

REPORT NO: NME 10007 DKMP 2

PABALELLO DEVELOPMENT AREA

No 2

STORMWATER REPORT



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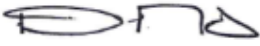
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Approval

The following Signatories approve this document:

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Revision History

| REV | DATE | DESCRIPTION | AFFECTED PAGES | ORIGINATOR |
|-----|------------|--|----------------|------------|
| 0 | 19/06/2023 | Dawid Kruiper Municipality Development Area No.2 | All | FD Maritz |
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| | | | | |

1. Introduction

Dawid Kruiper Municipality's Pabalello Development Site No.2 is located in Pabalello, Upington, Northern Cape Province of South Africa. The Google Image shows the exact location of the area.

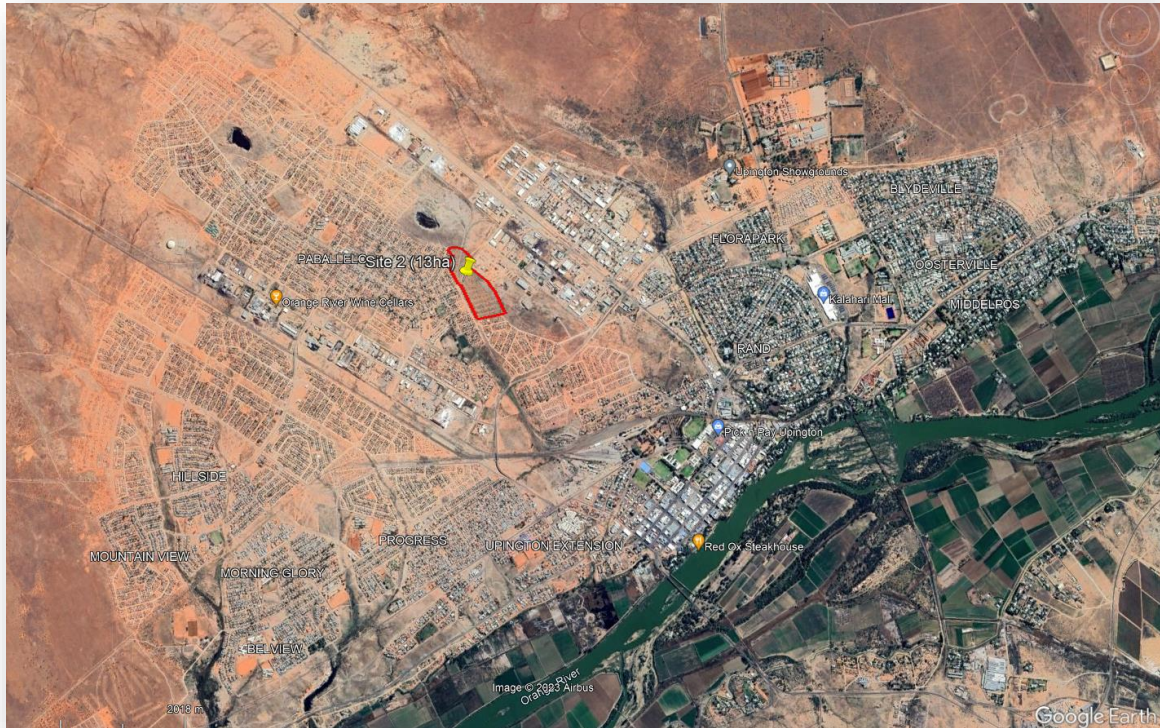


Figure 1: Location map for the Pabalello (Dawid Kruiper Municipality) Development Site No.2

One of the requirements of the Environmental Impact Assessment process is that a stormwater management plan be drafted for Pabalello Development Site No. 2.

The development area is located at 825m above mean sea level. The Mean Annual Precipitation in the area is given as 200 mm per annum, with a hN (1h,25 a) of 38 mm.

Dawid Kruiper Development Area No.2 covers approximately 13 ha.

This Report also contains recommendations related to the Storm Water Management Plan for Dawid Kruiper Development Area No.2.

2. Scope of Works

2.1. Project initiation and management

The need for a Stormwater Management Plan arose during the EIA process. Subsequently, NME Engineering (trading as FD Maritz) were contacted by Enviro Africa to conduct said stormwater management plan.

2.2. Hydrology review

A desktop hydrology review was undertaken by the Engineer to assess the catchment characteristics and delineation.

2.3. Stormwater Investigation and report

Most of the area has informal housing structures on it and can be identified as a “clean” area in terms of water runoff.

The purpose of this Report/Stormwater Management Plan is to assess the risk for potential damage during rainstorms. The further purpose is to propose measures and stormwater-related infrastructure, if necessary, to manage stormwater effectively and protect the environment.

3. Methodology

The methodology for compiling this document was as follows:

- Acquiring information on the area and existing infrastructure that form part of Dawid Kruiper Development Area No. 2.
- Determining and assessing the characteristics of the target area in terms of stormwater drainage and hydrology.
- Assessing the impact of the existing infrastructure.
- Recommendations for the management of stormwater.

4. Description of site

4.1. General

The target area can generally be described as hard with little vegetation. Stormwater drainage generally takes place overland in a South Westerly direction on a steepish slope of 1:25. No rivers or small streams run through the project area. There are no formal stormwater structures.

The figure below shows Pabalello Site 2 with contours. The industrial area to the north-east can also be seen.

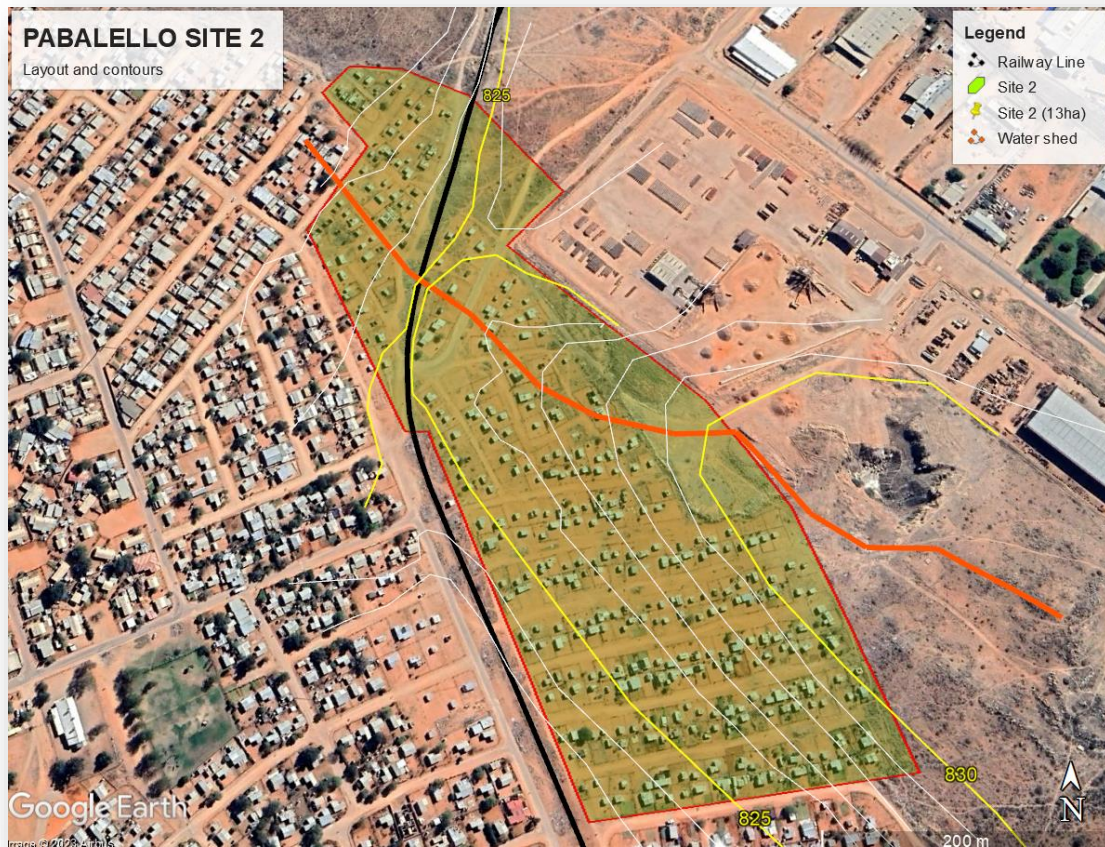


Figure 2: Pabalello Development Area 2

4.2. Current infrastructure in the target area

Informal structures have been erected over a very large part of the development area. The figure below shows a drone picture taken recently. Figure 3: Drone photo of Pabalello Development Site 2



Figure 4: Street and Infrastructure - Pabalello Development Site 2

The photo shows a photo of the infrastructure and a street in the direction of the natural runoff



Figure 5: Street and Infrastructure - Pabalello Development Site 2

The current informal infrastructure will probably dictate the town planning.

5. Hydrology

5.1. Drainage region.

Upington is located in Primary Drainage Region D which falls in a summer rainfall region. Pabalello Development Site 2 is only 13 hectares and covers a negligibly small part of the catchment area.

5.2. Hydrological data applicable to and drainage of the target area

The Google image in Figure 5 shows the natural drainage of Pabalello Development Site 2 as well as the watershed and catchment areas.

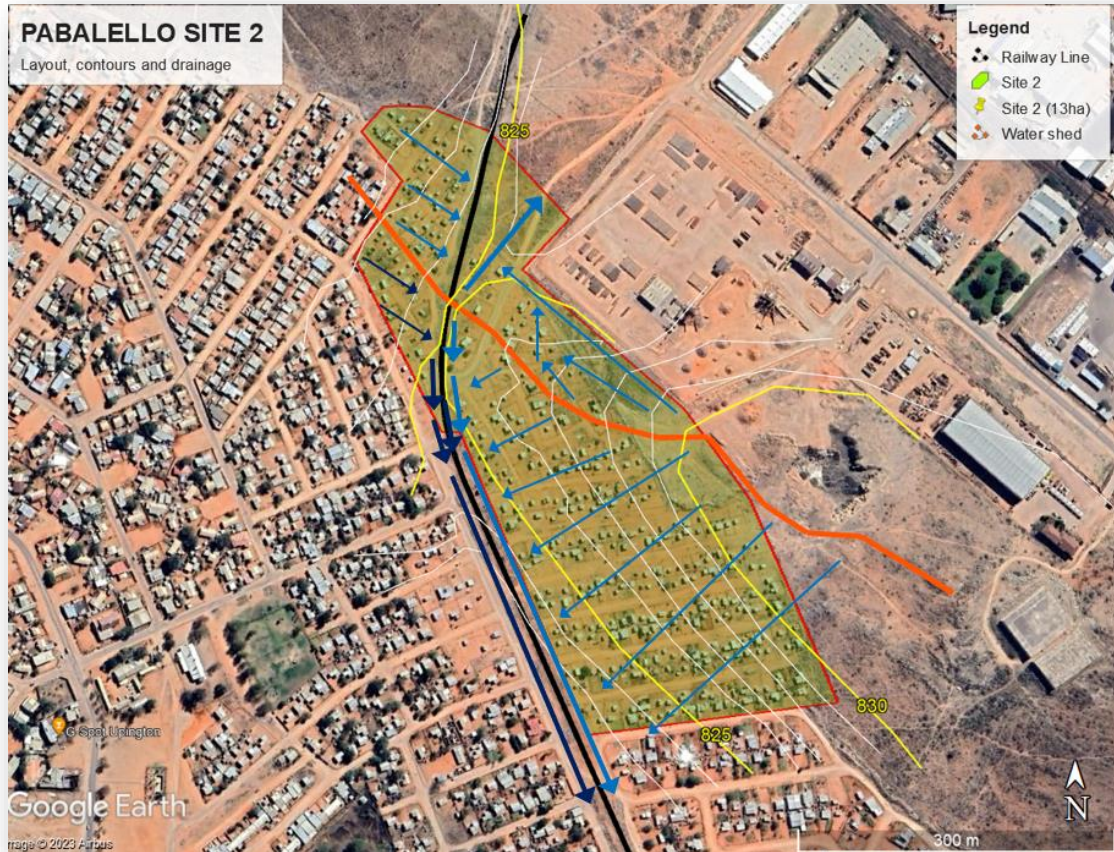


Figure 6: Catchment and natural drainage on Pabalello Development Site 2

The image shows the watershed (**red lines**) outside of Pabalello Development Area 2. All water in the area drains overland. The direction of the natural overland drainage lines is shown by the **thin blue arrows**. The water flows overland to the **railway line**, which forms a barrier. The **thick blue arrows** parallel to the railway line show the south-easterly direction in which the accumulated overland water flows.

The following describes the Pabalello Development Site No.2 area in terms of stormwater drainage:

- Stormwater runoff can be described as 100% overland flow through the development area. There are no natural watercourses or significant obstructions.

- Existing streets cross the development in the same direction as the natural contours (perpendicular to the overland water flow), and there are no significant stormwater structures on the roads. Stormwater crosses the roads naturally.
- The natural slope in the Pabalello Development Site 2 target area in the region of 1:25, resulting in maximum overland runoff velocities of less than 1.0 m/s. Little erosion is currently visible.
- The soil is a reddish dune sand with little vegetation
- The current infrastructure creates in some instances barriers that force the water to flow in the streets.

The following hydrological data applies to the area.

| | |
|---|--------------------|
| Mean Annual Precipitation | 200 mm per annum. |
| Mean Annual Evaporation | 1800 mm per annum. |
| 1-hour peak rainfall depth for a 25 year return period | 38 mm |
| 24-hour peak rainfall depth for a 25 year return period | 75 mm |
| Largest Catchment area | 0.1 sq.km |
| Longest stormwater runoff (overland) | 0.3 km |

1.1. Hydrological calculations

The whole area is subjected to overland flow, and hydrological calculations are therefore not applicable.

1.2. Downstream Water Users

The Pabalello Development Area No.1 area drains to natural water courses to the Orange River.

2. Conceptual Storm Water Management Plan

2.1. Principles of this Report/Storm Water Management Plan (SWMP)

A Storm Water Management Plan (SWMP) is a statutory requirement for residential developments in South Africa.

The purpose of a SWMP is primarily to prevent stormwater damage and pollution of water resources in and around the development area. The regulations define a methodical approach to be followed for the prevention and /or containment of pollution on target development areas during the construction of municipal services and housing infrastructure. The regulations also set design standards and specify measures that must be taken to monitor and evaluate the efficacy of pollution control measures that are implemented.

The principles of this report/SWMP include:

- **Management of “clean” and “dirty” water**
- **Preventing the pollution of water resources**
- **Prevent stormwater damage to land and solar-related infrastructure**

2.2. Applicability of the “principles” to the Dawid Kruiper Development Site 2

With this in mind, each of the requirements of a Storm Water Management Plan is tested in terms of its possible applicability at Pabalello Development Site 2 as follows:

Managing of clean “clean” and “dirty” water

During the construction phase, the Environmental Management Plan will prescribe and dictate actions to prevent pollution of the site and laydown areas.

When construction is completed, pollution from “dirty” water will be limited to the following that is addressed in the Environmental Impact Assessment:

- Sewer (concealed septic tanks) that will be emptied at an approved sewer treatment works.

Subsequently, stormwater will not pollute any natural resources as a result of the management of “dirty” water.

- **Preventing the pollution of water resources**

During the construction phase, the Environmental Management Plan will prescribe and dictate actions to prevent pollution of water resources.

Water sources will not be polluted as a result of stormwater when the plant is operational if the sewer, oil and solid waste are handled as described in the Environmental Impact Assessment.

Stormwater will not pollute any water sources if preventative matters are as described in the Environmental Impact Assessment and Environmental Management Plan.

Prevent stormwater damage to nature and solar-related infrastructure

This is probably the only issue of significance at Visserspan with regard to Storm Water Management.

Measures to address this issue are proposed in Section 7 of this report/Stormwater Management Plan.

3. Proposed Storm Water Infrastructure at Dawid Kruiper Development Area No.1

The Dawid Kruiper Development Area No.2 is very small (0.1 km²) in terms of hydrology, the risk of stormwater damage is very little as all water drains overland at fairly low velocities. Altering the natural flow and concentrating stormwater will not only be costly but will increase the risk of damage.

Our proposal that relates to stormwater management measures is therefore limited to the following:

- **That the building (Operation and Maintenance buildings and the Operational Centre) as well as the electrical-related infrastructure (Sub-Stations, Mini-sub, etc.), be constructed on a platform that enables stormwater to flow away from the infrastructure. This will be addressed during the final design.**

- **Excavations for PV panel infrastructure support will be done in such a manner that the natural ground level will only be disturbed in small areas. The ground must be repaired at the natural ground level.**
- **Trenches for cables and pipelines must be compacted and backfilled to the natural ground level**
- **Internal roads must be constructed as close as possible to the natural ground level. This will ensure that the natural flow of water will not be influenced. If necessary, gravel with the right properties can be used to create a smooth durable surface.**

We believe that these measures will address the management and handling of stormwater in a natural and simple way.

4. Conclusion

We trust that this report will provide the necessary information to make an informed decision with regard to the management of stormwater during the construction and operational phase of the Visserspan PV Solar Development.