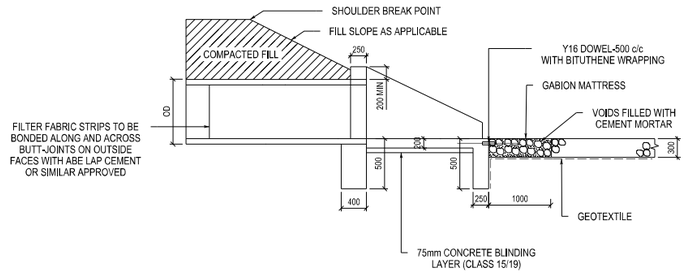


SECTION C-C

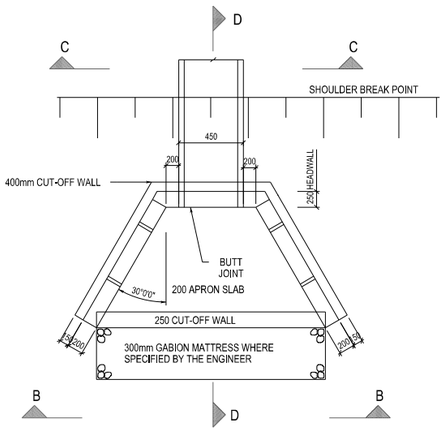


STONE PITCHING NOTES:
1. STONES SHALL BE MINIMUM 300 Kg MASS

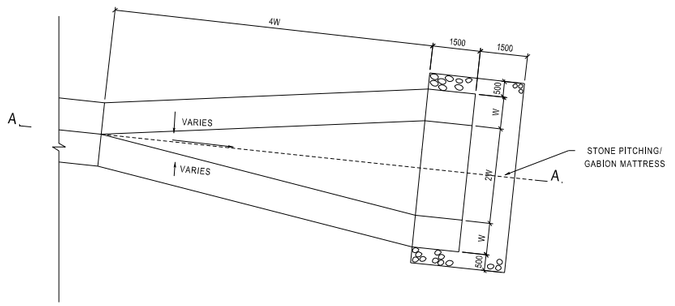
TYPICAL BERM DETAILS - SECTION A-A



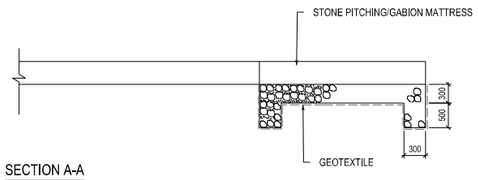
TYPICAL CULVERT INLET/OUTLET
SECTION D-D



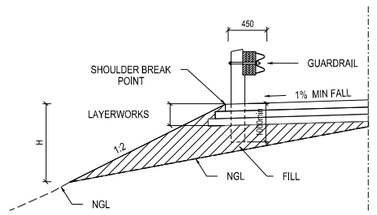
PLAN - SQUARE CULVERT OUTLET



SIDE DRAINS OUTLET



SECTION A-A



NOTE:
1. WHERE H > 3m, INSTALL GAURDRAILS ON HARDSTAND PLATFORM

TYPICAL GAURDRAIL INSTALLATION

GUARDRAIL NOTES
1. GAURDRAILS TO BE PLACED ON EDGE OF HARDSTAND/TURNAROUND POINTS WHERE FILL 3m.
2. GAURDRAILS SHALL NOT BE PLACED IN POSITIONS THAT WILL OBSTRUCT THE ASSEMBLY OF TURBINES. WHERE GAURDRAILS OBSTRUCTS THE ASSEMBLY OF ROTAR, THEY SHALL BE TEMPORARILY REMOVED.
3. WHERE HARDSTAND AREAS ARE TO BE REHABILITATED, GAURDRAILS SHALL BE MOVED TO NEW POSITIONS AS DECIDED ON SITE.

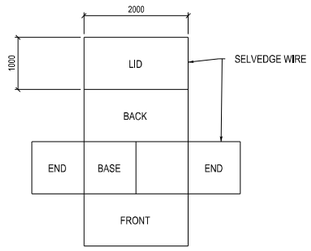


FIGURE 1

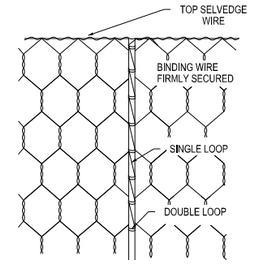


FIGURE 3

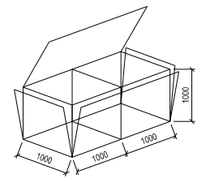


FIGURE 2

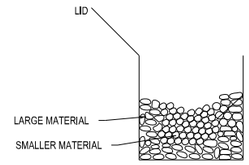


FIGURE 4

GABION BOX DETAILS

GABION NOTES:
1. GABION BOXES : (80x100) WIRE MESH
   MESH WIRE : 2,7mm AND PVC COATED
   SELVEDGE WIRE : 3,4mm AND PVC COATED
   BINDING WIRE : 2,2mm AND PVC COATED
2. FILLING STONE NOT LARGER THAT 250mm AND NOT SMALLER THAT THE SIZE OF THE MESH

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PROJECT: MULILO SONNEDIX PRIESKA PV

TITLE: TYPICAL DETAIL DRAWINGS GENERAL DETAILS

FOR DISCUSSION ONLY
PROJECT No. 110409
SCALE: AS SHOWN | SIZE: A0
DRAWING No. 110409-TD-01 | REV: A

2014/03/26