

Verw: 1731DOV-S2(Rev1)

Datum: 29/06/2018

Mnre Agterfontein Trust
PO Box 77
Ceres
6835

Attention: Mr Dawid Malherbe

PRELIMINARY DESIGN REPORT FOR THE PROPOSED ENLARGEMENT OF DRIEFONTEIN DAM ON RIETVALLEY 364 PORTION 33, DISTRICT CERES, MR D MALHERBE - PROPOSED PHASE 2 ENLARGEMENT

Your instruction regarding the investigation and preliminary design for the proposed **Phase 2** enlargement of Driefontein dam, refers. **Note**, this document should be read with and is intended to be an expansion to the previous **Phase 1** proposal.

1. BACKGROUND

The previous report, **1731DOV-S2** dated 15 Mar 2018, refers to the proposed enlargement of Driefontein dam with the storage capacity of approximately 320 000m³. The situation however was reconsidered and a second phase enlargement will now be added which will increase the total storage capacity to about 420 000m³. The dam would still mainly be filled by scheduled winter water from the Warmbokkeveld Scheme and **therefore the application principle would not be altered**. The existing dam is too small to store all the winter scheduled water and for that reason a substantial portion of the water had been sacrificed and lost over the years which benefited downstream water users to some extent.

Increasing the dam's total capacity by ±180 000m³ for storing of the currently wasted or sacrificed listed winter water, will make it possible for the applicant to expand his current production with about 22ha of deciduous fruit. This would benefit the broader economy by creating work opportunities for the previously disadvantaged groups in the surrounding local communities.

Since the licence application (WULA) is entirely based on an existing water use (ELU), namely paid-up scheduled winter water under the **Warmbokkeveld Irrigation Board**, none of the existing downstream uses will be affected negatively at all.

2. WATER AVAILABILITY

The deeds information regarding the relevant property as well as the water use information which was obtained from the *Breede-Gouritz Catchment Management Agency* (BGCMA) and soon to be finalised by their *Validation & Verification* process, had been evaluated for purposes of this report. We refer to **Appendices B&C**.

A) Existing Water Uses:

Takings:

- 514 400m³ (Warmbokkeveld IB: 64.3ha @ 8 000m³/ha/a)
- 111 623m³ (Groundwater)

Storage:

- 239 000m³ Driefontein Dam (To-be-enlarged)
- 7 213m³ Vis Dam
- 91 000m³ Barrak Dam - Surveyed
- **337 213m³ TOTAL**

B) Current Amended Licence Application:

- Driefontein Dam: $\pm 240\,000\text{m}^3$ (Existing)
 $\pm 180\,000\text{m}^3$ (Additional Storage)
 $\pm 420\,000\text{m}^3$ (Total Storing)
- New Irrigated Area 22ha fruit @ $8\,000\text{m}^3/\text{ha/a}$

3. DAM SAFETY & CLASSIFICATION

The first step in the process is to have the larger second phase of the proposed dam classified in terms of dam safety regulations. The application for reclassification was submitted on 14 May 2018 to the Dam Safety Office after which the classification was received on 27 Mar 2018 as a Small Category I dam with a Low hazard potential rating under reference **12/2/H101/FA**, refer **Appendix A**.

Being classified as a Category I dam means that an APP (Approved Professional Person) is not a legal requirement for the design and construction supervision of the dam. However, a basic design is still required in terms of the regulations for submission and obtaining a license to construct from DWS Dam Safety Office.

4. CONCEPTUAL DESIGN

The project entails the design and construction of the proposed phased enlargement of the Driefontein dam as a zoned earthfill embankment across the valley including an open channel spillway against the right bank and a pipe outlet under the central embankment. Die amended preliminary design drawings are included in **Appendix B & C**.

Phased Design Characteristics:

The proposed Driefontein dam is considered an in-stream dam with a wide U-alignment across the valley with the following characteristics:

Location:	33°21' 10.66"S 19°24' 14.3"E	
Driefontein Dam	Phase 1	Phase 2
Wall crest level (masl)	548,6	549,2
Full supply level (masl)	547,1	547,7
Lowest ground level (masl)	539,6	539,6
Max wall height (m)	8,95	9.55
Crest length (m)	390	431
Crest width (m)	4,0	4,0
Upstream slope	1 : 3	1 : 3
Downstream slope	1 : 2	1 : 2
Free board (m)	1,5	1,5
Embankment volume (m ³)	10,500	17,000
Total earthworks (m ³)	17,800	25,000
Nett storage capacity (m ³)	$\pm 320,000$	$\pm 420,000$
Flooded area (ha)	13,70	15,81
Total footprint (ha)	14,20	16,90

5. COSTING

The estimated costing of the project is based on recent tender prices of similar type projects within the Western Cape region. The preliminary costing of the project was done by using related data from other projects and dividing the sum total of all the earthworks and related costs by the sum total of all the bulk earthworks 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. The sum total of these give the estimated project cost as set out on the attached preliminary design evaluation sheet included as **Appendix G** and summarized as follows:

<u>Description</u>	<u>Driefontein dam (Phase 1)</u>	<u>Driefontein dam (Phase 2)</u>
Max Wall Height (m)	8,90	9,60
Total Earthmoving (m ³)	17 850	25 000
Nett Storage Capacity (m ³)	±320 000	±420 000
Storage : Earthworks	±5,4	±7,86
Estimated Cost (R)	±R1,252,000	±R2,736,000

The proposed project entails the enlargement of an existing dam. The storage ratio was calculated as the ratio between the total volume of material to be moved versus the capacity gain with regard to the enlargement. In general dam sites are considered more viable or economical when the storage ratio is about 5 and higher. The figures above show such ratios in the order of 5,4 and 7,9 respectively for **phase 1** and **phase 2** which is considered on the better side when it comes to the economics of building the dam.

In this case, the earthworks costing was calculated at a basic rate of **±R45/m³** accounting for ±65% of the total cost which translates to an estimated project cost in the order of **R2,74mill**, excluding fees etc.

6. APPENDIXES

- A) Reclassification, 27 Mar 2018
- B) Preliminary Design Evaluation: Quantities & Costing
- C) Drawing 1731-S2-01(Rcv1); Contour Layout Plan
- D) Drawing 1731-S2-02; Embankment Contour Layout Plan, Wall- & Spillway Sections
- E) Drawing 1731-S2-03; Contour Layout Plan (Aerial Photo)

You are welcome to contact us in case of uncertainty about the contents or if more information is required about any aspect or component herein.

We trust that you will find the above in order.

Yours faithfully



M Charl Bester (Pr Ing)

Copies to:	Me Inge Erasmus, EnviroAfrica, Somerset-West
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water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria 0001 / Sedibeng Building, 185 Francis Baard Street, Pretoria
Tel: 012 336-6629 Fax: 012 336-8674

stoffelss@dws.gov.za

✉ Ms SI Stoffels
☎ (012) 336-6629
📁 12/2/H101/FA
27 March 2018

Trustee
Agterfontein Trust
PO Box 77
CERES
6835

ATTENTION: MR DAVID MALHERBE- admin@agterfontein.co.za

Sir

RECLASSIFICATION OF A DAM WITH A SAFETY RISK IN TERMS OF CHAPTER 12 OF THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998), READ WITH THE REGULATIONS PUBLISHED IN GOVERNMENT NOTICE R. 139 OF 24 FEBRUARY 2012: DRIEFONTEIN DAM SITUATED ON PORTION 33 OF THE FARM RIETVALLEY 364, DIVISION OF CERES RD

A. APPLICATION

The application dated 14 September 2017, received from Mr M C Bester of the firm Sarel Bester Ingeneurs BK on your behalf, refers.

B. RECLASSIFICATION

- Please note that **Driefontein Dam** has been reclassified as follows:

12/2/H101/FA- Driefontein Dam	Existing	Proposed
Vertical wall height	7,4 meters	8,4 meters
Storage capacity	239 000 cubic metres	321 000 cubic metres
Size classification	Small	Small
Hazard potential rating	Low	Low
Category	I	I

- For the implications of the above reclassification you are referred to the above regulations. The reclassification has been done in view of new information that has become available to the Department.

C. REQUIREMENTS FOR ENLARGEMENT OF A DAM WITH A SAFETY RISK

- 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:
 - In terms of Regulation 4(1), no person who intends to construct a dam with a safety risk, or *enlarge, alter or repair an existing dam* with a safety risk, may begin any construction work, before he or she is in possession of a **licence to construct**, enlarge, alter or repair, issued by the Director-General.



NATIONAL DEVELOPMENT PLAN
Our Future - make it work

- 1.2 An owner who intends to construct a Category I dam, or to enlarge, alter or repair an existing dam so that the completed dam can be classified as a Category I dam **must apply for a licence to construct, enlarge, alter or repair on the form (DW694E) available on the (<http://www.dws.gov.za/DSO website>) by submitting** to the Director-General a proposed design complying with acceptable dam engineering practices and criteria set out in Regulation 5 to 9.
 - 1.3 You are advised to obtain the services of an experienced civil engineer or civil engineering technician for the **(enlargement) of Driefontein Dam** in your own interest.
 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 section 120 of the National Water Act, 1998, the dam must be **registered** at the Dam Safety Office of this Department within 120 days of the date on which the dam becomes capable of containing, storing or impounding water. Form (DW693E) available on the Dam Safety Regulation (Office) website at <http://www.dws.gov.za/DSO> must be completed and submitted to the Dam Safety Office for this purpose.
- D. YOUR ATTENTION IS DRAWN TO THE FACT THAT A LICENCE TO CONSTRUCT/ALTER/ENLARGE IN TERMS OF CHAPTER 12 SHALL NOT BE ISSUED UNLESS THE FOLLOWING PROVISIONS AND REGULATIONS ARE COMPLIED WITH:**
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
 ☎: (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



Letter signed by: Ms SI Stoffels

Designation: Senior Administration Clerk: Dam Safety Regulation

Date: 27 March 2018

Copies to: Mr M C Bester- sbri@telkomsa.net

Enclosure: Revised registration information

PRELIMINARY EVALUATION OF THE PROPOSED EARTH DAM: QUANTITIES AND COSTING

Client: AGTERFONTEIN TRUST

Address: Posbus 77

CERES 6835

Dam: DRIEFONTEIN DAM

- Notes:** 1. VAT EXCL.
2. DW opmetings gekombineer met SBRI
3. Bakmaat = 420 000m³

Project Nr.: 1731

Annexure: A

Date: 05-Feb-18

Updated: 27-Jun-18

Version: Mrt 2018

Report by: Charl Bester

SAREL BESTER ENGINEERS

P.O. Box 21, Ceres 6835

Ph: 023-312 2017

Fax: 086-514 3350

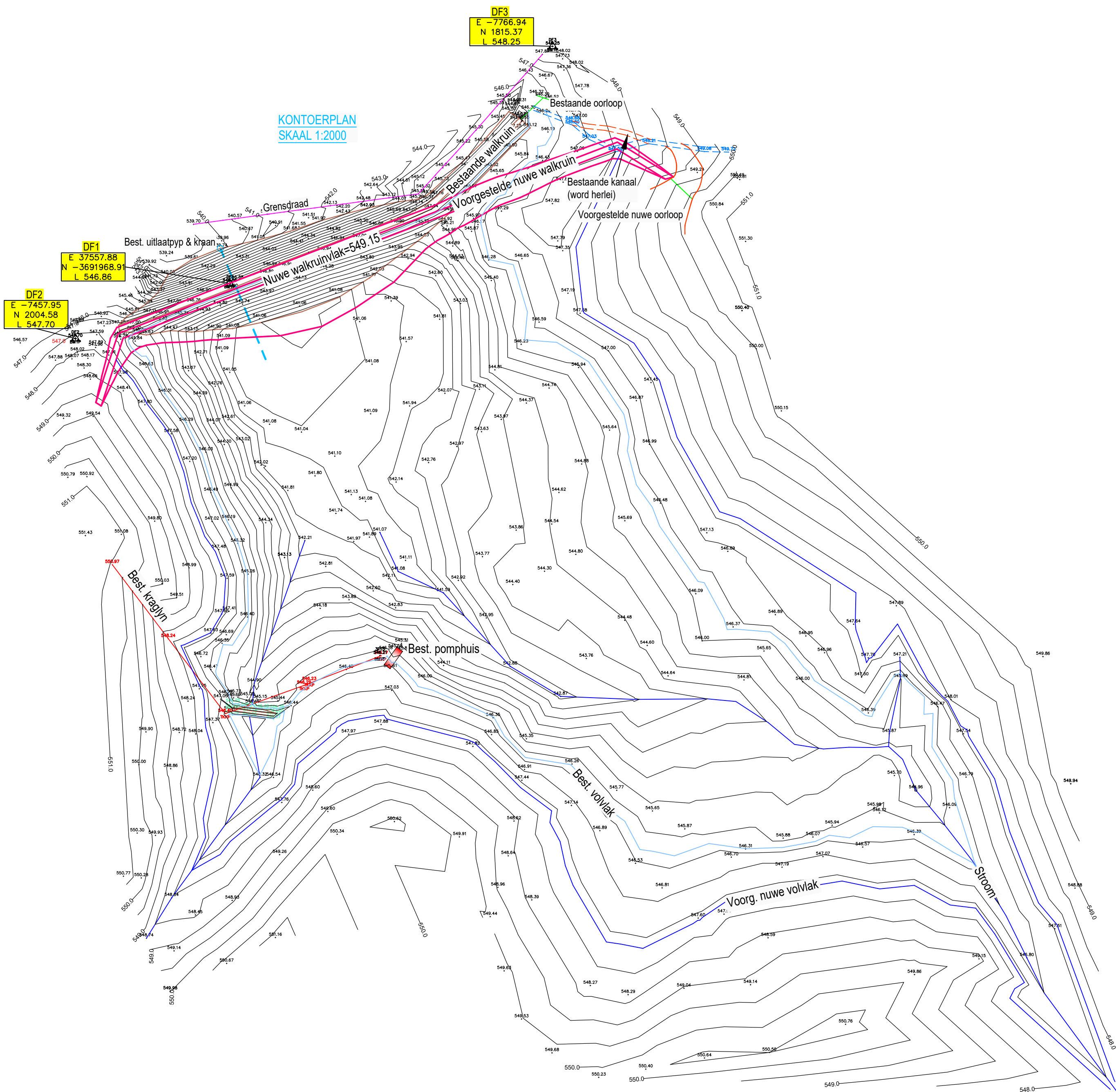
Design Parameters & Assumptions:

<i>Crest width (m):</i>	4.0	<i>Cut-off depth (m):</i>	3.00
<i>Upstream slope 1:</i>	3.0	<i>Cut-off base (m):</i>	4.00
<i>Downstream Slope 1:</i>	2.0	<i>Cut-off slope 1:</i>	0.75
<i>Percentage of fill from dam basin:</i>	50%	<i>Application (m³/ha):</i>	7,000

Financial Assumptions:

<i>Earthmoving Cost (R/m³):</i>	45.00
<i>Basic Fees Scale (%):</i>	8.0%
<i>Fees Base Value (R):</i>	R 11,500,000
<i>Verhoging (J / N):</i>	J

Item	Description	Unit	Stadium / Wall position / Terrain				
			Stadium 1 <i>Existing</i>	Stadium 2 <i>Phase 1</i>	Stadium 3 <i>Phase 2</i>	Stadium 4	Stadium 5
1.1	Wall crest level	masl	547.00	548.55	549.15		
1.2	Lowest ground level below wall	masl	539.60	539.60	539.60		
1.3	Maximum wall height	m	7.40	8.95	9.55	#N/A	#N/A
1.4	Wall crest length	m	298.0	391.0	431.0		
1.5	Wall volume - excluding cut-off	m³	0	10,500	17,000		
1.6	Cut-off trench excavation	m³	0	7,331	8,081	#N/A	#N/A
1.7	Total earthmoving	m³	0	17,831	25,081	#N/A	#N/A
2 STORAGE CAPACITY							
2.1	Full supply level	masl	546.30	547.05	547.65		
2.2	Draw-off level	masl	541.00	541.00	541.00		
2.3	Total free-board	m	0.70	1.50	1.50	0.00	0.00
2.4	Maximum depth above draw-off level	m	5.30	6.05	6.65	0.00	0.00
2.5	Nett capacity from contours	m³	227,000	317,500	415,700		
2.6	Capacity gain from excavations	m³	0	5,250	8,500	0	0
2.7	Potential gross capacity	m³	227,000	322,750	424,200	0	0
2.8	Water surface	ha	10.40	13.70	15.80		
2.9	Potential irrigation	ha	32.43	46.11	60.60	0.00	0.00
2.10	Average water depth	m	2.18	2.36	2.68	#DIV/0!	#DIV/0!
2.11	Ratio: Storage / Earthworks		nvt	5.37	7.86	#N/A	#N/A
2.12	Recommended pipe diameter	mm	250	300	300	150	150
3 COSTING (Excl VAT)							
3.1	Overhead & Preparation	Rand	0	123,447	173,639	#N/A	#N/A
3.2	Earthworks (excavate & construct)	Rand	0	802,406	1,128,656	#N/A	#N/A
3.3	Concrete & Outlet works	Rand	0	202,844	260,459	#N/A	#N/A
3.4	Diverse & Unforeseen	Rand	0	123,447	173,639	#N/A	#N/A
3.5		Rand					
3.6	Estimated Construction Cost	Rand	0	1,252,145	1,736,394	#N/A	#N/A
3.7	Engineering Fees Percentage	%	0.0%	10.8%	10.8%	#N/A	#N/A
3.8	Engineers costs (ECSA Fees)	Rand	0	134,707	186,803	#N/A	#N/A
3.9	Engineers costs (Disbursements)	Rand		40,000	45,000		
3.10	Estimated Engineers Costs	Rand	0	174,707	231,803	#N/A	#N/A
3.11		Rand					
3.12		Rand					
3.13	Total estimated capital cost	Rand	0	1,426,852	1,968,197	#N/A	#N/A
3.14	Capital costs per m³ gross capacity	Rand	0.00	4.42	4.64	#N/A	#N/A
3.15	Capital costs per irrigated hectare	Rand	0	30,946	32,479	#N/A	#N/A



TEGNIJSE IN LIGTING: DRIEFONTEIN DAM		
	BESTAANDE	VERHOGING
Walkruinwydte (m)	±4.00	4.00
Wakruinhoogte (mbsv)	547.00	549.15
Laagste grondvlak stroomaf (mbsv)	539.60	539.60
Maksimum walhoogte (m)	7.40	9.55
Walkruinlengte (m)	298.00	431.00
Stroomop helling	1: 3.00	3.00
Stroomaf helling	1: 2.00	2.00
Walinhoud (m³)	**	17 000
Totale beraamde grondveskuiwing (m³)	**	25 100
Volvoorraadvlak (mbsv)	546.30	547.65
Totale vryboord (m)	0.70	1.50
Bruto bakmaat (m³)	227 000	420 000
Oorstroomde area (ha)	10.40	15.80
Dam voetspoor area (ha)	11.00	16.90

HERSIENING

SAREL BESTER INGENIEURS

Raadgewende Siviele Ingenieurs
Argitektuursdienste

Datum: 29/06/2018

MC BESTER

Pr. Ing., B. Ing., LS&SI-970598, LSACAP-T1218

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Lyellstraat 64D
CERES, 6835

Tel.: 023-312 2017
Faks.: 086-514 3350
e-pos: sbri@telkomsa.net

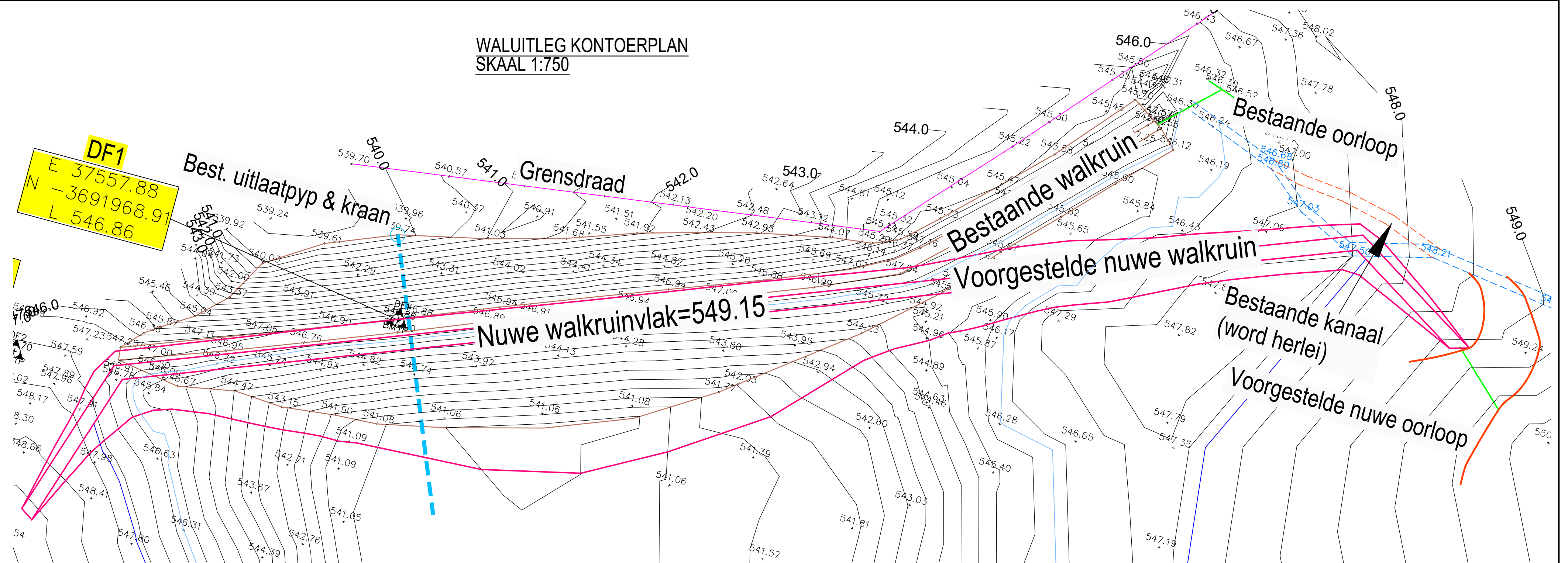
Agterfontein Trust
Posbus 77
CERES
6835

VOORGESTELDE VERHOGING VAN
DRIEFONTEIN DAM, te DRIEFONTEIN,
AFDELNG CERES

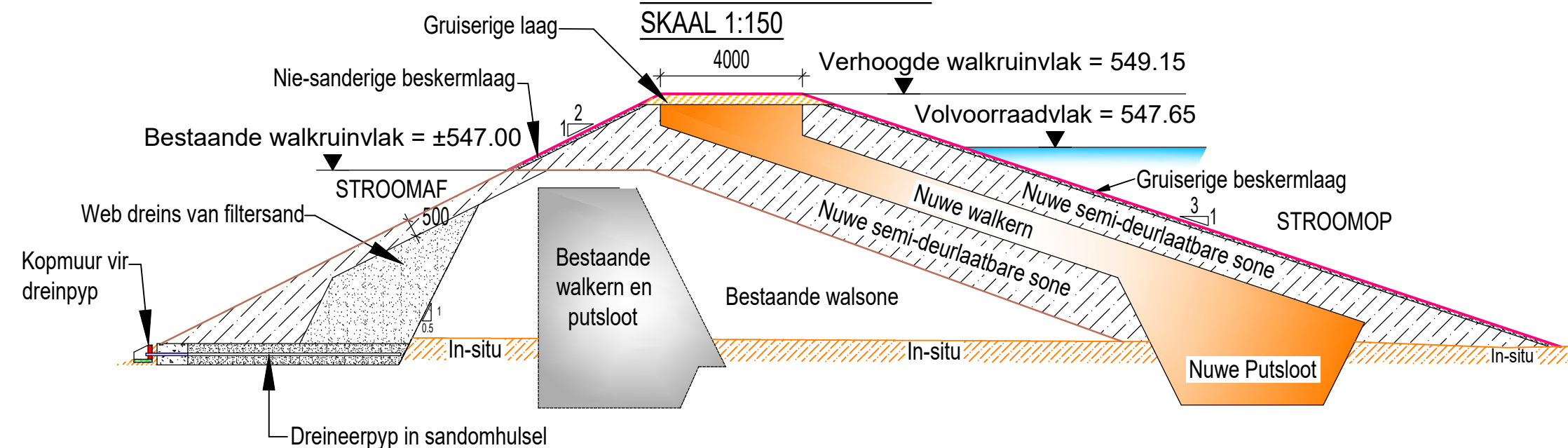
Kontoerplan

GETEKEN	DATUM	SKAAL	VEL
SC Hartzenberg	JUNIE 2018	soos getoon	1 van 1
OPGEMEET	ONTWERP	TEK. NOMMER	HER.
D. Willemsse M. Liebenberg	Sarel Bester Ingenieurs	1731-S2-01	1
KOPIEREG VOORBEHOU - 2018			A2

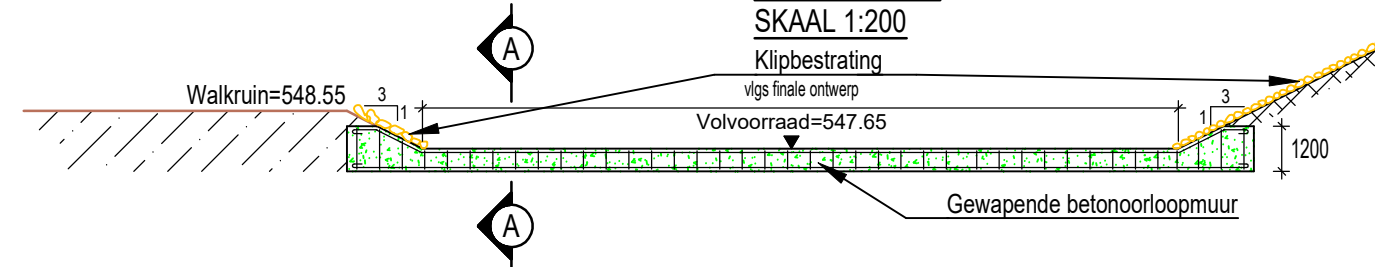
WALUITLEG KONTOERPLAN
SKAAL 1:750



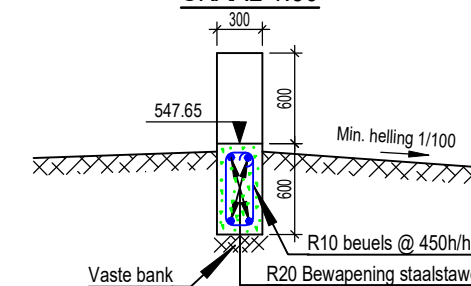
TIPIESE WAL DWARSNIT
STROOMOP VERHOOGING
SKAAL 1:150



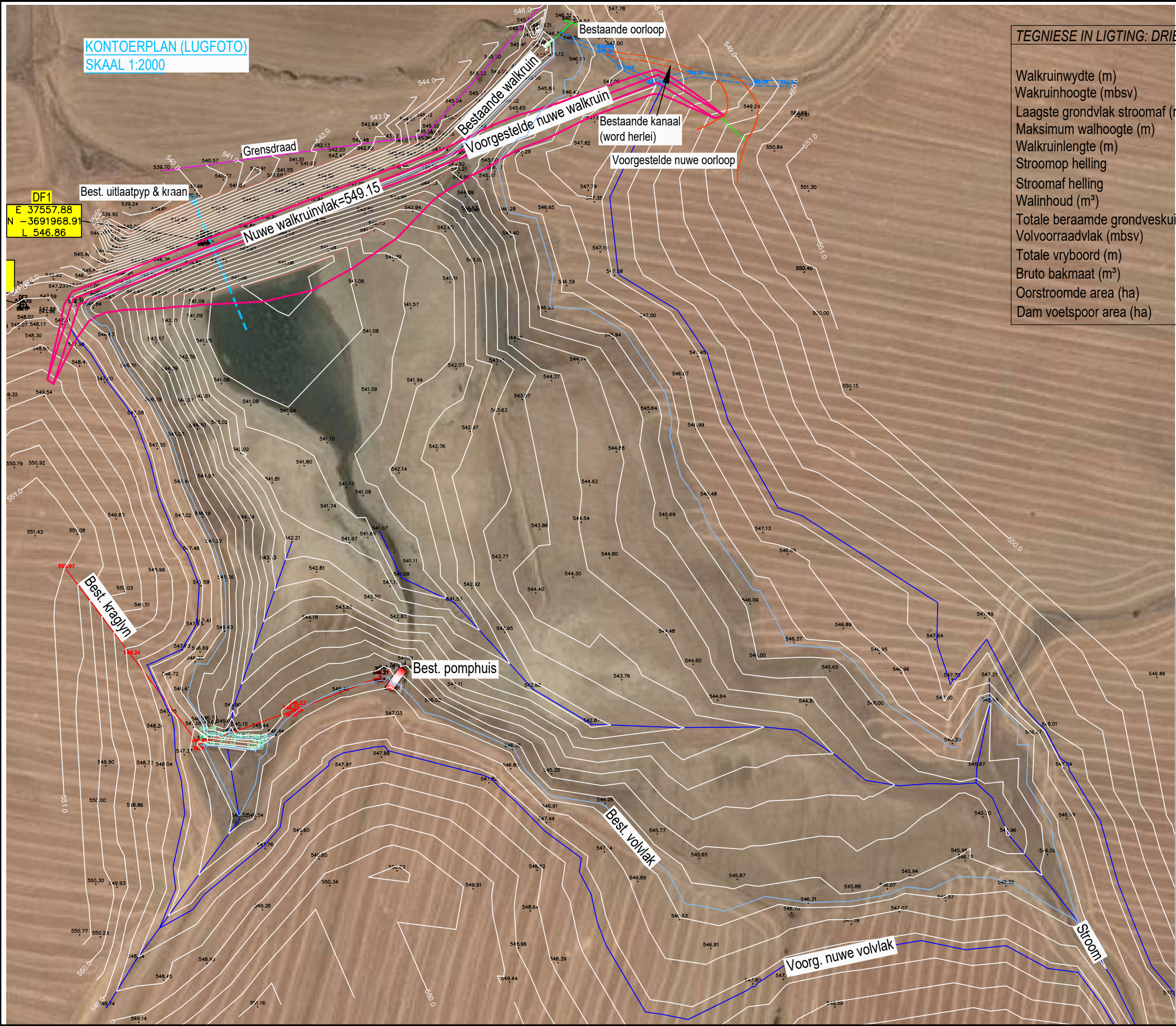
OORLOOPSNIT
SKAAL 1:200



SNIT A-A
SKAAL 1:50



<div style="display: flex; align-items: center; justify-content: space-between;"> <div style="text-align: center;">  <p>SAREL BESTER INGENIEURS</p> <p>Raadgewende Siviele Ingenieurs Argitektuursdienste</p> </div> <div style="text-align: right;"> <p>Datum: 29/06/2018</p> <p>MC BESTER</p> <p>Pr. Ing. B.Ing.,LSAISI/970598, LSACAP:T1218</p> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 45%;"> <p>Posbus 21 Lyllstreet 64D CERES, 6835</p> </div> <div style="width: 45%;"> <p>Tel.: 023-312 2017 Faks: 086-514 3350 e-pos: sbri@telkomsa.net</p> </div> </div>			
<p>Agterfontein Trust Posbus 77 CERES <u>6835</u></p>			
<p>VOORGESTELDE VERHOOGING VAN DRIEFONTEIN DAM, te DRIEFONTEIN, AFDELNG CERES</p>			
<p>Waluitleg Kontoerplan, Tipiese wal- & oorloop snitte</p>			
<p>GETEKEN</p> <p>SC Hartzenberg</p>	<p>DATUM</p> <p>JUNIE 2018</p>	<p>SKAAL</p> <p>soos getoon</p>	<p>VEL</p> <p>1 van 1</p>
<p>OPGEMEET D. Willemsse M. Liebenberg</p>	<p>ONTWERP Sarel Bester Ingenieurs</p>	<p>TEK. NUMMER</p> <p>1731-S2-02</p>	<p>HER.</p>
<p>KOPIEREG. VOORBEHOU - 2018</p>			<p>A2</p>



TEGNESE IN LIGTING: DRIEFONTEIN DAM		
	BESTAANDE	VERHOGING
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Oorstroomde area (ha)	10.40	15.80
Dam voetspoor area (ha)	11.00	16.90



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Argitektuursdienste

Datum: 29/06/2018
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KLIËNT: Agterfontein Trust
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CERES
6835

PROJEK:

VOORGESTELDE VERHOGING
VAN DRIEFONTEIN DAM

DETAIL:
Kontoerplan (Lugfoto)

GETEKEN	DATUM	SKAAL	VEL
SC Hartzenberg	JUNIE 2018	soos getoon	1 van 1
OPGEMEET	ONTWERP	TEK. NO.	HER.
D. Willemse M. Liebenberg	Sarel Bester Ingenieurs	1731-S2-03	
KOPIEREG VOORBEHOU - 2018			A3