

# PRELIMINARY DESIGN REPORT

For the Building and Commissioning of  
Category II Earthfill Dams

In terms of Article 117 to 123 of the  
National Water Act 1998  
(Act 36 of 1998)

## JADE HILLS DAM

Location: Situated on Ptn 26 of Stinkfontein 383,  
District Ceres

Owner: Jade Farming  
P.O. Box 72  
CERES  
6835

Person in control: Mr. J. Faul  
P.O. Box 72  
CERES  
6835

APP Reference: 1804

Date of Issue: November 2018

## SAREL BESTER INGENIEURS BK

Raadgewende Siviele Ingenieurs / Consulting Civil Engineers

Argitektuursdienste / Architectural Services

CK1999/69837/23

Bus/Box 21, CERES, 6835

T: 023-312 2017

F: 023-312 3802

E: sbri@telkomsa.net



Verw: 1804DDR-S2

Datum: 2018/11/26

Jade Farming  
P.O. Box 72  
CERES  
6835

Attention: Mr Jean Faul

**PRELIMINARY DESIGN REPORT FOR THE PROPOSED NEW JADE HILLS DAM ON FARM STINKFONTEIN 383, PORTION 26, DISTRICT CERES, JADE FARMING PTY LTD**

Your instruction regarding the investigation and preliminary design of the construction of the above mentioned dam, refers.

## **1. BACKGROUND**

A conceptual assessment for building a dam on this particular site was conducted for the first time approximately 7 years ago for a previous owner. The proposed dam, although on the small side, has a relatively high dam wall across a fairly narrow valley near the northern boundary on the farm Stinkfontein 383/26 in the Ceres district, approximately 5km east from Ceres as the crow flies, refer **Appendix A**.

The preliminary design of a dam normally follows after the scoping or feasibility stage during which the position, basic layout as well as the intended storage volume range along with the initial costing had been determined. The preliminary design will then serve as the basis for the final dam design and contract specifications according to dam safety regulations in terms of chapter 12 of the National Water Act, 1998 (Act 36 of 1998). However, in this case, stage 1 can be considered completed under the previous investigation as mentioned above, and with this being a modified expansion on the previous work.

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

The project entails the design and construction of the proposed Jade Hills Dam with a provisional storage capacity in the order of  $\pm 67\,000\text{m}^3$ . The main idea is to put up the existing winter water use, namely 8,6ha of water from the privately owned Rietvallei scheme for summer irrigation.

The farm was bought in 2013 from the previous owner who also owns the neighbouring property. However, the proportional water share in the private Rietvallei scheme had been leased and utilised on another neighbouring farm for many years, hence no footprint of any irrigation on the particular property under consideration. The recent transfer or transaction in fact included the transfer of the water use back onto the property, previously being farmed as a dry-land farm. Ending the long-standing water lease agreement and reverting back the use of the water onto the share-holding property, now unlocks the potential for developing about 10ha of fruit orchards.

## 2. ASSIGNMENT

The firm **Sarel Bester Engineers** has been appointed as the project engineer and coordinator also overseeing the various statutory obligations and responsibilities. Instruction and appointment was received to continue with the preliminary dam design stage for licensing purposes.

The preliminary design normally follows after and is based on the outcome from the feasibility or scoping exercise. However, in this case the proposed Jade Hills dam is based on the actual original survey data done for the previous owner.

The intention and purpose of the Preliminary Dam Design Report is and therefore 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 use license application,
- serve as information to DEADP regard to the environmental impact assessment, and
- serve as a basis to Dam Safety Office regarding proper classification and APP matters.

This application is based on storing the property's current share of water in the private scheme without any known negative impact on any existing water uses up- or downstream of it.

## 3. APPLICATION & MOTIVATION

The Water Use Licence Application (WULA) as such with its motivation is dealt with in full in a separate document also compiled by our office, **Sarel Bester Engineers**. The proposed new dam will pot up the winter water share in the scheme which was previously leased to and utilised on the neighbouring property. However, with the change in ownership in 2013 this particular water use has now been reverted back to the actual share-holding property which will now be farmed separately. The proposed dam will give the new or current owner the opportunity to use the water on the concerned property which was previously being farmed as dry lands. This agricultural expansion in itself will ensure long term economic viability as well as sustainability of the farming entity by creating additional permanent jobs on the farm within the agricultural industry.

The proposed dam site is located within the H10B quaternary catchment area. Since the application is solely based on an existing water use, no downstream water use will be influenced by this application.

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

## 4. ALTERNATIVES

Farm Stinkfontein 383 Portion 26, also known as Jade Hills, is a very small property with a rather flat local topography situated within the Ceres valley and as such there are no other economically viable alternative sites available on the property. This particular site however is considered the best and only economical option with a natural basin situated relatively high relative to the area-to-be-developed. Although not very good, the cost/storage ratio is considered viable under the circumstances requiring the least amount of earthworks while offering the best gravitational benefits when considering irrigations aspects, both considered positive from an economical point of view.

Other than that there is no real viable alternatives, and both the existing as well as the proposed farm infrastructure lends itself towards this option. The proposed footprint is on existing fields without any negative impact on any natural vegetations. The site is also situated close to the existing Rietvlei Scheme off-take point from where the water would be received ensuring minimal losses.

The Table below shows a summary of the dam site characteristics:

Option:	Jade Hills Dam
Max wall height (m)	11.1
Crest length (m)	240
Total earthworks (m <sup>3</sup> )	29 100
Gross storage capacity (m <sup>3</sup> )	±67 600
Flooded area (ha)	1,7
Storage : Earthworks	2.32
Estimated Cost (R)	±R1.87mil

## 5. WATER AVAILABILITY

The concerned property, Stinkfontein 383/26, has been researched and evaluated with regard to ownership as well as existing water uses under the auspices of the *Breedde-Gouritz Catchment Management Agency* (BGCMA). We refer to **Appendices B & C** for detail information.

A) Existing Lawful Use (ELU):

**TAKING:** Rietvallei Scheme (Winter) ~ 64 500m<sup>3</sup> (8,6ha @ 7 500m<sup>3</sup>/ha/a)  
~ transferred from Stinkfontein 383/50 (2011)

**STORING:** None

B) Proposed New Jade Hills Dam (Current WULA):

**STORAGE:** ~ 67 000m<sup>3</sup> (Proposed dam)

## 6. DAM SAFETY & CLASSIFICATION

The project entails the proposed Jade Hills dam and one of the first steps is to have the dam classified in terms of dam safety regulations. The application was submitted on April 2018 to the Dam Safety Office and the dam was classified on 11 June 2018 as a Small Category II dam with a Significant hazard potential rating under reference 12/2/H101/FE. Refer **Appendix D**.

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 *Jade Hills 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 small 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

The proposed dam site is located near the northern farm boundary far away from any registered roads or other types of infrastructure.

Apart from a borehole elsewhere on the property, no other features or structures were found in terms of statutory regulations which have to be protected in the design and construction process such as heritage etc.

## 10. HYDROLOGY

The proposed dam is located in the H10B quaternary catchment within the larger Breede River catchment area, see **Appendix E**. The application is solely based on an existing winter water use as a pro-rata share in the private Rietvallei pump scheme from the Titus River delivering water to eight independent farms.

Even though the application does not entail any surface runoff, we have done a basic hydrological run-off study for completeness of this report. However, based upon the local rainfall figures of the surrounding areas, we are of the opinion that the local run-off is much less than indicated in the WR2012 and therefore we have amended the local run-off with an in-house factor.

*Concerned quaternary catchment characteristics according to the WRC Report 2012 & Eisenburg Delineation Tool :*

Catchment	<u>Quaternary:</u>	<u>Local Catchment (Eisenburg)</u>	<u>Local Catchment (Amended)</u>
Name / Description - Catchment	H10B	Jade Hills Dam	Jade Hills Dam
Area [km <sup>2</sup> ]	162	0.13	0.13
Mean Annual Precipitation (MAP) [mm]	734	585	500
Mean Annual Runoff (MAR) [mm]	161	196	
Gross Average Runoff (MAR) [x 10 <sup>6</sup> m <sup>3</sup> ]	26,16	0.007	0.0018

## 11. GEOLOGY

According to the Geological Survey of South Africa, the proposed site falls within the Bokkeveld group and Ceres subgroup including the Voorstehoek formation, all part of the larger Cape System. We refer to **Appendix F**. These basic formations are described as follows:

- **Dv** – Dark-grey fossiliferous shale, mudstone and siltstone with thin sandstone beds,
- **Dg** – Black to dark-grey fossiliferous shale, mudstone and siltstone,
- **Dga** – dark-grey, rather lithic and feldspathic sandstone and siltstone, subordinate shale and conglomerate

The geological investigation identified two geological features towards the eastern side in the form of anti- and syncline structures respectively both in a close to north-south orientation. There is also a geological fault line south-east from the dam site in a north-south orientation. Geological slip or contact planes tend to consist of severely disintegrated material posing a potential risk for water to be redirected and as a result causing a dam to leak. In other words, attention should be given to the sealing off of the dam basin and foundation.

The soil on the site varies from sandy to gravelly silt to weathered shale which is considered suitable for a dam structure of this nature based on experience with similar dams in the nearby vicinity.

## 12. SITE PROFILE

The Water Research Commission have recently launched their updated study of the Water Resources of South Africa since the previous DVD version thereof, known as WR2005. The updated web-based information system, <[waterresourceswr2012.co.za](http://waterresourceswr2012.co.za)> launched in 2016, is well recommended by the Department of Water & Sanitation and also widely used throughout South Africa as basis when it comes to water management and development issues.

The table below shows a summary of such characteristics or profile regarding the proposed dam site.

<b>Figure</b>	<b>Property Description</b>	<b>Zone / Index / Value</b>	<b>Unit / Scale</b>
Figure 0	Water Management Area	18 ~ Breede	
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	Cultivated: Permanent - Commercial Irrigated	
Figure 6	Simplified Geology (WR90)	Intercalated arenaceous and argillaceous strata	
Figure 7	Soils (WR90) [Depth / Texture / Relief]	Moderate to deep/ sandy loam/ steep	
Figure 8	Sediment (WR90) [Erodibility Index]	16 ~ Low	High 1-8 Medium 9-15 Low 16-20
Figure 9	Vegetation (Acocks Veld Types)	Temperate and transitional forest and scrub types	
Figure 10	EWR Management Class	Class D (Largely 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	25001 – 50 000	[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.

### 13. CONCEPTUAL DESIGN

The proposed project entails the construction of a new zoned earthfill dam with an essentially straight alignment and layout.

A) Design Characteristics:

The proposed dam is considered an in-stream dam with the following characteristics:

Location	33°22' 32"S 19°22' 13"E
Wall crest level (masl)	548.50
Full supply level (masl)	547.00
Lowest ground level (masl)	537.40
Max wall height (m)	11.10
Crest length (m)	237
Crest width (m)	4.00
Upstream slope	1:3
Downstream slope	1:2
Free board (m)	1.50
Embankment volume (m <sup>3</sup> )	23,400
Total earthworks including cut-off (m <sup>3</sup> )	29,100
Gross storage capacity from contours (m <sup>3</sup> )	67,600
Water surface area (ha)	1.70
Embankment footprint (ha)	2.00

- B) Foundation: Preliminary visual inspections show a topsoil layer that varies between  $\pm 0,3\text{m}$  and  $\pm 0,5\text{m}$  thick on a silty to gravelly layer between 1,0 to 2,5m on a shale and siltstone foundation. The formation is considered adequate and suitable for this type of structure.
- 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 in the valley. This characteristic will be addressed formally in the final design by way of optional chemical stabilisation plus increased compaction specifications and built-in sand filters.
- D) Embankment design: The overall layout is a straight wall with a  $\pm 240\text{m}$  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  $\pm 11\text{m}$  with the upstream slope provisionally at 1v : 3h, the downstream slope at 1v : 2h and the crest width at 4m.
- E) Drainage: Due to the height and the possibility of dispersiveness of materials in the surrounding area and pending the outcome of the soil tests, the internal embankment profile might require an optional built-in drainage system in the form of a curtain drain on the downstream side of the core plus a blanket drain or evenly spaced strip drains over the downstream solum area. Apart from this, drainage will also rely on the normal phreatic movement of moisture through the earthfill structure itself.

- F) Stability: This aspect is considered part of the final design exercise when a full slope and internal stability analysis will be conducted based on the results forthcoming from the soil testing. Pending the outcome of these results, including the stability calculations, the proposed profile has been evaluated against and based upon applicable statistics obtained from a database of dams without any obvious risks being identified. However, the final design will include a formal design approach based on finite element stability calculation models.
- G) Outlet works: The outlet is currently planned as a single  $\varnothing 150\text{mm}$  class 9 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 inlet 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 10 to 20 days.
- H) Spillway & Flood management: The dam will be equipped with an open side channel spillway with a concrete sill at the right abutment leading the flood water safely past and away from the embankment toe and back into the stream bed. The erodibility index is 16 on a scale of 1 to 20 with 1 being high and 20 being low, in other words the index is classified as low. The dry freeboard is provisionally set at 1,2m in line with SANCOLD recommendations.
- I) Maintenance and Operation: The dam is situated in a winter rainfall area and will primarily be filled during the winter season from the Rietvallei scheme. The operation and supervision of the dam will take place under the direct control of the owners or delegated authority on a seasonal cycle.
- J) Specifications: Relevant and applicable specifications are envisaged for this purpose. Although it might not be a requirement for a category I dam as such, it is recommended that the following standardized specifications be considered as basis and part of the construction contract:
- General Conditions of Contract for Construction Works (2010)
  - SANS/SABS 1200AD: General (Small Dams)
  - SANS/SABS 1200DE: Small Earth Dams
  - SANS/SABS 1200GA: Concrete (Small Works)
  - SANS/SABS 1200L: Medium Pressure Pipeline

#### 14. 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 in order to ensure quality of workmanship.

#### 15. DOWNSTREAM DEVELOPMENT

The proposed dam is considered an in-stream dam located  $\pm 11\text{km}$  upstream from the confluence with the Dwarsrivier. The potential flood area consists mainly of cultivated land. The river also passes through parts of the town Ceres before it confluences with the Dwarsrivier. Downstream development consist of a few single isolated dwellings and minor roads as well as the district road (R46) between Ceres and Touwsrivier within the potential flood zone. The potential loss of life and expected economic damage is considered limited according to the outcome of the classification of the dam by Dam Safety Office (DSO).

## 16. COSTING

The estimated costing of the project is based on recent tender prices of similar type projects within the Western Cape region. The basic costing of the project was done by using related data from other projects and dividing the sum total of all the earthmoving and related costs by the sum total of all the bulk earthmoving volumes in order to obtain an all inclusive unit price for earthmoving. Additional allowance was then made for other costs such as overhead costs, concrete & outlet related costs as well as diverse & unforeseen cost items. These were all added up as the estimated project cost on the attached preliminary design evaluation sheet included in **Appendix G** and summarized below.

<u>Description</u>	<u>JADE HILLS DAM</u>
Max Wall Height (m)	11,1
Total Earthmoving (m <sup>3</sup> )	29 100
Nett Storage Capacity (m <sup>3</sup> )	±55 900
Storage : Earthworks	2,32
Estimated Dam Cost (R)	±R1,87mil

The figures above show average favourable storage ratios, being just greater than 2 and as such not really contributing to better economics regarding the overall cost per unit storage capacity. However, dam sites are considered more economical when the storage ratio is about 5 and higher.

In this case, the earthworks costing was calculated at a basic rate of **±R45/m<sup>3</sup>** accounting for ±65% of the total cost which translates to an estimated project cost in the order of **R1,87mill**, excluding fees etc.

## 17. SUMMARY

Jade Hills dam is planned as an in-stream dam situated in a very small tributary of the Dwarsrivier within the catchment of the larger Breede River system. The water use license application (WULA) for storing is entirely based on the existing winter water from the Rietvallei scheme, abstracted from the Titus river. The proposed method for abstracting and distributing water from the dam will primarily be by pumping uphill to the proposed fruit development areas surrounding the dam.

The basic layout of the dam will be that of a straight aligned earthfill structure with controlled inflow from the Rietvallei scheme together with its own spillway at the right abutment.

The application for a licence to store water from DWS as well as the environmental impact study for DEADP are both in process of being submitted along with this Preliminary Dam Design Report. 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.

Although on the slightly expensive side, based on the geotechnical information gathered for this purpose as well as topographical conditions, the overall site is considered suitable for a dam of this nature under the applicable conditions.

**18. APPENDIXES**

- A) Locality Map
- B) Title Deed Information
- C) Rietvallei Irrigation Scheme ~ Acknowledgement
- D) Classification Application, dated June 2018
- E) Hydrology
- F) Geology
- G) Preliminary Design Evaluation: Quantities & Costing
- H) Drawings:    1804-S1-01: Contour Plan on Aerial Photo  
                  1804-S2-01: Contour Layout Plan & Sections

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 Eng)

Copies to:	Mr Jean Faul, Jade Hills Farming, Ceres
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# **APPENDIX A**

Locality Map



# **APPENDIX B**

Title Deed Information

# WinDeed Database Deeds Office Property



STINK FONTEIN, 383, 26 (CAPE TOWN)

GENERAL INFORMATION	
Date Requested	2018/02/16 08:45
Deeds Office	CAPE TOWN
Information Source	WINDEED DATABASE
Reference	1804



PROPERTY INFORMATION	
Property Type	FARM
Farm Name	STINK FONTEIN
Farm Number	383
Portion Number	26
Local Authority	WITZENBERG DC
Registration Division	CERES RD
Province	WESTERN CAPE
Diagram Deed	T12363/1983
Extent	53.4685H
Previous Description	-
LPI Code	C0190000000038300026

OWNER INFORMATION	
<b>Owner 1 of 1</b>	
Type	COMPANY
Name	JADE FARMING PTY LTD
ID / Reg. Number	201112118207
Title Deed	T13043/2013
Registration Date	2013/03/18
Purchase Price (R)	2,500,000
Purchase Date	2013/02/21
Share	0.00
Microfilm	-
Multiple Properties	NO
Multiple Owners	NO

ENDORSEMENTS (4)				
#	Document	Institution	Amount (R)	Microfilm
1	B11820/2016	NEDBANK LTD	3,000,000	-
2	K120/2000S	-	UNKNOWN	2000 0139 2820
3	K973/1993S	-	UNKNOWN	1993 0598 2649
4	FARM CE 383/26	-	UNKNOWN	1985 0022 1407

HISTORIC DOCUMENTS (4)				
#	Document	Owner	Amount (R)	Microfilm
1	T76050/1997	WARMBOKVELD PLASE PTY LTD	213,874	2000 0139 2811
2	T12363/1983	CERES FRUIT GROWERS COOP LTD	UNKNOWN	1994 0094 3959
3	T68337/2011	MEGAVAAL ENGINEERING TECHNOLOGIES PTY LTD	2,350,000	-
4	T5441/1994	CERES FRUIT GROWERS OPERATIONS	26,813	2007 0113 2842

# **APPENDIX C**

Rietvallei Irrigation Scheme ~ Acknowledgement

# RIETVALLEI BESPROEIINGSKEMA

Posbus 99, Ceres, 6835  
Telephone: 023 312 1978

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23 Oktober 2018

Vir wie dit aangaan.

Na aanleiding van u e-opos bevestig ek die volgende:

**I/S Jade Hills (Stinkfontein 383/26) vir sy Rietvalleiskema (8,6ha) water wat aan hom oorgedra was tydens die aankoop van die eiendom.**

- (1) Rietvallei skema is bewus is van hierdie oordrag in 2011 (tesame met eiendom transaksie) van water vanaf (Warmbokkeveld plases - Stinkfontein 383/50) na Jade Hills farming ( Stinkfontein 383/26)
- (2) Dit is nie 'n probleem is vir die betrokkenes nie
- (3) die water is wel beskikbaar .

Aftappunte is reeds uitgewys.

Groete

Ian Zulch  
Voorsitter Rietvallei Besproeiing

# **APPENDIX D**

Classification Application, dated June 2018



# water & sanitation

Department:  
Water and Sanitation  
**REPUBLIC OF SOUTH AFRICA**

Private Bag X313, PRETORIA, 0001. Sedibeng Building 185, Francis Beard Street, PRETORIA, 0001.  
Tel: +27 12 336 7500 www.dws.gov.za

[modisel@dws.gov.za](mailto:modisel@dws.gov.za)

Ms L A Modise

(012) 336-7758

12/2/H101/FE

Mr Jean Faul  
Jade Farming  
P O Box 72  
**CERES**  
6835

Email: [jeanfaul@lando.co.za](mailto:jeanfaul@lando.co.za)

Sir

## **CLASSIFICATION OF DAM WITH A SAFETY RISK IN TERMS OF CHAPTER 12 OF THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998) READ WITH REGULATIONS 2 AND 3 OF THE REGULATIONS PUBLISHED IN GOVERNMENT NOTICE R. 139 OF 24 FEBRUARY 2012: PROPOSED JADE FARMING DAM 1 ON PORTION 26 OF THE FARM STINK FONTEIN 383, DIVISION OF CERES**

### **A. APPLICATION**

Your application received from Mr Steven le Roux of firm Sarel Bester Ingenieurs BK, dated 09 April 2018, refers.

### **B. CLASSIFICATION**

1. The classification of the **Proposed Jade Farming Dam 1** is as follows:

Vertical wall height	11.1 meters
Storage capacity	67 600 cubic meters
Size classification	Small
Hazard potential rating	Significant
Category	II

2. The classification is based on available information. If you have any information on the basis of which you feel the classification is incorrect, you should submit a substantiated application in writing for its revision.

### **C. REQUIREMENTS FOR CONSTRUCTING DAMS WITH A SAFETY RISK**

1. No construction work as stipulated in regulation 4, 10 to 22 of the said regulations may commence before the following appropriate steps have been followed:

1.1 In terms of Regulation 4(1), no person who intends to construct dams with a safety risk, may begin any construction work, before he is in possession of a **licence to construct**, issued by the Director-General (Dam Safety Regulation (Office)).

1.2 In terms of Regulation 10, any person who intends to construct a Category II dam, so that the completed dam can be classified as a Category II dam, must-



12/2/H101/FE

- 1.2.1 Acquire the services of an approved professional person to design the proposed projects and to draw up plans and specifications for it.
- 1.2.2 Apply on an official application form (DW695E available on the website: [www.dws.gov.za/DSO](http://www.dws.gov.za/DSO)) for a licence to **construct**, by submitting to the Director-General (Dam Safety Regulation (Office)) a proposed design complying with acceptable dam engineering practices and criteria as set out in Regulation 10 to 14.
2. In terms of Regulation 4(2) you have to obtain a water use licence before the dam safety licence to construct/alter/enlarge could be issued.
3. In terms of Regulation 25 an application for a licence to impound after completion of the dam on the form (DW696E) must be submitted. Impoundment of water in the dams may not commence until you are in possession of a licence to impound issued by this Department.
4. In terms of section 120 of the National Water Act, 1998, the dams must be registered at the Dam Safety Regulation (Office) of this Department within 120 days of the date on which the dam become capable of containing, storing or impounding water. The form (DW693E) must be completed and submitted to the Dam Safety Regulation (Office) for this purpose.

**D. THIS LETTER SHALL NOT BE CONSTRUED AS CONFERRING EXEMPTION FROM COMPLIANCE WITH THE FOLLOWING:**

1. The provisions of Chapter 4 of the National Water Act, 1998 pertaining to the lawful water use. Address enquiries and applications in this regard to the following address:

Chief Director: Western Cape  
 Department of Water and Sanitation  
 Private Bag X16

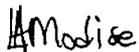
**SANLAMHOF**  
 7532

Tel: (021) 941 6000

Fax: (021) 941 6100

2. The provisions and regulations of the National Environmental Management Act, 1998 (Act No. 107 of 1998) regarding control over activities which may have a detrimental effect on the environment.

Yours faithfully



**Ms L A Modise**

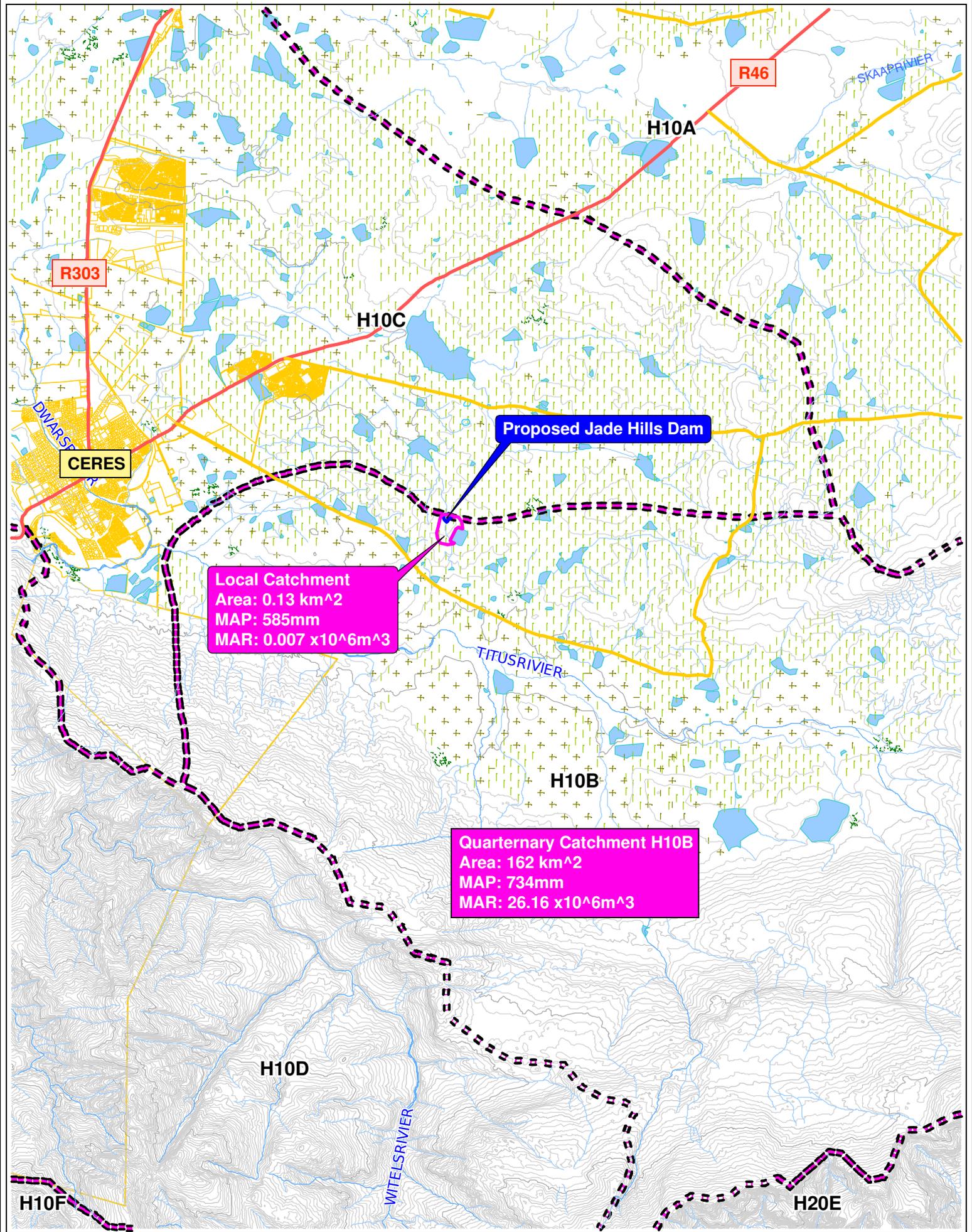
**Designation: Senior Administration Clerk: Dam Safety Regulation**

**Date: 11/06/2012**

Copy to: Mr Steven le Roux (Email: [steven@sbri.co.za](mailto:steven@sbri.co.za))

# **APPENDIX E**

Hydrology



**SAREL BESTER INGENIEURS BK**  
 Randopende Stateke Ingenieurs / Consulting Civil Engineers  
 Argitekuraandende / Architectural Services  
 BusBox 71 CERES, 6835  
 T: 023 312 2017  
 F: 085-514 3350  
 E: sbst@telkomsa.net

**MC BESTER**  
 Pr. Ing., LSAISI: 970598, LSACAP: T1218  
 Tel 023 312 2017 / Epos sbri@telkomsa.net

**Client:** Jade Farming  
 PO Box 72  
 CERES  
 6835

**Project:** Proposed Jade Hills Dam  
 HYDROLOGY MAP

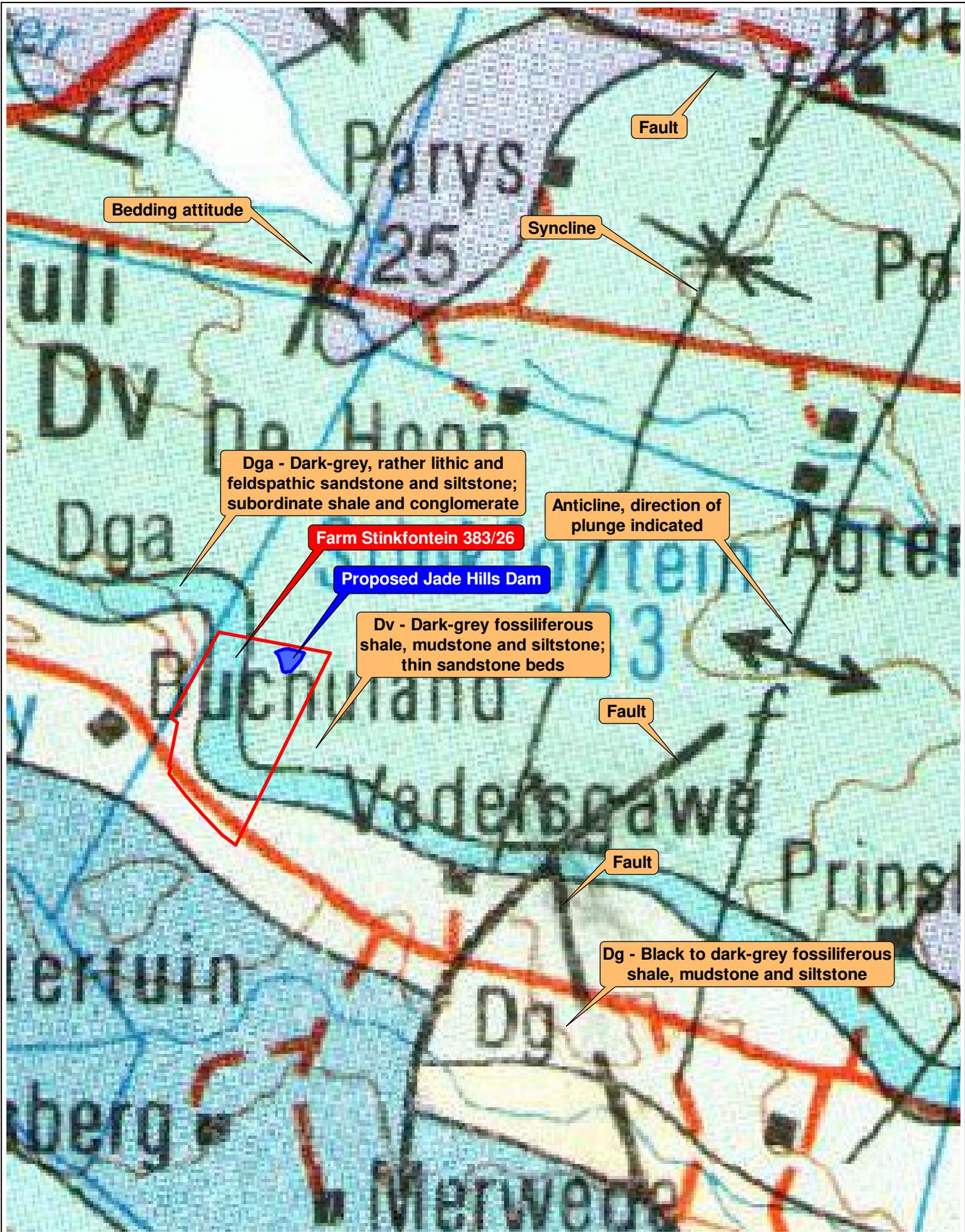
**Map Ref:** 3319AD

**Project Ref:**  
 1804

**Scale:**  
 1: 75 000

# **APPENDIX F**

Geology



**SAREL BESTER INGENIEURS BK**  
 Roadgewese Streeke Ingenieurs / Consulting Civil Engineers  
 Agtekondersende / Architectural Services  
 BusBox 21, CERES, 6835  
 T: 023 312 2017  
 F: 085-314 3350  
 C: 0859988710  
 E: sbst@telkomsa.net

**MC BESTER**  
 Pr. Ing., LSANSI: 970598, LSACAP: T1218  
 Tel 023 312 2017 / Epos sbri@telkomsa.net

**Client:** Jade Farming  
 PO Box 72  
 CERES  
 6835

**Project:** Proposed Jade Hills Dam  
 GEOLOGY MAP

**Map Ref:** 3319AD

**Project Ref:**  
 1804

**Scale:**  
 1: 25 000

# **APPENDIX G**

Preliminary Design Evaluation:  
Quantities & Costing

**PRELIMINARY EVALUATION OF THE PROPOSED EARTH DAM: QUANTITIES AND COSTING**

**Client:** Faul J.  
**Address:** P.O Box  
 CERES 6835

**Project Nr.:** 1804  
**Annexure:** A  
**Prepared:** Stanley  
**Date:** 10-Oct-18

**Version:** Okt 2017

**Report by:** Charl Bester  
 SAREL BESTER ENGINEERS  
 P.O. Box 21, Ceres 6835  
 Ph: 023-312 2017  
 Fax: 086-514 3350

**Dam:** DAM TERRAIN 2

**Notes:** 1. VAT EXCL.  
 2. from SBRI survey for Loxtonia (1040)  
 3. Inlystin 8.6ha @ ±7 000m³/ha = ±60 000m³

**Design Parameters & Assumptions:**

<i>Crest width (m):</i>	<b>4.0</b>	<i>Cut-off depth (m):</i>	<b>4.00</b>
<i>Upstream slope 1:</i>	<b>3.0</b>	<i>Cut-off base (m):</i>	<b>4.00</b>
<i>Downstream Slope 1:</i>	<b>2.0</b>	<i>Cut-off slope 1:</i>	<b>0.50</b>
<i>Percentage of fill from dam basin:</i>	<b>50%</b>	<i>Application (m³/ha):</i>	<b>7,000</b>

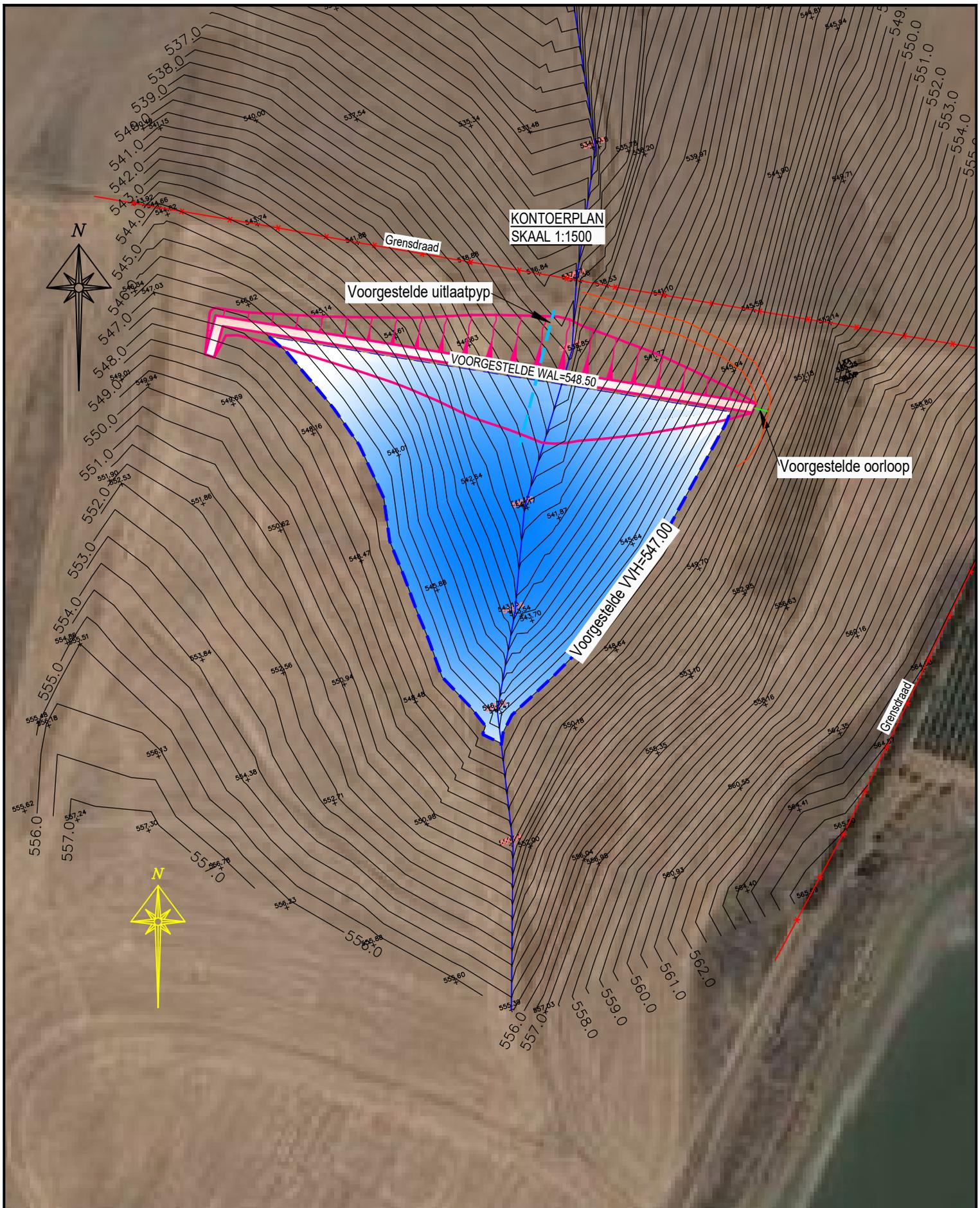
**Financial Assumptions:**

<i>Earthmoving Cost (R/m³):</i>	<b>45.00</b>
<i>Nominal Engineering Fees (%):</i>	<b>8.0%</b>
<i>Fees Base Value (R):</i>	<b>R 11,500,000</b>

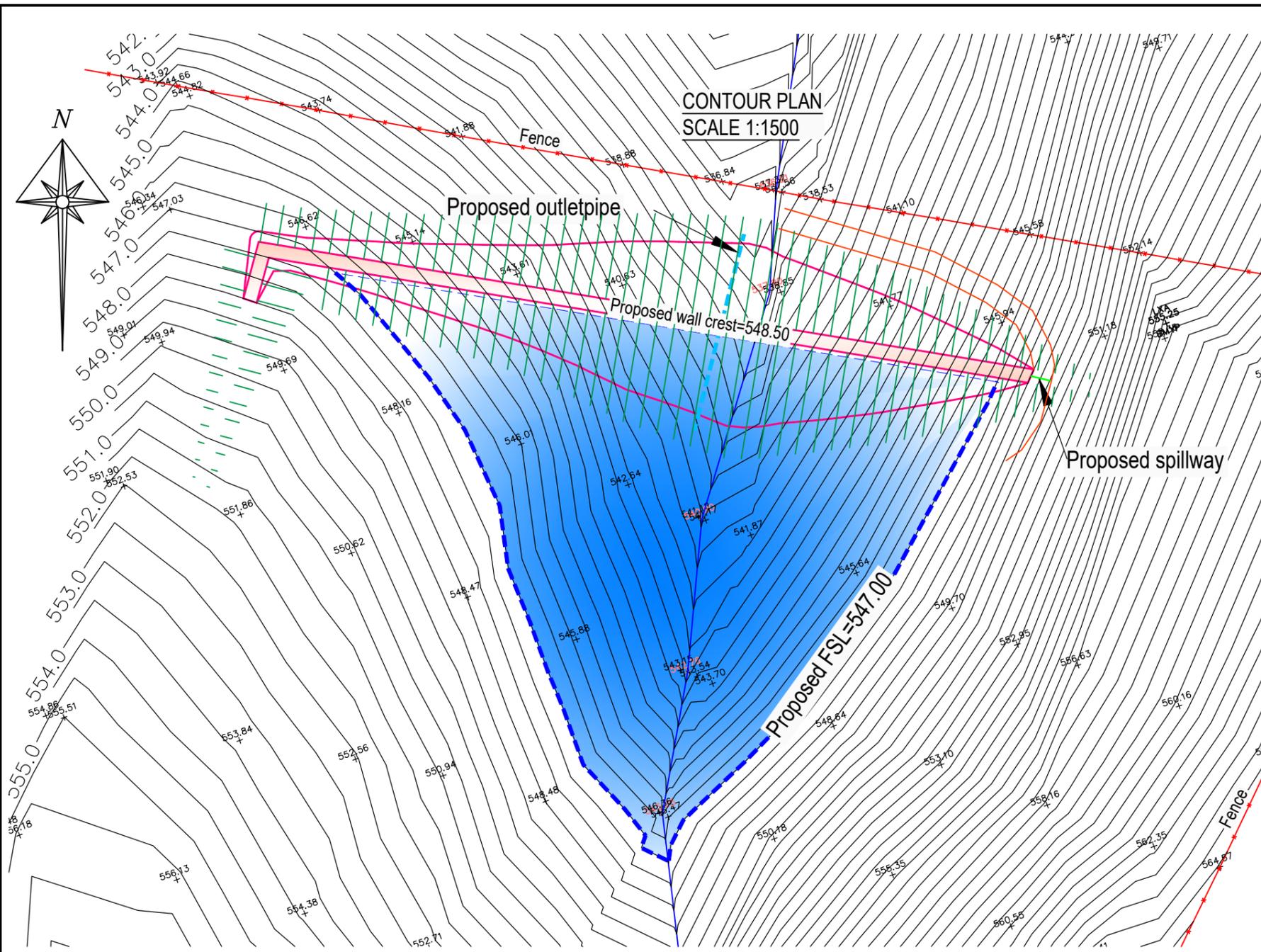
Item	Description	Unit	Stadium / Wall position / Terrain				
			Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
<b>1 EMBANKMENT</b>			>>Rietvalley Irr<<				
			<b>Maximum</b>				
1.1	Wall crest level	masl	548.50	549.00	549.50	552.00	
1.2	Lowest ground level below wall	masl	537.40	537.40	537.40	537.20	
1.3	Maximum wall height	m	11.10	11.60	12.10	14.80	#N/A
1.4	Wall crest length	m	237.0	246.5	256.0	315.0	
1.5	Wall volume - excluding cut-off	m³	23,400	26,700	30,600	54,400	
1.6	Cut-off trench excavation	m³	5,688	5,916	6,144	7,560	#N/A
1.7	<b>Total earthmoving</b>	<b>m³</b>	<b>29,088</b>	<b>32,616</b>	<b>36,744</b>	<b>61,960</b>	<b>#N/A</b>
<b>2 STORAGE CAPACITY</b>							
2.1	Full supply level	masl	547.00	547.50	548.00	550.50	
2.2	Draw-off level	masl	538.00	538.00	538.00	540.50	
2.3	Total free-board	m	1.50	1.50	1.50	1.50	0.00
2.4	Maximum depth above draw-off level	m	9.00	9.50	10.00	10.00	0.00
2.5	Nett capacity from contours	m³	55,900	64,500	75,000	139,000	
2.6	Capacity gain from excavations	m³	11,700	13,350	15,300	27,200	0
2.7	<b>Potential gross capacity</b>	<b>m³</b>	<b>67,600</b>	<b>77,850</b>	<b>90,300</b>	<b>166,200</b>	<b>0</b>
2.8	Water surface	ha	1.70	1.90	2.10	3.10	
2.9	Potential irrigation	ha	9.66	11.12	12.90	23.74	0.00
2.10	Average water depth	m	3.98	4.10	4.30	5.36	#DIV/0!
2.11	Ratio Storage : Earthworks		2.32	2.39	2.46	2.68	#N/A
2.12	Recommended pipe diameter	mm	150	150	150	200	150
<b>3 COSTING (Excl VAT)</b>							
3.1	Overhead & Preparation	Rand	186,994	209,674	236,211	398,314	#N/A
3.2	Earthworks (excavate & construct)	Rand	1,308,960	1,467,720	1,653,480	2,788,200	#N/A
3.3	Concrete & Outlet works	Rand	186,994	209,674	236,211	398,314	#N/A
3.4	Diverse & Unforeseen	Rand	186,994	209,674	236,211	398,314	#N/A
3.5		Rand					
3.6	<b>Estimated Construction Cost</b>	<b>Rand</b>	<b>1,869,943</b>	<b>2,096,743</b>	<b>2,362,114</b>	<b>3,983,143</b>	<b>#N/A</b>
3.7	Adjusted Fees percentage	%	10.8%	10.8%	10.0%	9.5%	#N/A
3.8	Engineers costs (ECSA Fees)	Rand	201,170	225,570	237,228	378,931	#N/A
3.9	Engineers costs (Disbursements)	Rand	75,000				
3.10	<b>Estimated Engineers Costs</b>	<b>Rand</b>	<b>276,170</b>	<b>225,570</b>	<b>237,228</b>	<b>378,931</b>	<b>#N/A</b>
3.11		Rand					
3.12		Rand					
3.13	<b>Total estimated capital cost</b>	<b>Rand</b>	<b>2,146,113</b>	<b>2,322,313</b>	<b>2,599,342</b>	<b>4,362,074</b>	<b>#N/A</b>
3.14	Capital costs per m³ gross capacity	Rand	31.75	29.83	28.79	26.25	#N/A
3.15	Capital costs per irrigated hectare	Rand	222,231	208,814	201,499	183,722	#N/A

# **APPENDIX H**

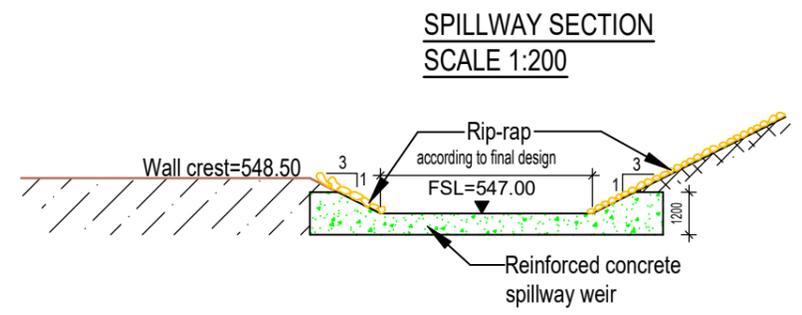
Drawings



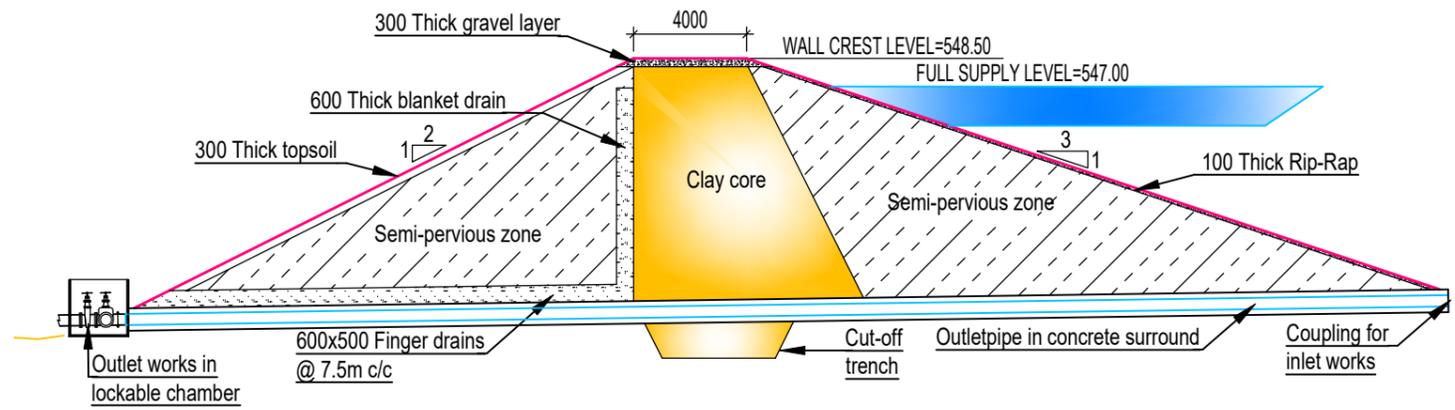
 <b>SAREL BESTER</b> Raadgewende Siviele Ingenieurs Argitekturendienste .....Datum: 26/06/2018 <b>MC BESTER</b> Pr. Ing., B. Ing., LS/SAISI-970598, LSACAP-T1218 Posbus 21, CERES, 6835 Tel. 023-312 2017 * Faks. 086-514 3350 e-pos: admin@sbi.co.za		KOPIEREG VOORBEHOU - 2017   A4	
		KLIËNT: <b>Mnr. J. Faul          Pobus          CERES          6835</b>	PROJEK: <b>NUWE DAM ONDERSOEK, CERES</b>
DETAIL: <b>Kontoerplan met waluitleg</b>		GETEKEN SC Hartzenberg	TEK. NO. <b>1804-S1-01</b>



TECHNICAL DATA: NEW DAM	
Wall crest width (m)	4.00
Wall crest level (msl)	548.50
Lowest groundlevel D/S (msl)	537.40
Maximum wall height (m)	11.10
Wall crest length (m)	237.00
Upstream slope	1: 3.00
Downstream slope	1: 2.00
Earthfill -cut-off trench excluded (m <sup>3</sup> )	23 400
Total earthfill (m <sup>3</sup> )	29 100
Full supply level (msl)	547.00
Total freeboard (m)	1.50
Netto storage capacity (m <sup>3</sup> )	67 600
Flooded area (ha)	1.70
Dam footprint area (ha)	2.00



TYPICAL EMBANKMENT CROSS SECTION  
SCALE 1:250



CLIENT: Jade Farming  
P.O. Box 72  
CERES  
6835

**SAREL BESTER ENGINEERS**  
Consulting Civil Engineers  
Architectural Service

PROJECT:  
NEW DAM INVESTIGATION AT  
JADE HILLS, CERES

Date: 26/11/2018  
MC BESTER  
Pr. Eng. B.Eng. MSACE 970598 SACAP11218  
P.O. Box 21, CERES, 6835  
Ph. 023-312 2017 \* Fax 086-514 3350  
e-mail: admin@sbel.co.za

DETAIL:  
Contour, Embankment & Spillway:  
Construction Sections

DRAWN	DATE	SCALE	SHEET
SC Hartzenberg	FEB. 2018	soos getoon	1 van 1

SURVEYED	DESIGNED	DWG. NR.	REV.
SC Hartzenberg	Sarel Bester Ingenieurs	1804-S2-01	