

Verw: 2235DDR-S2

Datum: 12/12/2024

## **Sterkwater Farming**

Farm Helpmekaar

Koue Bokkeveld

PO Box 103

Ceres

6835

Mr J Gibson

## **PRELIMINARY DESIGN REPORT FOR THE PROPOSED ENLARGEMENT OF LANGRUG-BOONSTE NR1 DAM, ALSO KNOWN AS HELPMEKAAR DAM, ON RIETRIVIER 202 PORTION 5, DISTRICT CERES, STERKWATER FARMING**

Our previous Feasibility Report, *2235DDR-S1 dated 15 December 2022*, received drawings of the existing dam as well as your subsequent instruction regarding the investigation and preliminary design of the construction of the above mentioned dam, refers.

### **1. BACKGROUND**

The proposed dam is located on the farm Rietrivier 202/5 at the foot of the Koue Bokkeveld mountain range, about 50km north of Ceres as the crow flies, refer **Appendix B1**.

The preliminary design normally follows after the feasibility stage and will then serve as the basis for the final design and contract specifications. However, in this case we consider stage 1 as being completed under the previous investigation referred to above, with this being the preliminary design of an enlargement of the existing dam.

In addition to the aforementioned, before a "License to Construct" can be issued, an "Environmental Authorisation (EA)" as well as a "Water Use License (WUL)" have to be obtained from the respective authorities. In order to address these two aspects, a preliminary dam design is required containing specific technical information on the dam, which then serve as supportive documentation to the respective applications.

The larger project entails the construction of both the enlargement of Langrug-Boonste Nr 1 dam, also known as Helpmekaar dam, and a small new buffer dam with its accompanying  $\pm 2$ km connecting pipeline as well as an agricultural expansion. This report however focusses on the design and construction of the proposed in-stream enlargement of Helpmekaar Dam with a provisional total storage in the order of  $\pm 800\,000\text{m}^3$ .

The proposed application for Helpmekaar Dam is based on an additional new surface water taking of  $410\,000\text{m}^3$  directly from the upper tributaries of the Leeu River. The dam enlargement will therefore ensure the conversion of about  $\pm 45$ ha annual cash crops into permanent fruit orchards.

Hence, the proposed project will also positively impact the previously disadvantaged groups as well as the broader economy in the long term.

## 2. ASSIGNMENT

The preliminary design normally follows after the scoping or feasibility stage which serves as basis for the final design and contract specifications to follow in line with dam safety regulations in terms of chapter 12 of the National Water Act, 1998 (Act 36 of 1998).

**Sarel Bester Engineers** have been appointed as the project engineer and coordinator overseeing the various processes and components regarding legal requirements as well as the design of the dam while also handling the Water Use License Application (WULA).

Instruction was subsequently given to proceed with the preliminary design stage for licensing purposes. The Environmental Impact Assessment (EIA) in accordance with the NEMA guidelines, is currently in progress under the care of **EnviroAfrica**.

Surveyed data was converted to the WGS84 universal world map grid in order to relate and overlay it onto the world map for referencing purposes.

Part of the preliminary design process include checking, verifying and updating information obtained from previous documentation as and where required and applicable with regard to storage capacity, expected earthworks quantities as well as the costing of the project for this purpose.

The intention and purpose of the Preliminary Dam Design Report is and will be used to:

- inform you as client of the concerned investigation regarding storage options along with provisional cost estimations.
- serve as motivational technical appendix to DWS regarding the water license application,
- serve as information to DEADP with regard to the environmental impact assessment, and
- serve as a basis to Dam Safety Office regarding proper classification and APP matters.

**Note**, the application is based on a new taking and the impact thereof on downstream water users have been covered elsewhere.

## 3. APPLICATION & MOTIVATION

The WULA as such including the motivation and potential impact on downstream users is dealt with in full in a separate report compiled by our offices. The application entails a new taking of 410 000m<sup>3</sup> from the local catchment to be stored in the proposed enlargement of the instream Langrug-Boonste Nr 1 dam, also known as Helpmekaar dam. The existing dam will be enlarged from a storage capacity of about 390 000m<sup>3</sup> to a total capacity of 800 000m<sup>3</sup>. Water will thus be abstracted during winter surplus periods and stored for irrigation in the dry summer seasons.

With the additional taking, the water user, namely *Sterkwater Boerdery*, will be able to convert about 45ha of annual cash crops into permanent fruit orchards. This agricultural expansion in itself will ensure long term economic viability as well as sustainability of the farming entity by creating additional permanent jobs within the agricultural industry.

The proposed dam site is located within the upper tributary of the Leeu River within the E21G quaternary catchment area.

Other motivational information as required in terms of Section 27 of the National Water Act, forms part of and is included in the WULA submitted separately.

#### 4. ALTERNATIVES

Since the farm is basically fully developed apart for the hilly areas, only two dam sites were evaluated in the feasibility report, 2355DDR-S1, dated 15Dec 2022. Site 1, namely the enlargement of Langrug-Boonste Nr 1 dam is by far the most economic site being an in-stream dam. Langrug-Boonste Nr 1 dam is therefore the preferred option of the two investigated sites. The maximum storage scenarios for both sites have been evaluated and is listed below and the dam characteristics and accompanying risks & costs differ substantially. Ultimately the preferred dam is based on costs, efficiency and loss of existing producing orchards or fields. The calculations below are based upon surveys done in December 2022. The **Table** below shows the comparison of key aspects between the options investigated previously as presented in Feasibility Report, **2235DDR-S1** dated 15 December 2022.

**Table 1** Summary of key attributes for the maximum storage scenarios on the respective sites:

|                              | Maximum available storage scenarios for both sites                                               |                              |
|------------------------------|--------------------------------------------------------------------------------------------------|------------------------------|
|                              | Site 1 –<br>Langrug-Boonste Nr 1 Dam<br>(Enlargement of Existing Dam)<br><b>PREFERRED OPTION</b> | Site 2<br>(Proposed New Dam) |
| Wall Height (m)              | 15,5                                                                                             | 15,0                         |
| Gross Earthmoving (m³)       | 53 000                                                                                           | 181 000                      |
| Gross Storage Volume (m³)    | 1 260 000                                                                                        | 570 000                      |
| Storage Volume Gain (m³)     | 865 000                                                                                          | 570 000                      |
| Surface Area (ha)            | 22                                                                                               | 8                            |
| Ratio (Storage : Earthworks) | 16,5                                                                                             | 3,2                          |
| Proposed Category            | 2                                                                                                | 2                            |

From the data above, the most obvious difference between the two sites is that Site 1 is far superior from an economical perspective with a storage : earthworks ratio in excess of 15.

#### 5. WATER USE

The proposed enlargement of Langrug Boonste Nr 1 dam is located on Rietrivier 202 portion 5 which is owned by Whitethorn Trust, however, the farm is leased and farmed by *Sterkwater Boerdery Pty Ltd* who is also the applicant and water user.

The property has been researched and evaluated with regard to ownership and existing lawful water uses as part of the Water Use Licence Application. Refer to **Appendix A1 & A3** for more information.

##### A) Takings;(Ref WARMS 22071348)

- Prt 5 Riet River 202                      1 030 370m³    Surface Water (*to be verified*)
- Prt 5 Riet River 202                      100 000m³    Ground Water (*to be verified*)
- Total:**                      **1 130 370m³**

##### B) Existing Storage:

- Total Existing Storage                      **1 830 780m³**    13x dams

##### C) Application for New Taking: (Current Helpmekaar WULA)

- New Surface Taking:                      410 000m³

##### D) Application for New Storage: (Current Helpmekaar WULA)

- Additional Storage: 410 000m<sup>3</sup>
- Existing Capacity: 390 000m<sup>3</sup> (Existing Langrug Boonste Nr 1 Dam)
- Proposed Total Capacity: 800 000m<sup>3</sup> (Enlarged Langrug Boonste Nr 1 Dam)

## 6. DAM SAFETY & CLASSIFICATION

The project entails the proposed enlargement of Langrug Boonste Nr 1 dam (Helpmekaar Dam) and one of the first steps is to have the dam classified in terms of dam safety regulations. The application was submitted to the Dam Safety Office (DSO) in November 2024 and we await the outcome, refer attached **Appendix A2**.

The application for appointment as the *Approved Professional Person (APP)* for the design and construction supervision of the dam will be submitted to DSO prior to or at the time of the submission of the final stage of the WULA.

## 7. ENVIRONMENTAL IMPACT

Government Notices R385, R386 & R387 of 21 April 2006, issued under Chapter 5 of the National Environmental Management Act, 1998 (Act 107 of 1998), also known as the "NEMA" procedures, determines that *Langrug Boonste Nr 1 dam* does qualify for a full *Environmental Impact Study*. The impact assessment and application is currently under way and handled by **Messrs EnviroAfrica**.

## 8. EMPOWERMENT

The proposed project does not include or entail any particular form of integrated BBBEE component as part of the relevant farming entity. The farming unit is considered medium and is economically regarded as an SME (Small / Medium Economic Enterprise). Nevertheless, good and sound operating principles are being applied throughout the year for the benefit of empowerment of previously disadvantaged persons.

## 9. STATUTORY REQUIREMENTS – OTHER

According to our assessment, the proposed project is not close to nor will it interfere with existing infrastructure or servitudes regarding primary or secondary roads, Eskom power-lines or any other infrastructure that may require statutory way-leaves or legislative processes.

The scope of work is well outside the triggers for a *Construction Work Permit* which is to be obtained from the Department of Labour.

## 10. HYDROLOGY

The proposed enlargement is located within the upper reaches of the Leeu River in the E21G quaternary catchment, within the larger Olifants-Doorn River catchment system, see **Appendix B2**.

The application is solely based on a new taking from the local catchment and therefore a simplified run-off study was done in order to determine the local drainage and availability of water.

The **Table** below summarises the attributes of the local versus the quaternary drainage area:

|               | QUATERNARY<br>CATCHMENT | PRO-RATA<br>LOCAL CATCHMENT |                                 |
|---------------|-------------------------|-----------------------------|---------------------------------|
|               | E21G                    | LANGRUG-BOONSTE Nr1 DAM     |                                 |
| Area          | 266                     | 3,87                        | km <sup>2</sup>                 |
| MAP           | 475                     | 475                         | mm                              |
| MAR           | 117                     | 117                         | mm                              |
| Virgin Runoff | 25%                     | 25%                         |                                 |
| MAR (Virgin)  | 31,08                   | 0,45                        | x10 <sup>6</sup> m <sup>3</sup> |

The above table indicates the hydrological potential of the local catchment of the proposed dam site showing a potential runoff (MAR) in the order of 450 000m<sup>3</sup> based on the WRC model, thus leaving about 12% for Instream Flow Requirement. (IFR).

## 11. SPILLWAY DESIGN CRITERIA

The proposed enlargement of Langrug Boonste Nr 1 dam is awaiting classification from the Dam Safety Office, but is expected to be a **Medium Category II** dam with a **Significant** Hazard Potential.

*Guidelines for the determination of appropriate flood sizes appears in SANCOLD "Guidelines on Safety in Relation to Floods", (Report 4, SANCOLD, December 1991) with reference to Table 5.4 therein for the Suggested Recommended Design Flood return periods (years) as follows:*

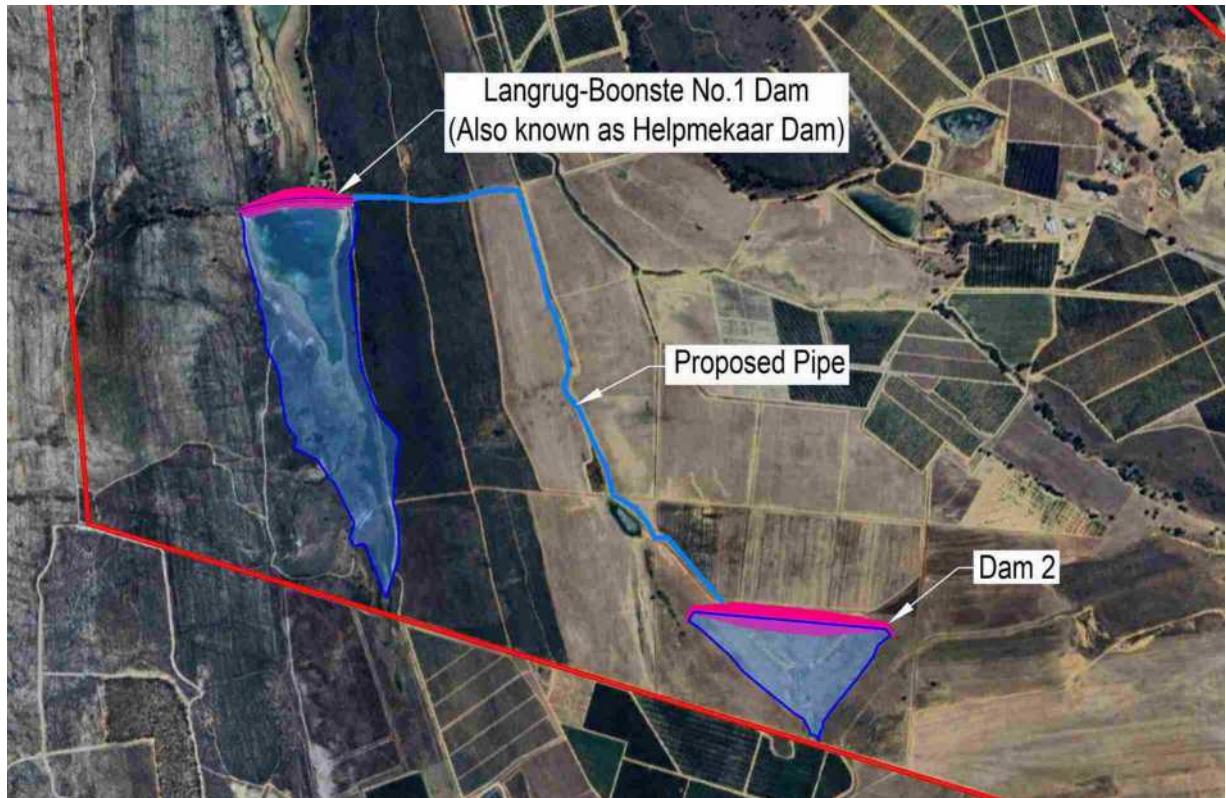
| Dam Size Class  | Hazard Rating |             |      |
|-----------------|---------------|-------------|------|
|                 | Low           | Significant | High |
| Small (5-12m)   | 20 - 50       | 100         | 100  |
| Medium (12-30)m | 100           | 100         | 200  |
| Large (>30m)    | 200           | 200         | 200  |

**Note,** Based on the expected classification and the table above the spillway system of the enlarged Helpmekaar Dam should be designed for the RDF equal to the **1:100 year** flood peak.

Various methods are normally used based on the SANCOLD guidelines and in this case the proposed **Recommended Design Flood (RDF)** is equivalent to the 1:100 flood peak in the order of **±25m<sup>3</sup>/s**, see **Appendix C1**. However, the final design does take this to a next level by routing the flood through the dam basin which normally would reduce the flood peak for benefits of a smaller spillway. In this case we expect the reduction to be substantial.

## 12. PROPOSED PIPELINE

The proposed connecting pipe route starts at the dam to-be-enlarged, crossing over a hill where it makes a 90° turn, following alongside the farm road towards the proposed new buffer dam. The pipeline is mainly for operational reasons and would serve the purpose of moving water between dams to where it would be practical to irrigate from. Refer **Proposed Pipeline Route** below.



The HDPE / PVC pipeline is planned to be about  $\pm 1,7\text{km}$  long, having a diameter of either  $\varnothing 300\text{mm}$  or  $\varnothing 360\text{mm}$  with an average design velocity of  $\pm 1,2\text{m/s}$  to be installed with a cover of at least  $\pm 0,6\text{m}$  deep.

## 13. GEOLOGY

The two proposed site has the following geological characteristics. *Langrug Boonste Nr 1 dam* is located on a formation described as sandy soil between sandstone and shale formations within the Lower Bokkeveld Series of the Bokkeveld Sub-group as part of the Cape System Group. Refer to **Appendix B3** for more information as summarised below.

- Q1** ~ Sandy Soil
- C2S2** ~ Shale, Siltstone and thin fine-grained sandstone bands
- C2Q2** ~ Quartzitic sandstone and graywacke
- C1Q2** ~ Quartzitic sandstone with thin shale and conglomerate lenses

**NB**, it is important to note that the footprint of the existing dam as well as the proposed enlargement thereof is in fact located on a geological fault line according to the geological maps. Along with this, there are also a number of geological features surrounding the dam site such as strikes and dips. All of this can impact and lead to seepage problems which can be difficult to treat. It is therefore important to follow up on this matter as part of the final design investigations and assessment on how to address the matter.

No soil tests have been done as yet. This is however just an overview of the general geology pertaining to the sites and it may be that the local soil conditions are such that it might have cost implications on both the final design as well as on the intended construction procedures. However, the existing dam as well as other dams in the vicinity are constructed with similar material and their behaviour over time is considered consistent and stable giving confidence in the proposed works.

Overall it would be considered better and less risky if the wall alignment can be arranged parallel to rather than crossing the contact planes between various formations which unfortunately will not be the case here.

Soil-testing for purposes of the geotechnical design will be incorporated in the final design stage of a dam as it is a costly exercise normally undertaken once the environmental authorisation and water use licence is in hand. Apart from many years of experience with the design and construction of earthfill dams built on the well-known shale, sandstone and even alluvial formations of the Western Cape, visual inspection of the sites including cut-faces of the old borrow areas within the basin of the dam-to-be-enlarged, confidence in the geological conditions was further strengthened by visual assessments of existing dams successfully constructed within close proximity of the proposed dam.

The shale formation is well-known for suitable clay for use in the core as well as semi-weathered gravely material suitable for use as unselected mass fill.

When it comes to the availability of material, the intention is for all the bulk earthfill to come from within the dam basin. The bulk requirement is in the order of  $\pm 46\,000\text{m}^3$  with the flooded area of the dam in the order of  $\pm 16\text{ha}$  which puts the expected average excavation depth to less than 1m which is considered reasonable and achievable under these conditions.

This is however still an overview of the general geology pertaining to the site and it may be that the local soil conditions is such that it might have cost implications on the final design as well as on the intended construction procedures. However, dams in the vicinity is constructed of similar material and their behaviour over time is considered consistent and reasonably stable giving confidence in the proposed works.

## 14. SITE PROFILE

The Water Research Commission have recently published their updated study of the Water Resources of South Africa since the previous version thereof dated 1990. The updated report, *TT382/08 dated March 2009*, is well recommended by the Department and widely used throughout South Africa as basis when it comes to water management and development issues.

**Table 14.1** Summary of attributes and profiles regarding the proposed dam site.

| Figure          | Property Description                          | Zone / Index / Value                  | Unit / Scale                         |
|-----------------|-----------------------------------------------|---------------------------------------|--------------------------------------|
| Figure 0        | Water Management Area                         | 17~ Olifants-Doring                   |                                      |
| Figure 1        | Rainfall: MAR                                 | 400-500                               | [mm]                                 |
| Figure 2a       | Evaporation (WR90 S-pan)                      | 1600-1700                             | [mm]                                 |
| Figure 2b       | Evaporation (A-pan)                           | 2000-2200                             | [mm]                                 |
| Figure 3        | Runoff: MAR                                   | 200-500                               | [mm]                                 |
| Figure 4a       | Landcover                                     | Shrubland fynbos                      |                                      |
| Figure 6        | Simplified Geology (WR90)                     | Principally arenaceous strata         |                                      |
| Figure 7        | Soils (WR90) [Depth / Texture / Relief]       | Moderate to deep / Sandy loam / Steep |                                      |
| Figure 8        | Sediment (WR90) [Erodibility Index]           | 14 ~ Medium                           | High 1-8<br>Medium 9-15<br>Low 16-20 |
| Figure 9        | Vegetation (Acocks Veld Types)                | Sclerophyllous bush types             |                                      |
| Figure 10       | EWR Management Class                          | Class C (Moderately modified)         | [A-F]                                |
| Figure 11       | Surface Water Quality - TDS                   | 0-500                                 | [mg/l]                               |
| Figure 12       | Population Density                            | 0-100                                 | [People / km <sup>2</sup> ]          |
| DWS GRA2 (2005) | Utilisable Groundwater Exploitation Potential | 15001 – 25 000                        | [m <sup>3</sup> /km <sup>2</sup> /a] |

All of the above properties and/or characteristics are well within an acceptable range for when it comes to building a dam and the overall observation and interpretation thereof does not show any alarms as such regarding the design and construction of a dam of this nature.

## 15. CONCEPTUAL DESIGN

The proposed project entails the design and construction of the proposed enlargement of Langrug-Boonste Nr 1 dam based on Option 2 with a target storage capacity in the order of  $\pm 800\,000\text{m}^3$  presented in **Appendix D** as follows:

- A) Design Concept:  
The proposed dam is considered an instream dam. The configuration will be a typical zoned earthfill structure as an enlargement of the existing dam equipped with an open channel spillway and outlet pipe in concrete underneath the embankment.
- B) Foundation: Preliminary visual inspections show a topsoil layer that varies around  $\pm 0,5\text{m}$  thick on a silty to gravelly layer between  $1,0$  to  $2,5\text{m}$  thick on a sandstone foundation. The formation is considered adequate and suitable for this type of structure. Experience with other dams constructed on the same or similar formations have seldom required special treatment beyond hand-cleaning and filling the surface cracks with cement mortar before clay is placed in the cut-off trench. Nevertheless, the risk of striking a localised fractured zone or fishers beneath the cut-off trench base is always there and in such a case grouting will be considered as the best possible and most practical solution when there is a risk of foundation failure or when the expected seepage rate is unacceptably high.
- C) Material investigation: No formal in depth soil analyses has been done by the client. Other dams in the vicinity is of similar material and their behaviour over time is considered consistent and stable. The more gravelly sandy material will be used as semi-dense mass fill within the up- and downstream embankment zones while the more clayey material will be incorporated within the central core and cut-off zones. Visual inspection of the proposed dam site provisionally suggests that the availability of material from the dam basin seems to be sufficient. Light dispersiveness is expected on these types of material based on general erosion marks elsewhere on the site and surroundings which will be addressed formally in the final design by means of increased compaction specifications, built-in sand filters or in extreme cases by means of chemical stabilisation.
- D) Embankment design: The overall layout is a straight aligned embankment with a  $\pm 320\text{m}$  crest length. The proposed internal profile will be zoned with selected clayey core and cut-off trench plus unselected up- and downstream mass earthfill zones protected by rip-rap against the upstream slope. Awaiting the outcome of the formal soil testing to be carried out for final design purposes, consideration will be given to the necessity and introduction of built-in sand drains. Due to the possibility of dispersiveness, the core and cut-off zones will be compacted to a higher density in the order of 98% Proctor. The planned maximum wall height is in the order of  $\pm 14\text{m}$  with the upstream slope provisionally at  $1\text{v} : 3\text{h}$ , the downstream slope at  $1\text{v} : 2\text{h}$  and the crest width at  $4\text{m}$ .
- E) Source of Materials: Preliminary calculations have shown that the proposed dam would require in the order of  $45\,000\text{m}^3$  bulk earthworks. The suitable borrow areas within the basins have been estimated at  $\pm 30\%$  of the flooded area which then works out on average excavation depth in the order of  $\pm 1,0\text{m}$  which is acceptable and achievable based on the preliminary exploration. The bulk of the core as well as the unselected mass fill zone material is therefore sufficiently available in volume and will come from within the basin of the dam by extending the basin into both river banks. However, until a local suitable sand source can be identified, sand for the intended filter zones will have to be imported from registered commercial sources.
- F) Drainage: Due to the height and expected dispersiveness of the materials from the surrounding area and pending the outcome of the soil tests, the internal embankment profile will be supplied with a built-in drainage system in the form of a curtain drain on the downstream side of the core plus evenly spaced strip drains over the downstream column area. Apart from this, drainage will also rely on the normal phreatic movement of moisture through the earthfill structure itself.
- G) Stability: This aspect forms part of the final geotechnical design which includes a full slope plus internal stability design based on the actual results forthcoming from the soil testing. Pending the outcome of these results, the embankment profile has provisionally been planned in accordance with well acclaimed technical literature by the names of *“Design of Small Dams*

*3<sup>rd</sup> edition 1987” by the US Department of Interior, Bureau of Reclamation and “A Guide to Practical Geotechnical Engineering in Africa, 5<sup>th</sup> edition 2019” by Franki with regard to material types and slope gradients.*

- H) Outlet works: The outlet is currently planned as a single ø400mm pipe encased in reinforced concrete with a flanged sluice-gate control valve and manifold on the downstream side and a sieve pipe on pedestals or alternatively a custom built float unit, at the upstream intake end. This will be sufficient for irrigation purposes as well as for emptying the dam or lowering the water level in case of an emergency condition, say within 22 days.
- I) Spillway & Flood management: The dam will be equipped with an open channel spillway with concrete sill at the left flank leading flood water safely past and away from the embankment toe and back into the stream bed. The erodibility index is 14 on a scale of 1 to 20 with 1 being high and 20 being low, in other words having a medium erodibility index. The dry freeboard is provisionally set at 1,5m in line with SANCOLD recommendations.
- J) Maintenance and Operation: The dam is situated in a winter rainfall area and will be filled during the winter season exclusively with surplus winter runoff water from its own catchment. The operation and supervision of the dam will take place under the direct control of the owners or delegated authority on a seasonal cycle.
- K) Specifications: The following standardised specifications are envisaged and considered applicable for construction of a dam of this nature, as follows:
- General Conditions of Contract for Construction Works (2015/2018)
  - SANS/SABS 1200AD: General (Small Dams)
  - SANS/SABS 1200DE: Small Earth Dams
  - SANS/SABS 1200GA: Concrete (Small Works)
  - SANS/SABS 1200L: Medium Pressure Pipeline

## 16. QUALITY CONTROL

The site surveying, planning, design and construction supervision will be handled by personnel of *Sarel Bester Engineers*. Regular inspections and in-situ compaction tests will be conducted during construction by an independent laboratory in order to ensure quality of workmanship.

## 17. DOWNSTREAM DEVELOPMENT

Langrug-Boonste Nr1 dam is an instream dam within the uppermost tributary of the Leeuw River with other dams respectively at ±1,0km, ±1,7km, ±3,5km and ±6,3km downstream from it within the same stream. In addition to and apart from all the agricultural development alongside the river banks, there are about 8-10 farm houses and/or buildings as well as about 5-7 farm roads downstream from the proposed dam within the potential flood area. Thereafter the expected impact seems to be negligible when it flows into the mountainous area after crossing the R303 road.

However the application for classification is due to be submitted to the Dam Safety Office shortly which will then determine the hazard rating and subsequent classification.

## 18. COSTING

Costing of the project is based on recent tender prices of similar type projects within the Western Cape region by means of all inclusive bulk unit costs with separate allowance for other costs such as overheads, concrete & outlet related costs as well as diverse & unforeseen costs. The sum-total is reflected as the gross estimated project cost on the attached preliminary design evaluation and costing sheet, refer **Appendix C2**, including design fees but excluding specialist costs, as summarised below.

| Description                      | Preferred |
|----------------------------------|-----------|
| Max Wall Height (m)              | ±14       |
| Total Earthmoving (m³)           | ±45 000   |
| Total Storage Capacity (m³)      | ±800 000  |
| Storage : Earthworks             | ±9,3      |
| Estimated Gross Project Cost (R) | ±R4,0mil  |

The figures above show above average storage ratios, being greater than 9 which is considered exceptionally good from an economical perspective compared to storage ratios 3-5 considered reasonable and those above 5 regarded as good to very good.

In this case the earthworks costing was calculated at a basic rate of **±R60/m³** accounting for ±70% of the contract cost, excluding fees etc.

## 19. SUMMARY

Langrug-Boonste Nr 1 dam, also known as Helpmekaar dam, is an instream dam situated within the uppermost tributary of the Leeu River forming part of the larger Olifants-Doorns River system. The water use license application (WULA) entails the new taking and storing for additional water.

|                                         | Langrug-Boonste Nr 1 Dam     |
|-----------------------------------------|------------------------------|
| Location                                | 32° 55' 3,6"S 19° 14' 12,9"E |
| Wall crest level (masl)                 | 871,5                        |
| Full supply level (masl)                | 870,0                        |
| Lowest ground level (masl)              | 857,7                        |
| Max wall height (m)                     | 13,8                         |
| Crest length (m)                        | 320,0                        |
| Crest width (m)                         | 4,0                          |
| Upstream slope                          | 1 : 3                        |
| Downstream slope                        | 1 : 2                        |
| Free board (m)                          | 1,5                          |
| Embankment volume (m³)                  | 45 000                       |
| Total earthworks including cut-off (m³) | 47 000                       |
| Nett storage capacity (m³)              | ±800 000                     |
| Water surface area (ha)                 | 16,3                         |
| Embankment footprint (ha)               |                              |

The additional storage capacity will make it possible to convert about 45ha of annual cash crops into permanent fruit orchards. The additional storage capacity will therefore ensure the continual sustainability of irrigation water which will also benefit the long-term agricultural development as well as the improvement of the socio-economical status of the farming community of the area.

The basic layout of the enlargement of the dam will follow the alignment of the existing dam wall, being a straight aligned embankment with a spillway on the left bank. It will also be equipped with a service spillway for low flows to reduce erosion in the return channel plus an extension to the existing outlet pipe.

The application for a licence to take and store water from DWS as well as the environmental impact study for DEADP are both in process along with this Preliminary Dam Design. The purpose of this document is also to provide certain technical information as part of the above procedures to the various departments regarding the proposed works.

The proposed enlargement of the instream dam is an exceptionally economical project based on the geotechnical and topographical information and conditions, and the site considered suitable for a dam of this nature.

## 20. APPENDICES

### A) Documentation

- A1~ Title Deed
- A2~ Classification Application DW692
- A3~ WARMS/WUA
- A4~ Water Use Licence Application (*In process*)
- A5~ Environmental Assessment (*In process*)

### B) Maps

- B1~ Locality Map
- B2~ Hydrology
- B3~ Geology
- B4~ Site Map

### C) Dam Site Evaluation

- C1~ Design Flood Peaks
- C2~ Preliminary Design Evaluation: Quantities & Costing

### D) Preliminary Design Drawings

- D1~ Drawing 2235-S2-01
- D2~ Drawing 2235-S2-02
- D3~ Drawing 2235-S2-03

You are welcome to contact us in case more information is required and/or in case of any uncertainty.

We trust that you will find the above in order.

Yours faithfully



M Charl Bester (Pr Ing)

|            |                                                 |
|------------|-------------------------------------------------|
| Copies to: | Mr Bernard de Witt, EnviroAfrica, Somerset-West |
|------------|-------------------------------------------------|

# **Appendix A**

## **DOCUMENTATION**

- ✓ **A1- Deeds Information**
- ✓ **A2- Classification (*DW692*)**
- ✓ **A3- WARMS/WUA**
- ✓ **A4- WULA (*In process*)**
- ✓ **A5- EIA (*In process*)**



Any personal information obtained from this search will only be used as per the Terms and Conditions agreed to and in accordance with applicable data protection laws including the Protection of Personal Information Act, 2013 (POPI), and shall not be used for marketing purposes.

## SEARCH CRITERIA

|                   |                  |                       |                  |
|-------------------|------------------|-----------------------|------------------|
| Search Date       | 2022/10/26 10:01 | Farm Number           | 202              |
| Reference         | -                | Registration Division | CERES RD         |
| Report Print Date | 2022/10/26 10:01 | Portion Number        | 5                |
| Farm Name         | -                | Remaining Extent      | NO               |
| Deeds Office      | Cape Town        | Search Source         | WinDeed Database |

## PROPERTY INFORMATION

|                       |            |                     |                       |
|-----------------------|------------|---------------------|-----------------------|
| Property Type         | FARM       | Diagram Deed Number | T8979/1917            |
| Farm Name             | RIETRIVIER | Local Authority     | WITZENBERG DC         |
| Farm Number           | 202        | Province            | WESTERN CAPE          |
| Registration Division | CERES RD   | Remaining Extent    | NO                    |
| Portion Number        | 5          | Extent              | 1178.1607H            |
| Previous Description  | -          | LPI Code            | C01900000000020200005 |

## OWNER INFORMATION (1)

|                     |                 |                          |              |
|---------------------|-----------------|--------------------------|--------------|
| WHITEHORN TRUST     |                 |                          | Owner 1 of 1 |
| Company Type        | TRUST           | Document                 | T33513/2001  |
| Registration Number | 3506/99         | Microfilm / Scanned Date | -            |
| Name                | WHITEHORN TRUST | Purchase Price (R)       | 2 052 000    |
| Multiple Owners     | NO              | Purchase Date            | 2000/11/06   |
| Multiple Properties | NO              | Registration Date        | 2001/05/10   |
| Share (%)           | -               |                          |              |

## ENDORSEMENTS (3)

| # | Document             | Institution      | Amount (R) | Microfilm / Scanned Date |
|---|----------------------|------------------|------------|--------------------------|
| 1 | FARM CE 202/5        | -                | -          | 1985 002 2 :01:13        |
| 2 | FROM CE RD 202/3 & 2 | 02/4             | -          | -                        |
| 3 | B12915/2022          | STANDARD BANK OF | 20 000 000 | -                        |

### DISCLAIMER

This report contains information provided to LNRM by content providers and LNRM cannot control the accuracy of the data nor the timely accessibility. LNRM will not be held liable for any claims based on reliance of the search information provided. This report is subject to the terms and conditions of LexisNexis Risk Management Agreement. LexisNexis Risk Management (Pty) Ltd is a registered credit bureau (NCRCB26).

**ENDORSEMENTS (3)**

| # | Document | Institution    | Amount (R) | Microfilm / Scanned Date |
|---|----------|----------------|------------|--------------------------|
|   |          | SOUTH AFRICA L |            |                          |

**HISTORIC DOCUMENTS (7)**

| # | Document    | Institution                   | Amount (R) | Microfilm / Scanned Date |
|---|-------------|-------------------------------|------------|--------------------------|
| 1 | B20390/1982 | -                             | Unknown    | 2000 0092 0769           |
| 2 | B36549/1999 | -                             | 1 000 000  | 2000 009 2 :07:64        |
| 3 | B552/1997   | A B S A BANK                  | 500 000    | 2000 009 2 :07:58        |
| 4 | B75052/1997 | ABSA BANK LTD                 | 850 000    | 2000 0092 0761           |
| 5 | B87052/1994 | ABSA BANK                     | 1 100 000  | 2000 0092 0749           |
| 6 | T29533/1982 | MERWE CAREL PETRUS<br>VAN DER | Unknown    | 2000 009 2 :07:50        |
| 7 | T3621/2000  | GIBSON WILLIAM JAMES          | 7 888 366  | 2001 0327 4723           |

**DISCLAIMER**

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## DAM SAFETY OFFICE

PRIVATE BAG X313 PRETORIA 0001

### APPLICATION FOR CLASSIFICATION OF ~~A PROPOSED NEW DAM~~ OR ENLARGEMENT OR ALTERATION OF AN EXISTING DAM

***Only applicable if the maximum wall height of the dam exceeds 5 metres and the gross storage capacity is more than 50 000 cubic metres***

#### 1. PARTICULARS OF THE DAM OWNER

|                                                                             |                                                                            |   |   |  |   |   |   |  |   |             |             |   |   |   |   |   |
|-----------------------------------------------------------------------------|----------------------------------------------------------------------------|---|---|--|---|---|---|--|---|-------------|-------------|---|---|---|---|---|
| 1.1. Name of dam owner                                                      | WHITEHORN TRUST                                                            |   |   |  |   |   |   |  |   |             |             |   |   |   |   |   |
| 1.2. Owner's postal address                                                 | PO BOX 103                                                                 |   |   |  |   |   |   |  |   |             |             |   |   |   |   |   |
|                                                                             | CERES                                                                      |   |   |  |   |   |   |  |   |             |             |   |   |   |   |   |
|                                                                             |                                                                            |   |   |  |   |   |   |  |   |             | Postal code |   | 6 | 8 | 3 | 5 |
| 1.3. Tel. no. of dam owner                                                  | 0                                                                          | 7 | 2 |  | 2 | 5 | 2 |  | 8 | 1           | 8           | 3 |   |   |   |   |
| 1.4. E-mail address of person in control of the dam                         | <a href="mailto:johnathan@sterkwater.co.za">johnathan@sterkwater.co.za</a> |   |   |  |   |   |   |  |   |             |             |   |   |   |   |   |
| 1.5 Name and postal address of person in control of the dam (if applicable) |                                                                            |   |   |  |   |   |   |  |   |             |             |   |   |   |   |   |
| JOHNATHAN GIBSON                                                            |                                                                            |   |   |  |   |   |   |  |   |             |             |   |   |   |   |   |
| PO BOX 103                                                                  |                                                                            |   |   |  |   |   |   |  |   |             |             |   |   |   |   |   |
| CERES                                                                       |                                                                            |   |   |  |   |   |   |  |   |             |             |   |   |   |   |   |
|                                                                             |                                                                            |   |   |  |   |   |   |  |   | Postal code |             | 6 | 8 | 3 | 5 |   |
| 1.6. Tel. no. of person in control of the dam                               | 0                                                                          | 7 | 2 |  | 2 | 5 | 2 |  | 8 | 1           | 8           | 3 |   |   |   |   |
| 1.7. E-mail address of person in control of the dam                         | <a href="mailto:johnathan@sterkwater.co.za">johnathan@sterkwater.co.za</a> |   |   |  |   |   |   |  |   |             |             |   |   |   |   |   |

#### 2. PROPERTY ON WHICH THE DAM IS OR WILL BE SITUATED AND LOCALITY

|                                                                                                                                   |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |       |   |   |   |   |   |   |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|-------|---|---|---|---|---|---|
| 2.1. Property description as per title deed                                                                                       | FARM RIETRIVIER 202               |  |  |  |  |  |  |  |  |  |  |  |  |  |       |   |   |   |   |   |   |
|                                                                                                                                   | PORTION 5                         |  |  |  |  |  |  |  |  |  |  |  |  |  |       |   |   |   |   |   |   |
| 2.2. Magisterial district                                                                                                         | CERES RD / WITZENBERG MUNICIPALTY |  |  |  |  |  |  |  |  |  |  |  |  |  |       |   |   |   |   |   |   |
| 2.3. Nearest city/town                                                                                                            | "DIE DORP OP DIE BERG"            |  |  |  |  |  |  |  |  |  |  |  |  |  |       |   |   |   |   |   |   |
| 2.4. Distance to nearest city or town                                                                                             |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  | 12 km |   |   |   |   |   |   |
| 2.5. Direction from nearest city or town                                                                                          | NORTH NORTH-WEST                  |  |  |  |  |  |  |  |  |  |  |  |  |  |       |   |   |   |   |   |   |
| 2.6. Number of 1:50 000 scale topographical map                                                                                   |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  | *     | 3 | 2 | 1 | 9 | C | C |
| * A copy of the relevant portion of this map which clearly indicates the position of the dam and downstream area must be attached |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |       |   |   |   |   |   |   |
| 2.7. Position of the centre of the dam wall to an accuracy of one second                                                          |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |       |   |   |   |   |   |   |
| Latitude:    3   2   °    5   5   '    0   3   "    Longitude:    1   9   °    1   4   '    1   1   "                             |                                   |  |  |  |  |  |  |  |  |  |  |  |  |  |       |   |   |   |   |   |   |

2.8. Title deed number

|             |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| T33513/2001 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|-------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|

### 3. GENERAL INFORMATION

3.1. Name of dam

3.2. Name of watercourse or source

3.3. For **clean water** dams, give the purpose of the dam (mark **all** applicable purposes with X)

domestic supply ☐ irrigation ☒ industrial use ☐  
 stock watering ☐ fisheries ☐ other (specify below)   
 Describe "other"

3.4. For **wastewater** dams, give the purpose of the dam (mark **all** applicable purposes with X)

pollution control ☐ wastewater disposal ☐ industrial residue ☐  
 oxidation / evaporation ☐ mine residue ☐ other (specify below)   
 Describe "other"

3.5. For an existing dam describe the nature and extent of the proposed alterations or enlargements

3.6. Proposed starting date of construction

3.7. Name and postal address of designer or consultant (if available)

Postal code

3.8. Tel. no. of designer or consultant

3.9. E-mail adress of designer or consultant

### 4. PARTICULARS OF DAM AND BASIN

(For enlargement or alteration of an existing dam, particulars must be for the completed structure)

4.1. Type of dam (mark applicable type with X - mark more than one for composite dams)

earthfill ☒ rockfill ☐ gravity ☐  
 buttress ☐ arch ☐ multi-arch ☐  
 earth "service" reservoir ☐ reinforced concrete "service" reservoir ☐  
 mine residue deposit \* ☐ industrial residue deposit \*

\* This also means any structure generally termed a "tailings or slimes dam"

other (specify)

4.2. Maximum wall height  m

**\*\* Note! Wall height is the vertical difference between the lowest downstream ground elevation on the outside of the dam wall and the non-overspill crest level or the general top level of the dam wall**

4.3. Crest length of wall  m

4.4. Gross storage capacity  m<sup>3</sup>

4.5. Area of water surface at full supply level  ha

4.6. Maximum full supply water depth (must be provided)  m

## 5. PARTICULARS OF DEVELOPMENT DOWNSTREAM OF THE DAM

Describe with the aid of a 1:50 000 scale map the nature and situation of development downstream of a dam that would be threatened by a failure of the dam. Development means any houses, dwellings, other buildings, roads, bridges, cultivated lands, orchards, powerline foundations etc.

The area downstream of the dam wherein all development must be described is defined as follows;

- For every one metre of maximum wall height, at least one kilometre of the valley downstream of the dam wall should be analysed

2/3 of maximum wall height for the first kilometre downstream and 1/2 of the maximum wall height for the rest of the downstream distance

### 5.1. Development downstream of the dam (houses, dwellings and other similar structures)

| Distance downstream (km) | Purpose or use of structure | Height above river bed (m) | Distance from river (m) | Number of inhabitants or users |
|--------------------------|-----------------------------|----------------------------|-------------------------|--------------------------------|
| 0,7                      | Guest House                 | 0,5                        | 130                     | ±2                             |
| 1,3                      | Community Dwellings         | 1-5                        | 40-130                  | ±35                            |
| 1,6                      | Farm Store                  | 3                          | 550                     | ±15                            |
| 2,4                      | Farm Stores                 | 1-5                        | 190                     | ±5                             |
| 2,7                      | Farm Dwelling               | 1-5                        | 170                     | ±3                             |
| 3,7                      | Pack House                  | 3                          | 70                      | ±10                            |
| 4,5                      | Pack Houses & Farm Store    | 9                          | 900-1000                | ±40                            |
| 5,5                      | Farm Store                  | 6                          | 1000                    | ±5                             |
| 5,8                      | Farm Stores                 | 5                          | 1050                    | ±8                             |
| 6,1                      | Farm Dwelling               | 6                          | 360                     | ±3                             |
| 8                        | Farm Estate                 | 5-8                        | 1000                    | ±60                            |
| 8,9                      | Farm Sheds & Dwelling       | 5-8                        | 220                     | ±2                             |
| 10,6                     | Farm Store                  | 1-5                        | 770                     | ±2                             |
| 13                       | Water Extraction Chambers   | 1-3                        | 3-5                     | 0                              |

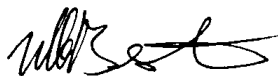
| Distance<br>downstream<br>(km) | (1)<br>Type of road<br>or railway | If a road,<br>is it<br>tarred?<br>(Y/N) | Height of<br>road / railway<br>above river<br>bed (m) |    | Bridge, culvert or pipe openings |                |                  |              | (2)<br>Type<br>of<br>crossing | (3)<br>Visibility<br>distance<br>(m) | Number<br>of<br>vehicles<br>per day |
|--------------------------------|-----------------------------------|-----------------------------------------|-------------------------------------------------------|----|----------------------------------|----------------|------------------|--------------|-------------------------------|--------------------------------------|-------------------------------------|
|                                |                                   |                                         |                                                       |    | Width<br>(mm)                    | Height<br>(mm) | Diameter<br>(mm) | How<br>many? |                               |                                      |                                     |
| 1,3                            | FRD                               | N                                       | 2                                                     | ,0 |                                  |                |                  |              | D                             | I 450<br>li 100                      | ±10                                 |
| 2,6                            | FRD                               | N                                       | 1                                                     | ,0 |                                  |                |                  |              | D                             | I 700<br>li 550                      | ±10                                 |
| 3,4                            | FRD                               | N                                       | 3                                                     | ,0 |                                  |                |                  |              | D                             | I 420<br>li 240                      | ±10                                 |
| 8,1                            | FRD                               | N                                       | 2                                                     | ,0 | 500                              | 1000           |                  | 2            | C                             | I 850<br>li 400                      | ±25                                 |
|                                |                                   |                                         | 2                                                     | ,0 |                                  |                | 850              | 4            |                               | I 850<br>li 400                      |                                     |
|                                |                                   |                                         | 2                                                     | ,0 |                                  |                | 600              | 4            |                               | I 850<br>li 400                      |                                     |
|                                |                                   |                                         |                                                       |    |                                  |                |                  |              |                               |                                      |                                     |
| 8,8                            | FRD                               | N                                       | 1                                                     | ,5 |                                  |                |                  |              | D                             | I 100<br>li 120                      | ±15                                 |
| 10                             | FRD                               | N                                       | 1                                                     | ,2 |                                  |                |                  |              | D                             | I 999<br>li 200                      | ±5                                  |
| 10,5                           | FRD                               | N                                       | 1                                                     | ,0 |                                  |                |                  |              | D                             | I 320<br>li 450                      | ±5                                  |
| 11                             | FRD                               | N                                       | 1                                                     | ,5 |                                  |                |                  |              | D                             | I 120<br>li 160                      | ±10                                 |
| 12,4                           | FRD                               | N                                       | 2                                                     | ,3 | 4000                             | 2000           |                  | 2            | C                             | I 220<br>li 180                      | ±30                                 |
| 13,8                           | FRD                               | N                                       | 1                                                     | ,8 | 1500                             | 1000           |                  | 1            | C                             | I 300<br>300                         | ±15                                 |
|                                |                                   |                                         | 2                                                     | ,3 | 1500                             | 1500           |                  | 2            | C                             | 300<br>300                           |                                     |
|                                |                                   |                                         |                                                       |    |                                  |                |                  |              |                               |                                      |                                     |
| 14                             | FRD                               | N                                       | 1                                                     | ,2 |                                  |                |                  |              | D                             | I 220<br>li 100                      | ±10                                 |
| 15                             | MRD                               | N                                       | 3                                                     | ,7 | 4500                             | 3000           |                  | 7            | C                             | I 400<br>li 999                      | ±500                                |

[illegible][illegible][illegible]

**6. DECLARATION BY APPLICANT**

I declare that the information given by me for the classification of the above dam is true and correct.

Signature: \_\_\_\_\_

Date: 18 Nov 2024

***NB! Remember to attach a clear copy of the relevant topographical map (see 2.6)***



**BREDE-GOURITZ**  
CATCHMENT MANAGEMENT AGENCY

51 Baring Street Worcester 6850, Private Bag X3055 Worcester 6850

Enquiries: E Fredericks Tel: 023 346 8000 Fax: 023 347 2012 E-mail: [efredericks@bgcma.co.za](mailto:efredericks@bgcma.co.za)

Ref: 22048936  
Date: 02 February 2021

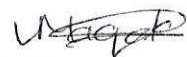
WHITETHORN TRUST  
PO BOX 103  
CERES  
6835

**NATIONAL REGISTER OF WATER USE CERTIFICATE 22048936**

Your water registration certificate is attached.

Please review this report for any errors and bring it to our attention within one calendar month.

Yours sincerely,

PP 

**MR JAN VAN STADEN**  
**CHIEF EXECUTIVE OFFICER (ACTING)**



## water & sanitation

Department:  
Water and Sanitation  
REPUBLIC OF SOUTH AFRICA

### National Register of Water Use Registration Record 22048936

Water Use Registration Record 22048936 is issued in terms of the regulations requiring that a Water Use be registered, promulgated under Section 26(1)(c) of the National Water Act( Act 36 of 1998) to:

#### Applicant

Applicant Type: COMPANY  
Name: WHITETHORN TRUST  
Enterprise Type TRUST  
Business Registration Number: IT3506/1999  
Postal Address: PO BOX 103  
CERES  
6835

VAT Registration Number:

#### Water Management Area

Name: BREEDE-GOURITZ

#### Register Status

Status: ACTIVE

#### Water Uses

See attached Annexure(s)

| Water Use No. | Water Use | Volume                          | Volume Start Date | Volume End Date |
|---------------|-----------|---------------------------------|-------------------|-----------------|
| 1             | 21(a)     | 725,000 CUBIC METRES PER YEAR   | 2000/01/01        |                 |
| 3             | 21(b)     |                                 | 2000/01/01        |                 |
| 4             | 21(b)     |                                 | 2002/04/01        |                 |
| 5             | 21(b)     |                                 | 2002/04/01        |                 |
| 6             | 21(a)     | 1,400,000 CUBIC METRES PER YEAR | 2000/01/01        |                 |

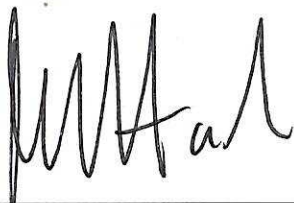


## water & sanitation

Department:  
Water and Sanitation  
REPUBLIC OF SOUTH AFRICA

### National Register of Water Use Registration Record 22048936

Water Use Registration Record 22048936 is issued in terms of the regulations requiring that a Water Use be registered, promulgated under Section 26(1)(c) of the National Water Act( Act 36 of 1998) to:



Office: Breede-gouritz Cma  
Regional Office: Western Cape Region  
CMA: BREEDE-GOURITZ CATCHMENT  
MANAGEMENT AGENCY



Date stamp of issuing office

#### DISCLAIMER :

##### This Registration Record:

- 1 is not an acknowledgement of an entitlement to the registered water use;
- 2 may NOT be used to create the impression that it is proof of a water use entitlement. By virtue of section 22(1) of the National Water Act, the only documents that may be used as proof of a water use entitlement, are:
  - 2.1 a licence;
  - 2.2 an official document stating the extent of existing lawful water use pursuant to sections 33 or 35 of the National Water Act;
  - 2.3 a general authorisation as published in the Gazette; or
  - 2.4 Schedule 1 of the National Water Act.

##### Notes:

- If an entitlement for the specific water use referred to in this Registration Record has been confirmed by the Department, it may be indicated as such in this Registration Record.
  - If the responsible authority has dispensed with the requirement for a licence for a specific water use, no water use entitlement is needed for that use under the National Water Act.
- 3 is issued without alterations or erasures and is invalid if it contains alterations not in conformity with the Department's official copy; and in substitution of any Registration Record the Department may have previously issued and the information is valid as at the date of issue.

# National Register of Water Use Registration Record 22048936

Taking water from a water resource in terms of Section 21(a) of the National Water Act

## Water Use Identification

Register Number: 22048936  
Water Use Number: 1  
Water Use Start Date: 2000/01/01  
Water Use Status Date: 2002/08/21  
Water Use Status: REGISTERED

## Lawfulness Authentication

Finding: LAWFULNESS STILL TO BE DETERMINED  
Finding Date: 2006/03/31  
Finding Reason: UNVERIFIED

Finding Confirmed: YES

## Water Use Details

Water Use Sector(s)(i.e. Purpose(s) of Water Use): AGRICULTURE: IRRIGATION  
Source Type: BOREHOLE  
Water Resource Name: GROUNDWATER  
Point of Abstraction: Latitude 33.25° south Longitude 19.3° east  
Datum Type: CAPE (MODIFIED CLARKE 1880)  
Quaternary Drainage Region: H10C

## Registered Volumes

| Start Date | End Date | Registered Volume (m³) | Time Interval |
|------------|----------|------------------------|---------------|
| 2000/01/01 |          | 725000                 | PER YEAR      |

## Property Where Water Use Occurs

Property Name: RIETRIVER  
Property Number: 202  
Portion of Property: 5  
SG Cadastral Code: C01900000000020200005  
Deeds Office: CAPE TOWN  
Registration Division: CERES  
Registration Division Province: WESTERN CAPE  
Surveyor General Office: CAPE TOWN

## WUN/Property Relationship Details

| Relationship Start Date | Relationship End Date |
|-------------------------|-----------------------|
| 2000/01/01              |                       |

# National Register of Water Use Registration Record 22048936

Taking water from a water resource in terms of Section 21(a) of the National Water Act

## Water Use Identification

|                        |            |
|------------------------|------------|
| Register Number:       | 22048936   |
| Water Use Number:      | 1          |
| Water Use Start Date:  | 2000/01/01 |
| Water Use Status Date: | 2002/08/21 |
| Water Use Status:      | REGISTERED |

### DISCLAIMER :

This Registration Record:

- 1 is not an acknowledgement of an entitlement to the registered water use;
- 2 may NOT be used to create the impression that it is proof of a water use entitlement. By virtue of section 22(1) of the National Water Act, the only documents that may be used as proof of a water use entitlement, are:
  - 2.1 a licence;
  - 2.2 an official document stating the extent of existing lawful water use pursuant to sections 33 or 35 of the National Water Act;
  - 2.3 a general authorisation as published in the Gazette; or
  - 2.4 Schedule 1 of the National Water Act.

#### Notes:

- If an entitlement for the specific water use referred to in this Registration Record has been confirmed by the Department, it may be indicated as such in this Registration Record.
  - If the responsible authority has dispensed with the requirement for a licence for a specific water use, no water use entitlement is needed for that use under the National Water Act.
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# National Register of Water Use Registration Record 22048936

Taking water from a water resource in terms of Section 21(a) of the National Water Act

## Water Use Identification

Register Number: 22048936  
Water Use Number: 6  
Water Use Start Date: 2000/01/01  
Water Use Status Date: 2002/08/28  
Water Use Status: REGISTERED

## Lawfulness Authentication

Finding: LAWFULNESS STILL TO BE DETERMINED  
Finding Date: 2006/03/31  
Finding Reason: UNVERIFIED

Finding Confirmed: YES

## Water Use Details

Water Use Sector(s)(i.e. Purpose(s) of Water Use): AGRICULTURE: IRRIGATION  
Source Type: RIVER/STREAM  
Water Resource Name: LEEUW RIVER(DAM)  
Point of Abstraction: Latitude 32° 55' 3" south Longitude 19° 14' 12" east  
Datum Type: CAPE (MODIFIED CLARKE 1880)  
Quaternary Drainage Region: H10C

## Registered Volumes

| Start Date | End Date | Registered Volume (m³) | Time Interval |
|------------|----------|------------------------|---------------|
| 2000/01/01 |          | 1400000                | PER YEAR      |

## Property Where Water Use Occurs

Property Name: RIETRIVER  
Property Number: 202  
Portion of Property: 5  
SG Cadastral Code: C01900000000020200005  
Deeds Office: CAPE TOWN  
Registration Division: CERES  
Registration Division Province: WESTERN CAPE  
Surveyor General Office: CAPE TOWN

## WUN/Property Relationship Details

| Relationship Start Date | Relationship End Date |
|-------------------------|-----------------------|
| 2000/01/01              |                       |

# National Register of Water Use Registration Record 22048936

Taking water from a water resource in terms of Section 21(a) of the National Water Act

## Water Use Identification

|                        |            |
|------------------------|------------|
| Register Number:       | 22048936   |
| Water Use Number:      | 6          |
| Water Use Start Date:  | 2000/01/01 |
| Water Use Status Date: | 2002/08/28 |
| Water Use Status:      | REGISTERED |

### DISCLAIMER :

This Registration Record:

- 1 is not an acknowledgement of an entitlement to the registered water use;
- 2 may NOT be used to create the impression that it is proof of a water use entitlement. By virtue of section 22(1) of the National Water Act, the only documents that may be used as proof of a water use entitlement, are:
  - 2.1 a licence;
  - 2.2 an official document stating the extent of existing lawful water use pursuant to sections 33 or 35 of the National Water Act;
  - 2.3 a general authorisation as published in the Gazette; or
  - 2.4 Schedule 1 of the National Water Act.

#### Notes:

- If an entitlement for the specific water use referred to in this Registration Record has been confirmed by the Department, it may be indicated as such in this Registration Record.
  - If the responsible authority has dispensed with the requirement for a licence for a specific water use, no water use entitlement is needed for that use under the National Water Act.
- 3 is issued without alterations or erasures and is invalid if it contains alterations not in conformity with the Department's official copy; and in substitution of any Registration Record the Department may have previously issued and the information is valid as at the date of issue.

# National Register of Water Use Registration Record 22048936

Storing water in terms of Section 21(b) of the National Water Act

## Water Use Identification

Register Number: 22048936  
 Water Use Number: 3  
 Water Use Start Date: 2000/01/01  
 Water Use Status Date: 2003/10/25  
 Water Use Status: REGISTERED

## Storage of Raw Water

Total Number of Dams: 9  
 Water Course(s):  
 HELMEKAAR DAM 45500 Hmk  
 RIETE DAM 115000 Hmk  
 ISUEM DAM 82000 Hmk  
 BLOUKRAAN DAM 82000  
 BRANDAM 90000 Hmk  
 PLAT DAM 145000 SBR  
 ROOI DAM 204000 Hmk  
 LANGRUG DAM 615 5000 Sbk  
 GROOT DAM 796000 Hmk

## Dam Details

| Name of Dam | Estimated/<br>Calculated | Measure For Movement<br>of Aquatic Species | Volume<br>Stored (m³) |
|-------------|--------------------------|--------------------------------------------|-----------------------|
| RIVER       | ESTIMATED                | NO                                         | 414500.00             |

## Property Where Water Use Occurs

Property Name: RIETRIVER  
 Property Number: 202  
 Portion of Property: 5  
 SG Cadastral Code: C01900000000020200005  
 Deeds Office: CAPE TOWN  
 Registration Division: CERES  
 Registration Division Province: WESTERN CAPE  
 Surveyor General Office: CAPE TOWN

## WUN/Property Relationship Details

| Relationship Start Date | Relationship End Date |
|-------------------------|-----------------------|
| 2000/01/01              |                       |

# National Register of Water Use Registration Record 22048936

Storing water in terms of Section 21(b) of the National Water Act

## Water Use Identification

|                        |            |
|------------------------|------------|
| Register Number:       | 22048936   |
| Water Use Number:      | 3          |
| Water Use Start Date:  | 2000/01/01 |
| Water Use Status Date: | 2003/10/25 |
| Water Use Status:      | REGISTERED |

### DISCLAIMER :

This Registration Record:

- 1 is not an acknowledgement of an entitlement to the registered water use;
- 2 may NOT be used to create the impression that it is proof of a water use entitlement. By virtue of section 22(1) of the National Water Act, the only documents that may be used as proof of a water use entitlement, are:
  - 2.1 a licence;
  - 2.2 an official document stating the extent of existing lawful water use pursuant to sections 33 or 35 of the National Water Act;
  - 2.3 a general authorisation as published in the Gazette; or
  - 2.4 Schedule 1 of the National Water Act.

#### Notes:

- If an entitlement for the specific water use referred to in this Registration Record has been confirmed by the Department, it may be indicated as such in this Registration Record.
  - If the responsible authority has dispensed with the requirement for a licence for a specific water use, no water use entitlement is needed for that use under the National Water Act.
- 3 is issued without alterations or erasures and is invalid if it contains alterations not in conformity with the Department's official copy; and in substitution of any Registration Record the Department may have previously issued and the information is valid as at the date of issue.

# National Register of Water Use Registration Record 22048936

## Storing water in terms of Section 21(b) of the National Water Act: Dam Registration

### Water Use Identification

|                        |            |
|------------------------|------------|
| Register Number:       | 22048936   |
| Water Use Number:      | 4          |
| Water Use Start Date:  | 2002/04/01 |
| Water Use Status Date: | 2002/08/21 |
| Water Use Status:      | REGISTERED |

### Lawfulness Authentication

|                 |                                   |
|-----------------|-----------------------------------|
| Finding:        | LAWFULNESS STILL TO BE DETERMINED |
| Finding Date:   | 2006/03/31                        |
| Finding Reason: | UNVERIFIED                        |

|                    |     |
|--------------------|-----|
| Finding Confirmed: | YES |
|--------------------|-----|

### Water Use Details for Raw Water Dam

|                                                    |                         |
|----------------------------------------------------|-------------------------|
| Water Use Sector(s)(i.e. Purpose(s) of Water Use): | AGRICULTURE: IRRIGATION |
|----------------------------------------------------|-------------------------|

|                             |      |
|-----------------------------|------|
| Quaternary Drainage Region: | H10C |
|-----------------------------|------|

### Dam Details

|                                                                |                             |                  |
|----------------------------------------------------------------|-----------------------------|------------------|
| Dam Name:                                                      | LANGRUG - SE- DAM           | 5886             |
| Name of Watercourse:                                           | RIETRIVER                   |                  |
| Centre of Dam Wall:                                            | <b>Latitude</b>             | <b>Longitude</b> |
|                                                                | 32° 55' 3" south            | 18° 14' 12" east |
| Datum Type:                                                    | CAPE (MODIFIED CLARKE 1880) |                  |
| Centre of River at the point where river crosses the Dam wall: | <b>Latitude</b>             | <b>Longitude</b> |

|                    |                             |
|--------------------|-----------------------------|
| Datum Type:        |                             |
| Capacity:          | 615.6 THOUSAND CUBIC METRES |
| Billable Dam:      | NO                          |
| Safety Risk Dam:   | YES                         |
| Completed          | YES                         |
| Date of Completion | 1998/10/01                  |

|                                                            |                         |
|------------------------------------------------------------|-------------------------|
| Water Use Sector(s)(i.e. Purpose(s) for Storing of Water): | AGRICULTURE: IRRIGATION |
|------------------------------------------------------------|-------------------------|

# National Register of Water Use Registration Record 22048936

Storing water in terms of Section 21(b) of the National Water Act: Dam Registration

## Water Use Identification

Register Number: 22048936  
Water Use Number: 4  
Water Use Start Date: 2002/04/01  
Water Use Status Date: 2002/08/21  
Water Use Status: REGISTERED

## Property Where Water Use Occurs

Property Name: RIETRIVER  
Property Number: 202  
Portion of Property: 5  
SG Cadastral Code: C01900000000020200005  
Deeds Office: CAPE TOWN  
Registration Division: CERES  
Registration Division Province: WESTERN CAPE  
Surveyor General Office: CAPE TOWN

## WUN/Property Relationship Details

| Relationship Start Date | Relationship End Date |
|-------------------------|-----------------------|
| 2002/04/01              |                       |

### DISCLAIMER :

This Registration Record:

- 1 is not an acknowledgement of an entitlement to the registered water use;
- 2 may NOT be used to create the impression that it is proof of a water use entitlement. By virtue of section 22(1) of the National Water Act, the only documents that may be used as proof of a water use entitlement, are:
  - 2.1 a licence;
  - 2.2 an official document stating the extent of existing lawful water use pursuant to sections 33 or 35 of the National Water Act;
  - 2.3 a general authorisation as published in the Gazette; or
  - 2.4 Schedule 1 of the National Water Act.

#### Notes:

- If an entitlement for the specific water use referred to in this Registration Record has been confirmed by the Department, it may be indicated as such in this Registration Record.
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# National Register of Water Use Registration Record 22048936

Storing water in terms of Section 21(b) of the National Water Act: Dam Registration

## Water Use Identification

Register Number: 22048936  
Water Use Number: 5  
Water Use Start Date: 2002/04/01  
Water Use Status Date: 2002/08/21  
Water Use Status: REGISTERED

## Lawfulness Authentication

Finding: LAWFULNESS STILL TO BE DETERMINED  
Finding Date: 2006/03/31  
Finding Reason: UNVERIFIED

Finding Confirmed: YES

## Water Use Details for Raw Water Dam

Water Use Sector(s)(i.e. Purpose(s) of Water Use): AGRICULTURE: IRRIGATION

Quaternary Drainage Region: H10C

## Dam Details

Dam Name: ROOIDAM  
Name of Watercourse: RIETRIVER  
Centre of Dam Wall: 

|                  |                 |
|------------------|-----------------|
| Latitude         | Longitude       |
| 32° 54' 0" south | 19° 14' 0" east |

Datum Type: CAPE (MODIFIED CLARKE 1880)

Centre of River at the point where river crosses the Dam wall: 

|          |           |
|----------|-----------|
| Latitude | Longitude |
|----------|-----------|

Datum Type:  
Capacity: 615.6 THOUSAND CUBIC METRES  
Billable Dam: NO  
Safety Risk Dam: YES  
Completed: YES  
Date of Completion: 1998/10/01

Water Use Sector(s)(i.e. Purpose(s) for Storing of Water): AGRICULTURE: IRRIGATION

# National Register of Water Use Registration Record 22048936

Storing water in terms of Section 21(b) of the National Water Act: Dam Registration

## Water Use Identification

Register Number: 22048936  
Water Use Number: 5  
Water Use Start Date: 2002/04/01  
Water Use Status Date: 2002/08/21  
Water Use Status: REGISTERED

## Property Where Water Use Occurs

Property Name: RIETRIVER  
Property Number: 202  
Portion of Property: 5  
SG Cadastral Code: C01900000000020200005  
Deeds Office: CAPE TOWN  
Registration Division: CERES  
Registration Division Province: WESTERN CAPE  
Surveyor General Office: CAPE TOWN

## WUN/Property Relationship Details

| Relationship Start Date | Relationship End Date |
|-------------------------|-----------------------|
| 2002/04/01              |                       |

### DISCLAIMER :

This Registration Record:

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  - 2.1 a licence;
  - 2.2 an official document stating the extent of existing lawful water use pursuant to sections 33 or 35 of the National Water Act;
  - 2.3 a general authorisation as published in the Gazette; or
  - 2.4 Schedule 1 of the National Water Act.

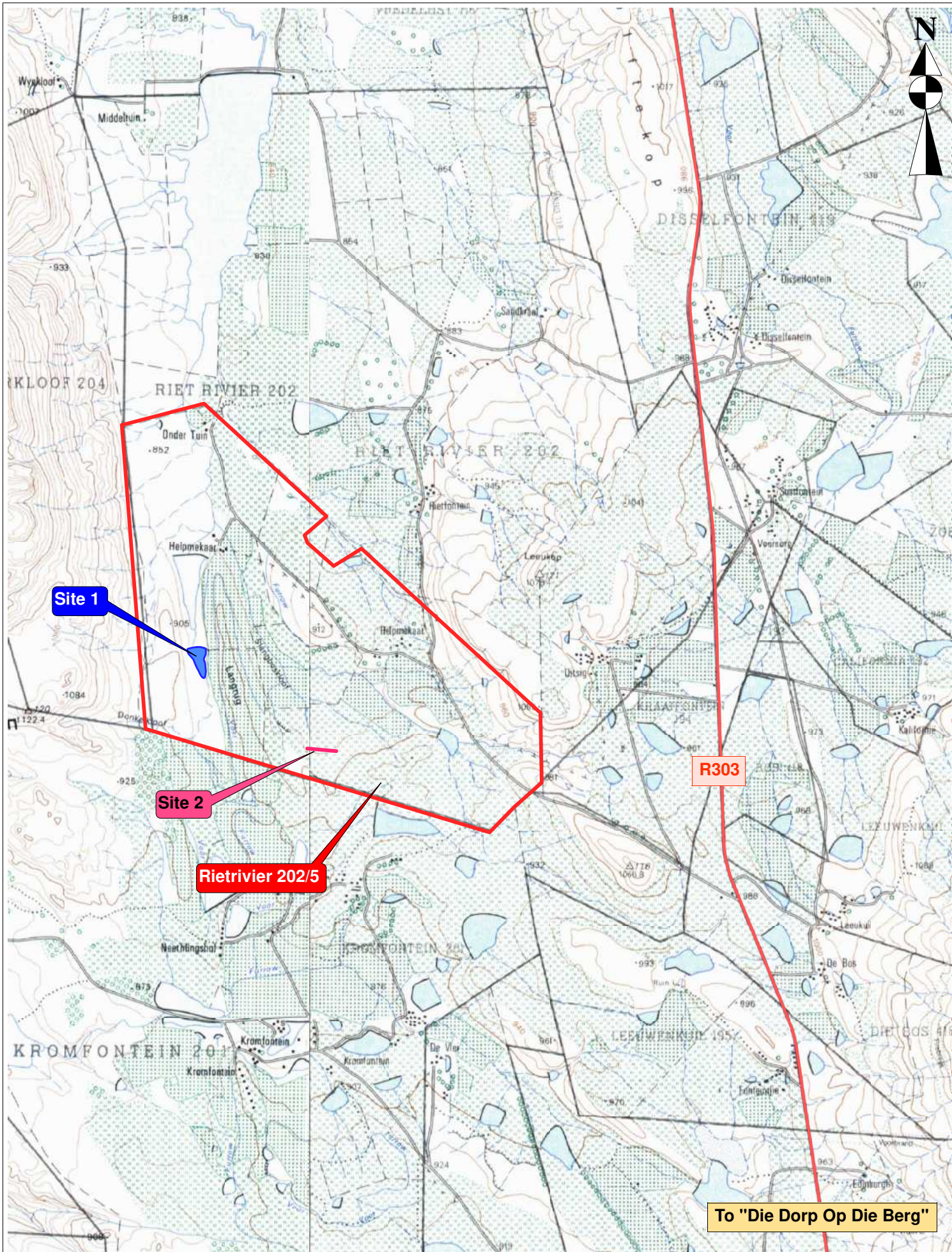
#### Notes:

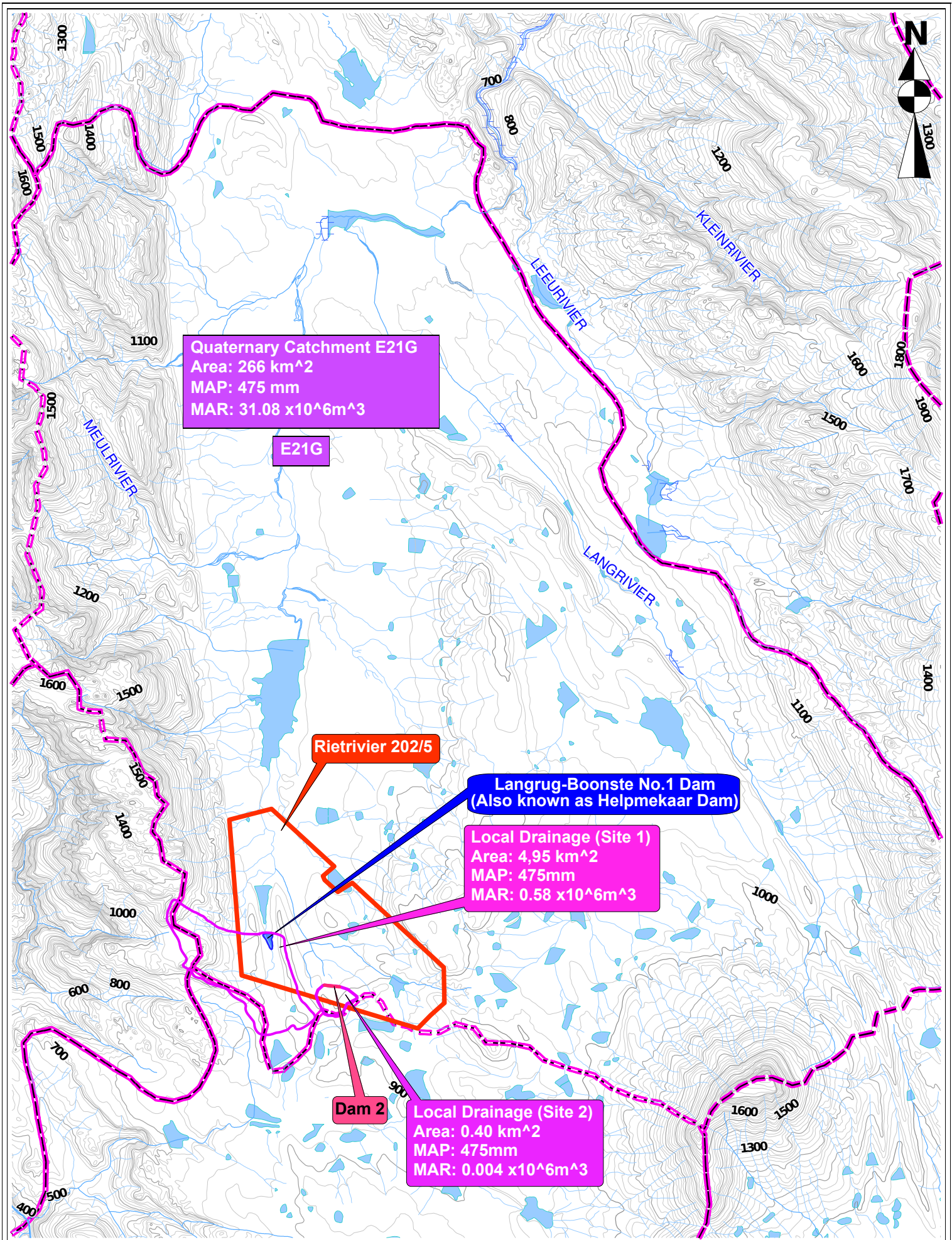
- If an entitlement for the specific water use referred to in this Registration Record has been confirmed by the Department, it may be indicated as such in this Registration Record.
  - If the responsible authority has dispensed with the requirement for a licence for a specific water use, no water use entitlement is needed for that use under the National Water Act.
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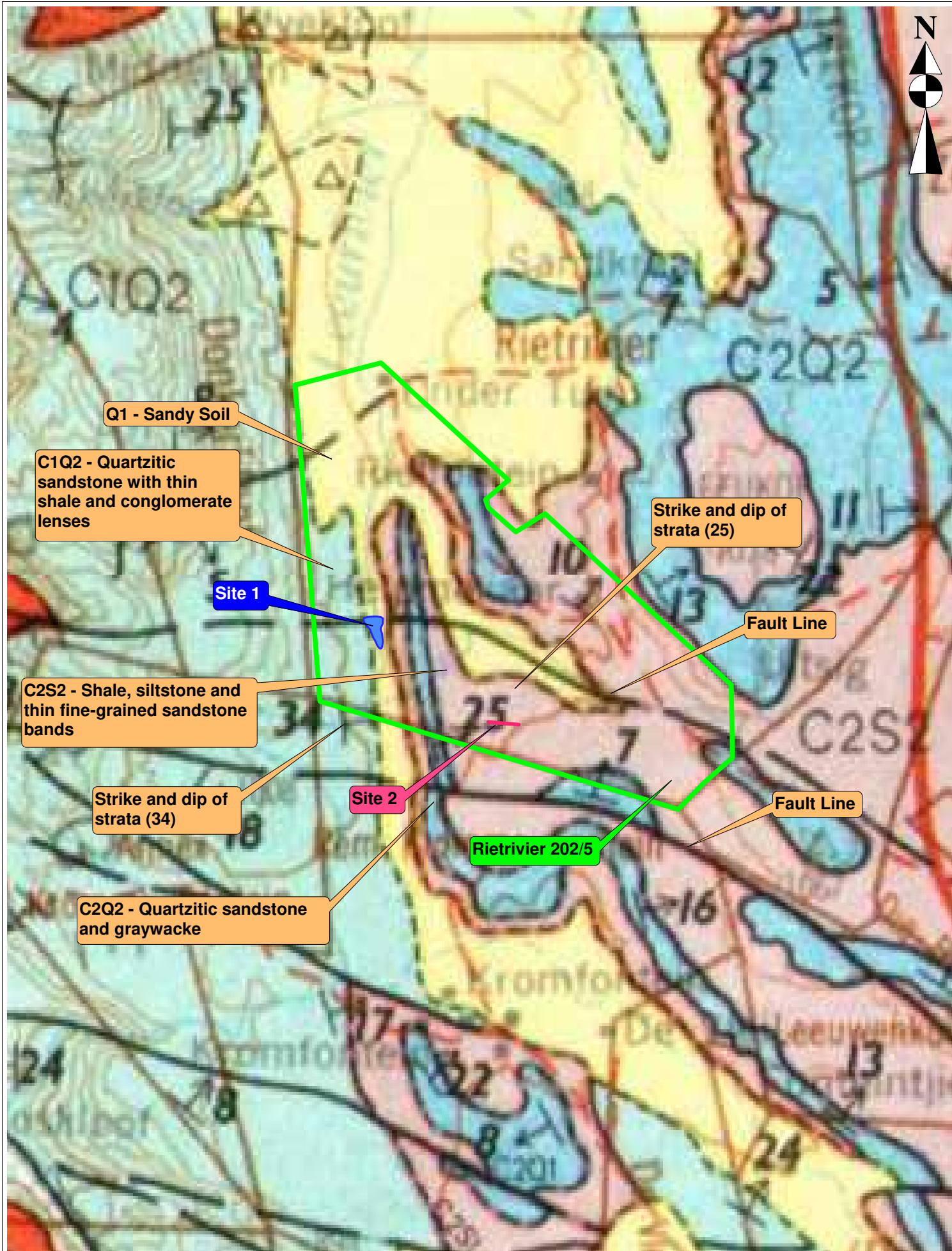
# **Appendix B**

## **MAPS**

- ✓ **B1- Locality Map**
- ✓ **B2- Hydrology Map**
- ✓ **B3- Geology Map**
- ✓ **B4- Site Map**







AERIAL PHOTO  
SCALE N/A



Langrug-Boonste No.1 Dam  
(Also known as Helpmekaar Dam)

Proposed Pipe

Dam 2

Reitriver 2021/5

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A4

**SAREL BESTER ENGINEERS CC**

Consulting Civil Engineers  
Architectural Services

MC BESTER  
Pr Eng. B. Eng. MSc (CE) 870598, MSc (CAP) 1218  
P.O. Box 21, CERES 6835  
Ph. 023-312 2017  
e-mail: admin@sari.co.za

Date: 6/9/2023

CLIENT:

Sterkwater Boerdery  
P.O. Box 103  
CERES  
6835

PROJECT:

PROPOSED ENLARGEMENT OF A DAM/  
NEW DAM ON FARM 202 PORTION 5,  
CERES DISTRICT

DETAIL:

Site Map

SCALE

N/A

DATE

SEP. 2023

DRAWN

R van der Merwe

DWG. NR.

2235-S2-01

# **Appendix C**

## **PRELIM DESIGN CALCULATIONS**

- ✓ **C1- Design Flood Peak**
- ✓ **C2- Prelim Design Assessment**

# Utility Programs for Drainage

## Flood calculations



**Sinotech**

Project name: Helpmekaar Dam (Site 1)  
Analysed by: RvdM  
Name of river: Tributary of the Leeurivier  
Description of site: 2235  
Filename: I:\UPD\2235\_HelpmekaarDam\_DVIV.fld  
Date: 15 November 2022

Printed: 5 April 2023

Page 1

### Summary of peak flows (m<sup>3</sup>/s)

| Method                                       | 1:2 | 1:5 | 1:10 | 1:20  | 1:50  | 1:100 | 1:200 | Design year |
|----------------------------------------------|-----|-----|------|-------|-------|-------|-------|-------------|
| Rational                                     |     |     |      | 17.41 | 23.85 | 30.83 |       | 50          |
| Alternative rational                         |     |     |      | 13.19 | 17.43 | 21.14 | 23.94 | 50          |
| Unit hydrograph                              |     |     |      | 15.15 | 19.95 | 24.80 |       | 50          |
| Standard design flood                        |     |     |      | 13.97 | 20.46 | 25.91 | 31.69 | 50          |
| Empirical                                    |     |     |      | 13.43 | 17.56 | 20.66 |       | 50          |
| Statistical: LN                              |     |     |      |       |       |       |       |             |
| Statistical: LEV1                            |     |     |      |       |       |       |       |             |
| Statistical: LP3                             |     |     |      |       |       |       |       |             |
| Statistical: EV1                             |     |     |      |       |       |       |       |             |
| Class of road = Class 1 Primary Distributors |     |     |      |       |       |       |       |             |



# PRELIMINARY DESIGN ASSESSMENT OF THE PROPOSED EARTH DAM

**Client:** Sterkwater Farming

**Project Nr.:** 2235

**Version:** Oct 2024

**Address:**

**Annexure:**

**Dam:** Site 1 – Helpmekeer Dam

**Date:** 04-Sep-24

**Report by:** Charl Bester

SAREL BESTER ENGINEERS

P.O. Box 21, Ceres 6835

Ph: 023-312 2017

- Notes:** 1. Also known as Langrug-Boonste No.1 Dam  
2. Downstream Development  
3. Estimated Basin Calculations

## Design Parameters & Assumptions:

|                     |       |                        |      |
|---------------------|-------|------------------------|------|
| Crest width (m):    | 4,0   | Cut-off depth (m):     | 3,00 |
| Upstream slope 1:   | 3,0   | Cut-off base (m):      | 4,00 |
| Downstream Slope 1: | 2,0   | Cut-off slope 1:       | 0,50 |
| Irrigation (m³/ha): | 7 000 | Capacity Yield Factor: | 1,3  |

## Financial Assumptions:

|                          |              |
|--------------------------|--------------|
| Earthmoving Cost (R/m³): | 60,00        |
| Basic Fees Scale (%):    | 8,0%         |
| Fees Base Value (R):     | R 11 500 000 |
| Enlargement (Y/N):       | Y            |

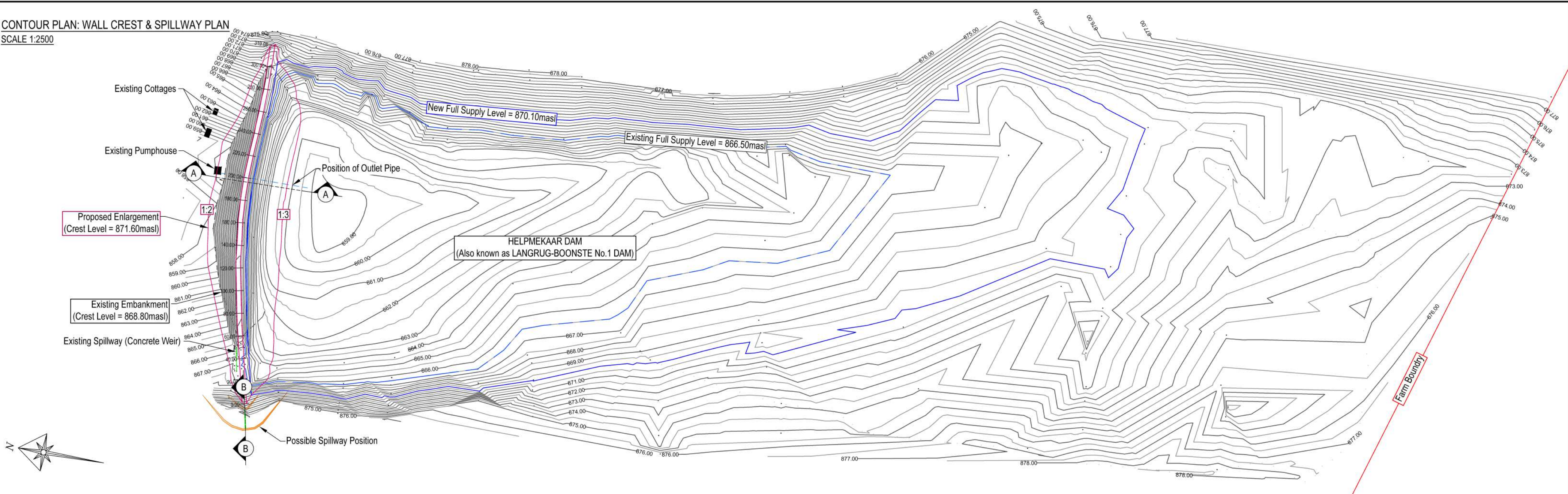
| Item | Description                                | Unit | Existing | OPT 1     | OPT 2      | OPT 3   | OPT 4   |
|------|--------------------------------------------|------|----------|-----------|------------|---------|---------|
| 1    | <b>EARTHWORKS</b>                          |      |          |           | <<800000>> |         |         |
| 1.1  | Embankment crest level (NOC)               | masl | 868,80   | 871,50    | 871,60     |         |         |
| 1.2  | Lowest ground level (TOE)                  | masl | 858,00   | 857,70    | 857,70     |         |         |
| 1.3  | Maximum wall height                        | m    | 10,80    | 13,80     | 13,90      | #N/A    | #N/A    |
| 1.4  | Embankment crest length                    | m    | 240,0    | 320,0     | 320,0      |         |         |
| 1.5  | Embankment: <b>Cut to Fill</b> (X-Works)   | m³   | 0        | 40 800    | 45 000     |         |         |
| 1.6  | Embankment: <b>Borrow to Fill</b> (Import) | m³   |          |           |            |         |         |
| 1.7  | <b>Cut to Spoil</b> (X-Basin & below FSL)  | m³   |          |           |            |         |         |
| 1.8  | <b>Cut to Spoil</b> (Outside & above FSL)  | m³   |          |           |            |         |         |
| 1.9  | <b>Temp Stockpile</b> (Double handle)      | m³   |          |           |            |         |         |
| 1.10 | <b>Cut-off trench</b> excavation volume    | m³   | 0        | 1 320     | 1 320      | #N/A    | #N/A    |
| 1.11 | <b>Gross Earthworks</b>                    | m³   | 0        | 42 120    | 46 320     | #N/A    | #N/A    |
| 2    | <b>STORAGE CAPACITY</b>                    |      |          |           |            |         |         |
| 2.1  | Full supply level                          | masl | 866,50   | 870,00    | 870,10     |         |         |
| 2.2  | Draw-off / Empty level                     | masl | 858,00   | 859,00    | 859,00     |         |         |
| 2.3  | Total free-board                           | m    | 2,30     | 1,50      | 1,50       | 0,00    | 0,00    |
| 2.4  | Max depth above draw-off level             | m    | 8,50     | 11,00     | 11,10      | 0,00    | 0,00    |
| 2.5  | Nett capacity from contour model           | m³   | 392 000  | 745 600   | 765 000    |         |         |
| 2.6  | Capacity gain as percentage of fill        | %    | 0%       | 90%       | 90%        | 0%      | 0%      |
| 2.7  | Capacity gain from excavations             | m³   | 0        | 36 720    | 40 500     | 0       | 0       |
| 2.8  | Capacity gain over existing dam            | m³   | 0        | 390 320   | 413 500    | 0       | 0       |
| 2.9  | <b>Potential gross capacity</b>            | m³   | 392 000  | 782 320   | 805 500    | 0       | 0       |
| 2.10 | Water surface                              | ha   | 9,50     | 16,30     | 16,30      |         |         |
| 2.11 | Potential gross (yield) irrigation         | ha   | 72,80    | 145,29    | 149,59     | 0,00    | 0,00    |
| 2.12 | Average water depth                        | m    | 4,13     | 4,80      | 4,94       | #DIV/0! | #DIV/0! |
| 2.13 | Recommended pipe diameter                  | mm   | 300      | 400       | 400        | 150     | 150     |
| 3    | <b>COSTING (Excl VAT)</b>                  |      |          |           |            |         |         |
| 3.1  | Overhead & Preparation                     | Rand | 0        | 361 029   | 397 029    | #N/A    | #N/A    |
| 3.2  | Earthworks (excavate & construct)          | Rand | 0        | 2 527 200 | 2 779 200  | #N/A    | #N/A    |
| 3.3  | Concrete & Outlet works                    | Rand | 0        | 416 880   | 458 449    | #N/A    | #N/A    |
| 3.4  | Diverse & Unforeseen                       | Rand | 0        | 361 029   | 397 029    | #N/A    | #N/A    |
| 3.5  |                                            | Rand |          |           |            |         |         |
| 3.6  | <b>Estimated Construction Cost</b>         | Rand | 0        | 3 666 137 | 4 031 706  | #N/A    | #N/A    |
| 3.7  | Engineering Fees Percentage                | %    | 0,0%     | 9,5%      | 9,5%       | #N/A    | #N/A    |
| 3.8  | Engineers costs (ECSA Fees)                | Rand | 0        | 348 773   | 383 551    | #N/A    | #N/A    |
| 3.9  | Engineers costs (Disbursements)            | Rand |          |           |            |         |         |
| 3.10 | <b>Estimated Engineers Costs</b>           | Rand | 0        | 348 773   | 383 551    | #N/A    | #N/A    |
| 3.11 |                                            | Rand |          |           |            |         |         |
| 3.12 |                                            | Rand |          |           |            |         |         |
| 3.13 | <b>Total estimated project cost</b>        | Rand | 0        | 4 014 910 | 4 415 257  | #N/A    | #N/A    |
| 4    | <b>INDICATORS</b>                          |      |          |           |            |         |         |
| 4.1  | Ratio (Gained Storage : Earthworks)        | >3   | n/a      | 9,27      | 8,93       | #N/A    | #N/A    |
| 4.2  | Cost per storage capacity gained           | R/m³ | n/a      | 10,29     | 10,68      | #N/A    | #N/A    |
| 4.3  | Cost per irrigation hectare gained         | R/ha | n/a      | 55 387    | 57 496     | #N/A    | #N/A    |

# **Appendix D**

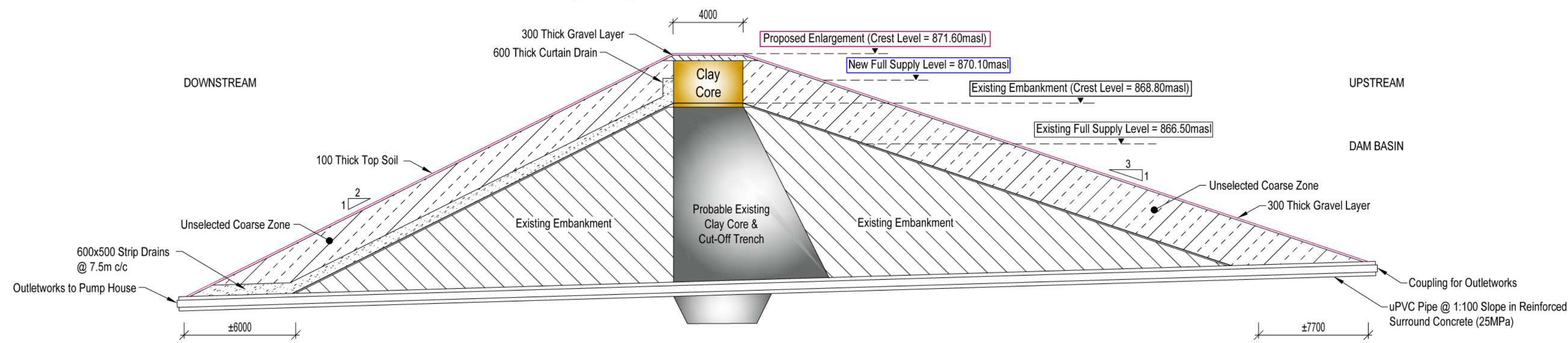
## **PRELIM DESIGN DRAWINGS**

✓ **DWG 2235-S2-02**

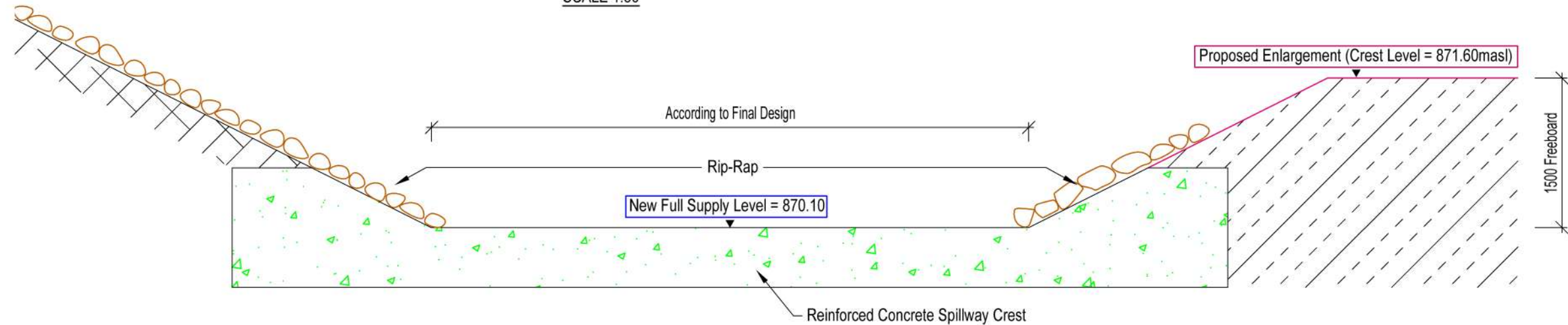
CONTOUR PLAN: WALL CREST & SPILLWAY PLAN  
SCALE 1:2500



TYPICAL SECTION THROUGH EMBANKMENT (A-A)  
SCALE 1:200



TYPICAL SECTION THROUGH SECTION (B-B)  
SCALE 1:50



| TECHNICAL INFORMATION: LANGRUG-BOONSTE No.1 DAM (SITE 1) |               |               |
|----------------------------------------------------------|---------------|---------------|
|                                                          | EXISTING      | ENLARGEMENT   |
| Wall crest level                                         | : 868.80 masl | : 871.60 masl |
| Wall crest width                                         | : 4.00 m      | : 4.00 m      |
| Wall crest length                                        | : 240.00 m    | : 320.00 m    |
| Lowest ground level at embankment toe                    | : 858.00 masl | : 857.70 masl |
| Maximum wall height                                      | : 10.80 m     | : 13.90 m     |
| Upstream slope                                           | 1V : 3.00 H   | 1V : 3.00 H   |
| Downstream slope                                         | 1V : 2.00 H   | 1V : 2.00 H   |
| Embankment earthfill: cut-off trench excl.               | : -           | : ±45 000 m³  |
| Total estimated earthfill                                | : -           | : ±46 320 m³  |
| Full supply level                                        | : 866.50 masl | : 870.10 masl |
| Total freeboard                                          | : 2.30 m      | : 1.50 m      |
| Netto storage capacity                                   | : ±392 000 m³ | : ±800 000 m³ |
| Flooded area                                             | : ±9.50 ha    | : ±16.30 ha   |
| Dam footprint area                                       | : ±9.80 ha    | : ±17.30 ha   |

| REVISION                                                                                                                                                  |                                       |                           |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------------|------------|
|                                                                                                                                                           |                                       |                           |            |
| <b>SAREL BESTER ENGINEERS CC</b><br>Consulting Civil Engineers<br>Architectural Services                                                                  |                                       |                           |            |
| Date: 12/12/2024                                                                                                                                          |                                       |                           |            |
| MC BESTER<br>Pr. Eng., B.Eng., MSAICE:970598, SACAP:T1218<br>P.O. Box 21<br>Lyell Street 62<br>CERES, 6835<br>Ph: 023-312 2017<br>e-mail: admin@sbi.co.za |                                       |                           |            |
| CLIENT: Sterkwater Boerdery<br>P.O. Box 103<br>CERES<br>6835                                                                                              |                                       |                           |            |
| PROJECT: PROPOSED ENLARGEMENT OF<br>LANGRUG-BOONSTE NO.1 DAM<br>ON FARM 202 PORTION 5, CERES DISTRICT                                                     |                                       |                           |            |
| DETAIL: Contour Plan, Embankment Cross Section &<br>Spillway Section                                                                                      |                                       |                           |            |
| DRAWN<br>R van der Merwe                                                                                                                                  | DATE<br>MAY, 2024                     | SCALE<br>as shown         | SHEET<br>2 |
| SURVEYED<br>R van der Merwe<br>D La Meyer                                                                                                                 | DESIGNED<br>Sarel Bester<br>Engineers | DWG. NUMBER<br>2235-S2-02 | REV.       |
| COPYRIGHT RESERVED - 2024                                                                                                                                 |                                       |                           |            |
| A2                                                                                                                                                        |                                       |                           |            |