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Verw: 1618DOV-S2

Datum: 26/02/2018

Harmony Trust
PO Box 415
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Attention: Messrs Denzil van der Merwe & Hein Juries

PRELIMINARY DESIGN REPORT FOR THE PROPOSED NEW HARMONY 266 DAM ON THE FARM HOUDENBEK 415, DISTRICT CERES, HARMONY TRUST

Our previous investigation, *ref 1618DOV-S1, dated 13 May 2016*, as well as your subsequent instruction to proceed with the preliminary design of the above mentioned dam, refers.

Note, this report should be read in conjunction with ***Prelim Design 1619DOV-S2: Toeka Dam***.

1. BACKGROUND

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. This will then serve as the basis for the final dam design and contract specifications in line with dam safety regulations in terms of sections 117 to 123, chapter 12 of the National Water Act, 1998 (Act 36 of 1998).

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"* 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, which also then serve as a supplement to the specific applications.

The larger ***Harmony project*** entails the design and construction of two proposed instream dams, namely Harmony 266 & Toeka dams, with a combined provisional storage capacity in the order of **2 250 000m³**. Although both dams would be constructed on farm Houdenbek 415, the accompanying agricultural development would be for the neighbouring BBEEE farming entity, namely ***Harmony Trust***. The new development however, would entail about 75ha fruit orchards stretching over two properties, Houdenbek 415 and the neighbouring Winkelhaak 224, which is the property of ***Harmony Trust.*** Refer to ***Appendix C*** regarding ownership. The two concerned owners are in agreement and will arrange the necessary legal agreements, ***Appendix C***.

The proposed **Harmony 266 Dam** will have a storage capacity in the order of **250 000m³** and it will be filled primarily with runoff from its own catchment area, an unnamed tributary to the Houdenbek River, upstream of the confluence with the larger Riet River. Hence, winter surplus water will be the primary source for the dam.

The overall project focuses on expanding the existing BBEEE agricultural project, namely the ***Harmony Trust*** on the farm Winkelhaak 224. It is a combined project in conjunction with the proposed larger Toekda dam on the same property, *(refer 1619-DOV-S2, dated Feb 2018)*, whereby an additional 75ha of fruit orchards will be planted in addition to the existing 40ha of vegetables and pastures. This would benefit the existing BBBEE entity and more importantly also the broader economy by creating work opportunities for the previously disadvantaged groups.

Although fully based on new "takings" according to the Water Use Licence Aapplication (WULA), none of the existing downstream uses will be affected negatively since regulatory mechanisms would ensure that only surplus winter water would be abstracted from the larger Houdenbek catchment.

The proposed site is located within the Koue Bokkeveld district about 15km east from the town, Op-die-Berg as the crow flies as shown in ***Appendix A.***

2. ASSIGNMENT

Sarel Bester Engineers has been appointed as the project engineer coordinating and overseeing the various actions and components regarding the design of the dam along with handling the Water Use Licensing Application (WULA).

Instruction and appointment was received to continue with the preliminary dam design stage for licensing purposes. Both the Environmental Impact Assessment (EIA) according to NEMA guidelines and the Water Use License Application (WULA) are currently in progress under the care of ***Messrs EnviroAfrica*** and ***Sarel Bester Engineers*** respectively.

The preliminary design normally follows after, and is partially based on the outcome from the scoping & feasibility study done by ourselves. The preferred envisaged storage capacity is however based on the site-survey done by *Messrs Boland Opmeting,* dated 22 Jan 2010 and the presentation thereof by *Messrs Van Breda & Associates* in May 2012. This assignment now takes it further by focussing on certain design aspects as well as certain legal implications including conceptual design drawings.

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

The preliminary design process has checked, verified and updated information obtained from previous reports as and where required or 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 therefore will be used to:

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

3. APPLICATION & MOTIVATION

The Water Use Licence Application (WULA) as such including the relevant motivations is dealt with in full in a separate report compiled by ***Sarel Bester Engineers.***

The 100% black-owned applicant, *Harmony Trust* is planning to expand their current enterprise with fruit orchards for which **Harmony Dam** will store and supply water for **±9ha out of the total of 75ha**. The proposed new dam will ensure long term economic viability as well as sustainability of the present project by creating permanent jobs within the agricultural industry.

The dam site is located along a small tributary within the larger Houdenbek River catchment area upstream of the confluence of the Winkelhaak River into the Riet River which forms part of the larger Doring River, a tributary to the Olifants River system. Building a dam of this capacity should not have any noticeable impact on any of the downstream existing lawful water uses since the abstraction is purely based on surplus winter water.

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

4. ALTERNATIVES

Messrs Van Breda & Associates' report of May 2012, covered the investigation of two alternative dam sites respectively referred to as “Harmony 266” and “Harmony 268” situated on farm Winkelhaak 415 belonging to the applicant’s partner. The evaluation was based upon runoff calculations and surveys done by Messrs *Boland Opmeting*. Refer to ***Appendix B*** for detail.

The decisive factors are normally the basin characteristics with reference to available capacity versus demand, optimal costing of the works, risks etc. In this case “Harmony 266” dam site was motivated as the preferred alternative based on the available runoff, cost effectiveness as well as storage capacity in relation to sacrifice of potential production land over that of “Harmony 268” dam site. Refer to ***Appendix G*** for more information.

The *Table* below shows the key characteristics of the preferred site.

Table 1: Characteristic of Dam Site

Option:	Harmony 266 Dam
Max wall height (m)	12.8
Crest length (m)	280
Total earthworks (m³)	52 800
Nett storage capacity (m³)	±250 000
Flooded area (ha)	5.4
Storage : Earthworks	4.9
Estimated Cost (R)	±R3.65mil

The above dam site does have a larger footprint compared to its respective alternative which does sacrifice some of the potential irrigation land to some extend. However, it does have other advantages such as lower wall heights requiring less earthmoving and disturbance resulting in more efficient storage ratios and hence better overall economics.

5. WATER AVAILABILITY

Although the newly proposed dam will be situated on the neighbouring property, namely Houdenbek 415, the water use will be executed on Harmony Trust's property, namely Winkelhaak 224. The idea is that although the dam site and part of the proposed orchard development will be on the neighbouring property, the farm will be subdivided and the concerned land will be consolidated with that of Winkelhaak 224, refer ***Appendix C*** for more information.

We have thus investigated and evaluated Winkelhaak 224 with regard to ownership as well as existing water uses (ELU's).

A) Existing Water Uses Refer WUL (Licence no: B191/2/520/68):

- Taking: 400 000m³
- Storage: 400 000m³
- Existing Irrigation: 40 ha vegetables

B) Water Use Licence Application:

- New Irrigated Area **(#)** 66ha / 75ha fruit @ 9500m3/ha/a
- New Irrigated Area 9ha / 75ha fruit @ 9500m3/ha/a
- New Taking **(#)** 627 500m³ (66 @ 9 500m³/ha/a)
- New Taking 85 500m³ *(9 @ 9 500m³/ha/a)*
- New Storage **(#)** 2 000 000m³ *(Report 1619DOV-S2)*
- **New Storage** **250 000m³** ***(This Report)***
- **Total New Storage** **2 250 000m³ (Toeka + Harmony 266)**

(#) Refer WULA in Prelim Design Report 1619DOV-S2: Toeka Dam

Note, since the characteristics of this area is such that new water takings rely entirely on rapid flushes of surplus winter water available over a very short periods of time during which most of the available water runs past the point of abstraction, all water needs to be collected and abstracted within a 2-3 month window with a 3-4 year carry-over factor. This means that the yield of the dam is extremely low due to runoff patterns and implies that in order to execute such taking in the order of 85 500m³, the storage should be about factor 3.2 larger.

6. DAM SAFETY & CLASSIFICATION

The project entails the proposed Harmony 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 and Harmony 266 Dam was classified on 18 Oct 2017 as a Medium size Category II dam with a Low hazard potential rating, refer ***Appendix D***.

Application for APP (Approved Professional Person) for the design and construction supervision of the dam will follow once the WUL has been issued.

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 determine that Harmony 266 Dam does in fact trigger certain environmental aspects and therefore qualifies for a full EIA study. The impact assessment and application is currently under way under the auspices of ***Messrs EnviroAfrica.*** The final EIA will be submitted during the second quarter of 2018 with the Environmental Authorisation (EA) expected end 2018.

8. EMPOWERMENT

The proposed project entails the further development of an existing 100% black-owned BBEEE farming entity, namely Harmony Trust, reference T2213/2003. They have been in the agricultural sector and trading successfully for the past 12 years with their neighbouring partner and mentor, ***Morester Boerdery***. The planning is to grow and irrigate an additional 75ha of fruit with this newly applied-for water use. For more detail please refer to the WULA, reference 1733.

9. STATUTORY REQUIREMENTS

Various other statutory requirements might be applicable or of importance depending on site specific conditions apart from the regulations already dealt with above.

In this case the proposed dam site is located in a sensitive area which might concern archaeological and/or heritage aspects. A site visit and proposed research studies are planned at this stage and we await the outcome thereof.

10. HYDROLOGY

The location of the dam site lies within the E21D quaternary catchment under the auspices and care of the Olifants/Doorn WMA. This is an in-stream dam situated within the tributary of Houdenbeksrivier being part of the upper reaches of the larger Olifants River draining into the ocean north from Strandfontein, as shown on ***Appendix E***.

The relevant catchment properties according to the WRC Report TT382/08 (WR2005), also available on GIS-website of Dept Agriculture in cooperation with Elsenburg, are shown in the table below.

Table 2 shows the local catchment information in relation to the quaternary drainage area:

Catchment (ELSENBURG Catchment Delineation Tool)	Quaternary	Local Catchment
Name / Description	E21D	Harmony 266 Dam
Area [km²]	242.5	3.1
Mean Annual Rainfall (MAP) [mm]	627	432
Mean Annual Runoff (MAR) [mm]	190	105
Gross Average Runoff (MAR) [x 10^6 m³]	46	0.33

Table 3 reflects the water availability of the proposed dam:

WATER AVAILABILITY (ELSENBURG Catchment Delineation Tool)			
	QUATERNARY CATCHMENT	LOCAL CATCHMENT	
	E21D	Harmony 266	
Primary Catchment	46	0.33	$x10^6m^3$
VIRGIN MAR	**46**	**0.33**	**$x10^6m^3$**
- IFR (25%)		0.08	$x10^6m^3$
- Existing Dams		0.00	$x10^6m^3$
NETT MAR		**0.25**	**$x10^6m^3$**
- Available for Storage		0.25	$x10^6m^3$
- Proposed Storage		0.25	$x10^6m^3$
BALANCE		**0**	**$x10^6m^3$**

From the above figures it is concluded that after the IFR of about 25% has been released, the available water (Nett MAR) from the local source is about 250 000m^3. Since the target storage is in the same order of 250 000m^3 the risk of not being able to fill such a dam in some years appears high and top-up might be required at times from the larger Toeka Dam.

11. GEOLOGY

According to the Geological Survey of South Africa, the proposed site falls within the Bokkeveld and Witteberg Series all part of the larger Cape System. We refer to ***Appendix F***. These formations are described as follows:

- ***C2Q4*** – *Sandstone & clayey sandstone*
- ***C2Q5*** – *Sandstone & clayey sandstone*
- ***C2S5*** – *Siltstone & sandy shale*
- ***C2S6*** – *Siltstone*
- ***C3Q1*** – *Quartzitic sandstone with subordinate sandy shale bands*
- ***C3Q1S1*** – *White quartzitic sandstone, sandy shale & siltstone*
- ***C3S2*** – *Sandy shale & siltstone with sandstone bands*
- ***G2S4*** – *Shale & siltstone (fossiliferous)*

From the geological investigation it was identified that a relatively near fault or shift zone is present west from the dam site in a northwest-southeast orientation. Geological break lines or fault zones tend to consist of severe disintegrated material which pose the potential for water to be redirected and as a result cause the dam to leak. In other words, attention should be given to adequate sealing of the dam basin.

12. WR2005 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.

The *Table* below shows a summary of such characteristics or profile 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	100-200	[mm]
Figure 4a	Landcover	Irrigated areas and sugarcane	
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]	15 ~ Medium	**H**igh 1-8 **M**edium 9-15 **L**ow 16-20
Figure 9	Vegetation (Acocks Veld Types)	Sclerophyllous bush types	
Figure 10	EWR Management Class	Class E-F Not an acceptable class	[A-F]
Figure 11	Surface Water Quality - TDS	>2000	[mg/l]
Figure 12	Population Density	0-100	[People / km²]
DWAF GRA2 (2005)	Utilisable Groundwater Exploitation Potential	25 001 – 50 000	[m³/km²/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 project entails the design and construction of the proposed in-stream Harmony 266 dam with a straight aligned earthfill embankment across the valley including an open channel side spillway and outlet works under the embankment. Refer to ***Appendices G&H*** for more information.

A) Design Characteristics:

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

Location:	32°59' 44.7"S 19°27' 50.9"E
HARMONY 266 DAM	
Wall crest level (masl)	952.4
Full supply level (masl)	950.9
Lowest ground level (masl)	939.6
Max wall height (m)	12.8
Crest length (m)	280
Crest width (m)	4
Upstream slope	1 : 3
Downstream slope	1 : 2
Free board (m)	1.5
Embankment volume (m³)	47,500
Total earthworks (m³)	52,800
Nett storage capacity (m³)	250,000
Flooded area (ha)	5.4
Total footprint (ha)	6.5

B) Foundation: Preliminary visual inspections obtained from *Messers Van Breda & Associates* show a topsoil layer of less than ±0,3m deep on weathered sandstone and sandy material down to depths varying between 1,5m and 3,5m deep underlain by unweathered sandstone bank. One of the test pits showed limited amounts of clay down to 2,5m deep below ground level on sandy material. The formation is considered adequate for a dam of this nature.

C) Material investigation: No formal in depth soil analyses has been done as yet. Other dams in the vicinity is constructed of similar material and their behaviour over time is considered adequate and stable. The more gravelly sandy material will be used as unselected mass fill within the up- and downstream embankment zones while the more clayey material will be incorporated into the central core and cut-off zones. Provisional estimates based on visual inspections of the proposed dam site 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. However, this characteristic will be addressed formally in the final design by way of either chemical stabilisation, increased compaction or built-in sand filters or a combination thereof.

D) Embankment design: The overall layout is that of a straight aligned in-stream dam with a crest length of ±280m. The proposed internal embankment profile will be zoned with a selected clayey core and cut-off zones 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 ±13m with the upstream slope provisionally set 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 based on experience from within 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 strip drains evenly spaced over the downstream solumn 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 complete 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 at this stage. However, the final design will include a formal stability design based on finite element design models.

G) Outlet works: The outlet works is planned as a single ø250mm class 9 outlet pipe configuration in reinforced concrete with a flanged sluice-gate control valve and manifold system on the downstream side. On the upstream side one of the following alternatives will be considered and provided ranging between a stainless steel sieve, a type of sieve pipe on pedestals or custom built float units. The capacity is of importance which has to 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 30 days.

H) Spillway & Flood management: Harmony 266 dam is an in-stream dam with uncontrolled inflow from a natural river catchment. The proposed spillway design entails an open channel or by-wash spillway with return channel provisionally planned on the left bank leading the flood water safely around the embankment end and away from the toe-line back into the stream bed. The erodibility index is 15 on a scale of 1 to 20 with 1 being high and 20 being low, in other words the index is classified as medium and we foresee an unlined return channel. The total freeboard is provisionally set at ±1,5m based on uncontrolled or natural inflow pattern.

I) Special Requirements: Releasing water for in-stream flow requirements (IFR) will most probably be a condition of the water use license with reference to compulsory auditing. In order to comply, the outlet of the dam will be equipped with a scour system including a calibrated measuring weir or device. This aspect is considered a specialised item and the design thereof will form part of the detail design once the WUL is obtained.

J) Maintenance and Operation: The dam is situated in a winter rainfall area and will primarily be filled during the winter season with water pumped from the Houdenbek River as well as a small amount coming from its own catchment area. The operation and supervision of the dam will take place under the direct control of the owners or delegated person on a seasonal cycle.

K) Specifications: The dam has been classified as a Medium size Category II dam with a Low hazard potential rating. Relevant and applicable specifications are envisaged for this purpose. 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 the construction phase in order to ensure quality of workmanship in accordance with SABS/SANS standards.

15. DOWNSTREAM DEVELOPMENT

The proposed in-streamdam is located in a tributary nearly 0,6km upstream from the confluence with the Houdenbeks River. The potential flood area consists mainly of grazing fields before it joins the Houdenbeks River where a large dam is situated. About 3,5km downstream it confluence with another tributory to form the larger Riet River along which single isolated dwellings and minor roads do exist within the potential flood zone. The potential loss of life and expected economic damage is considered reasonable in accordance to 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 sheets ***Appendix G*** as summarized below.

Description	Harmony 266
Max Wall Height (m)	12.8
Total Earthmoving (m^3)	52 800
Nett Storage Capacity (m^3)	±250 000
Storage : Earthworks	4.9
Estimated Project Cost (R)	±R4.0mil

The figures above show storage ratios in the order of 5 which is considered to be good when it comes to the economics of building a dam. Normally, dam sites are considered more viable or 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^3** accounting for ±65% of the total cost which translates to an estimated project cost in the order of **R3,65mil**, excluding fees etc.

17. SUMMARY

Harmony 266 dam is planned as an in-stream dam situated in a tributary of the Houdenbeks River catchment within the larger Olifants River system. The water use license application is based on new takings from runoff water from the local catchment. Irrigation from the dam will mainly be by gravitation or by means of a pump system from the outlet of the dam onto surrounding fields.

The layout of the dam is planned as a straight aligned earthfill embankment across the valley. It will be equipped with an open channel or by-wash spillway around the left flank as well as an outlet pipe under the embankment encased in concrete.

The proposed site is rather complex with specific reference to the expected geotechnical conditions and consequential design requirements including the spillway cutting through the northern bank. The optimal positioning of various structural components is dictated by the topographical characteristics of the site between the abutments on either side.

The application is based on new 'takings' thus meaning that the total irrigated area will expand by approximately 9ha out of a total of 75ha over a period of time.

The water use license application (WULA) for the 'taking' and 'storing' of water as well as the environmental impact assessment (EIA) have been initiated under the auspices of our offices and *EnviroAfrica* respectively. The purpose of this document is therefore also to provide certain technical information as part of the above applications to the various departments regarding the proposed works.

All taken into account given the technical challenges, with sound engineering the site is considered suitable for a dam of this nature.

18. APPENDIXES

A) Locality Map
B) Alternative Options
C) Title Deed information (2x)
D) Classification, dated Oct 2017
E) HydrologyMap
F) Geology Map
G) Preliminary Design Evaluation: Quantities & Costing
H) Drawing 1618-S2-01: Contour Layout Plan & Sections

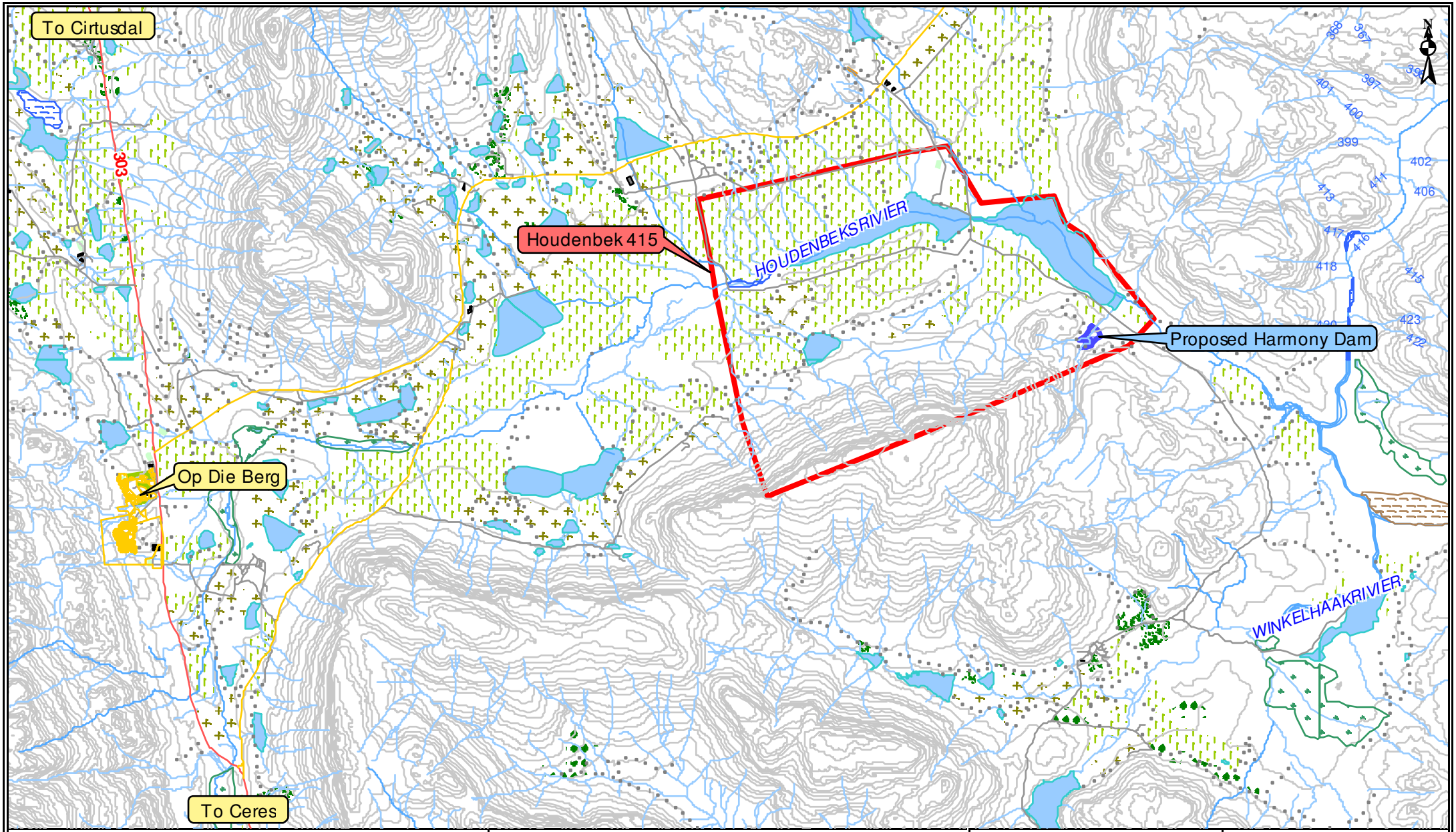
You are welcome to contact us in case of uncertainty about the contents or if more information is required about any aspect or component herein.

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 Mr Dirk van Driel, Fresh Water Specialist



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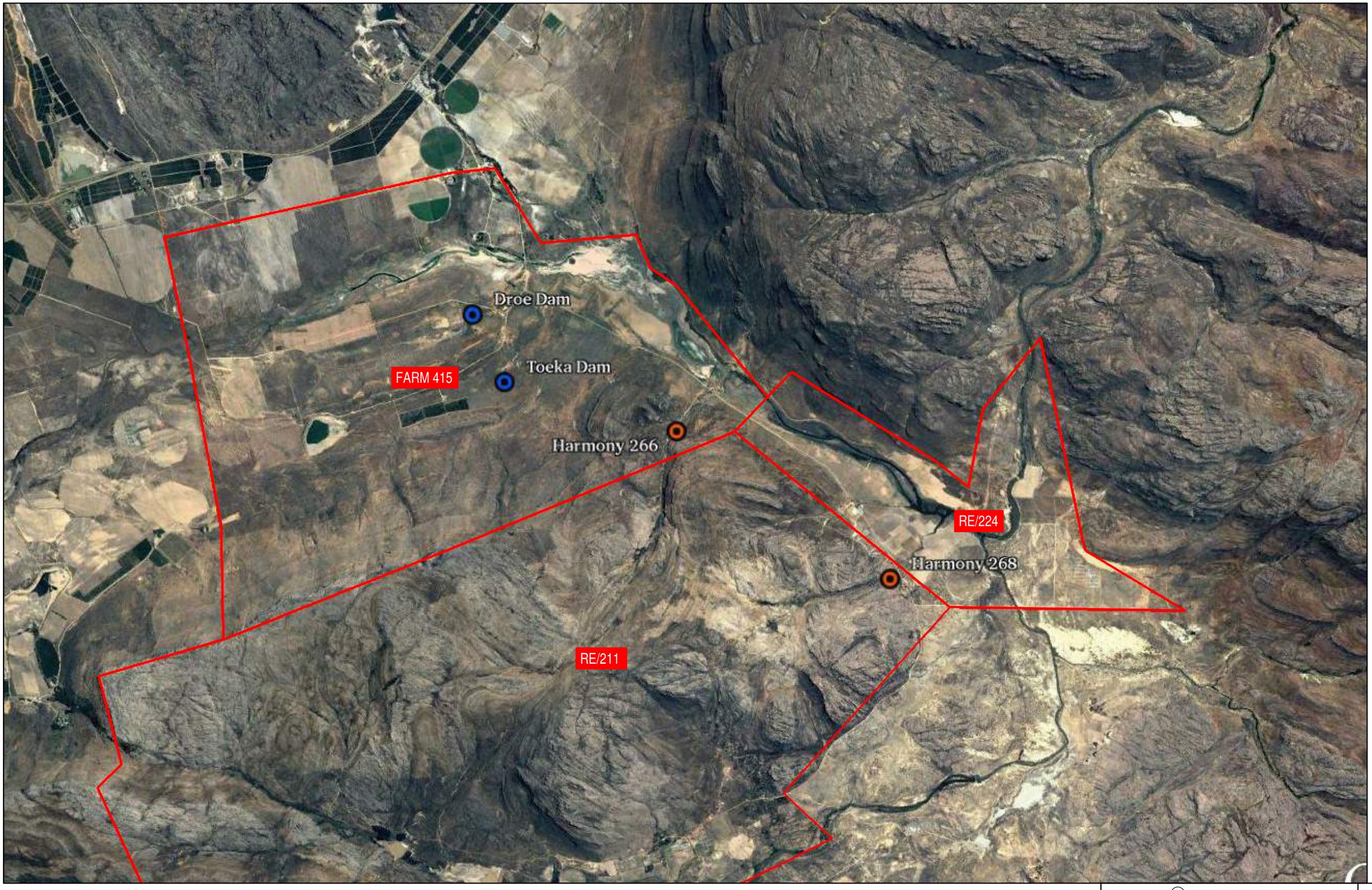
Client: MHB Trust
PO Box 20
Kouebokkeveld
6836

Scale:	Locality Map
1: 75 000	Harmony Dam
Map Ref:	Project Ref:
3219CD Ceres	1618



A3

SAREL BESTER ENGINEERS
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CLIENT: Harmony Trust
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PROJECT:
PROPOSED DAM SITES FOR
TOEKA & HARMONY

DETAIL:
Dam Options

DRAWN	DATE	SCALE	SHEET
R van der Merwe	FEB. 2018	1: 40 000	1 of 1

SURVEYED	DESIGNED	DWG. NR.	REV.
N/A	N/A	1733-01	

WinDeed Database Property Report

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WINKEL HAAK, 224, 0 (REMAINING EXTENT) (CAPE TOWN)

GENERAL INFORMATION

Date Requested	2017/05/11 17:02
Deeds Office	CAPE TOWN
Information Source	WINDEED DATABASE
Reference	1618

PROPERTY INFORMATION

Property Type	FARM
Farm Name	WINKEL HAAK
Farm Number	224
Portion Number	0 (REMAINING EXTENT)
Local Authority	WITZENBERG DC
Registration Division	CERES RD
Province	WESTERN CAPE
Diagram Deed	WOQ4PTI-27/1831
Extent	1084.3725H
Previous Description	-
LPI Code	C01900000000022400000

OWNER INFORMATION

—

Owner 1 of 1

Type	TRUST
Name	HARMONY TRUST
ID / Reg. Number	2213/2003
Title Deed	T22507/2006
Registration Date	2006/03/31
Purchase Price (R)	1,300,000
Purchase Date	2006/02/13
Share	0.00
Microfilm	2009 0131 4839
Multiple Properties	NO
Multiple Owners	NO

ENDORSEMENTS (2)

#	Document	Institution	Amount (R)	Microfilm
1	B50054/2008	NEDBANK LTD	1,000,000	2009 0130 3291
2	FARM CE 224	-	UNKNOWN	1985 0022 0205

HISTORIC DOCUMENTS (11)

#	Document	Owner	Amount (R)	Microfilm
1	T66085/1998	HARMONIE TRUST	1,100,000	2006 0950 2248
2	B1271/2003	LAND & LANDBOUBANK VAN SUID-AFRIKA	15,000,000	2008 0730 3288
3	B1272/2003	LAND & LANDBOUBANK VAN SUID-AFRIKA	10,000,000	2008 0730 3289
4	B6808/1999	-	UNKNOWN	2003 0064 4308
5	T2471/1963	KERSHOFF JOHANNES EDUARD	UNKNOWN	-
6	T27618/1982	KERSHOFF DANIEL JACOBUS	UNKNOWN	1998 0569 1961
7	T3336/1978	KERSHOFF JOHANNES EDUARD	UNKNOWN	1998 0569 1955
8	T66083/1998	KERSHOFF DANIEL JACOBUS	PARTITION	1998 0569 1973
9	T66083/1998	KERSHOFF MARIA ELIZABETH B-E	PARTITION	1998 0569 1973

10	B58050/2005	LAND & LANDBOU ONTWIKKELINGSBANK VAN SUID AFRIKA	3,944,000	2008 0730 3296
11	B31002/2006	LAND & LANDBOU ONTWIKKELINGSBAN	1,100,000	2008 0120 0048

WinDeed Database Property Report

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HOUDENBEK, 415, 0 (REMAINING EXTENT) (CAPE TOWN)

GENERAL INFORMATION

Date Requested	2017/05/11 13:00
Deeds Office	CAPE TOWN
Information Source	WINDEED DATABASE
Reference	1618

PROPERTY INFORMATION

Property Type	FARM
Farm Name	HOUDENBEK
Farm Number	415
Portion Number	0 (REMAINING EXTENT)
Local Authority	WITZENBERG DC
Registration Division	CERES RD
Province	WESTERN CAPE
Diagram Deed	T19586/1975
Extent	2069.5132H
Previous Description	-
LPI Code	C01900000000041500000

OWNER INFORMATION

Owner 1 of 1

Type	TRUST
Name	M H B TRUST
ID / Reg. Number	239/87
Title Deed	T86941/1995
Registration Date	1995/11/22
Purchase Price (R)	1,226,000
Purchase Date	1995/09/26
Share	0.00
Microfilm	2008 0739 3257
Multiple Properties	NO
Multiple Owners	NO

ENDORSEMENTS (6)

#	Document	Institution	Amount (R)	Microfilm
1	I-6241/2004LG	-	UNKNOWN	-
2	B51458/2008	NEDBANK LTD	50,000,000	2009 0170 1934
3	FARM CE 415	-	UNKNOWN	1985 0022 1505
4	FROM CE RD 182,220,1	82/2	UNKNOWN	-
5	B16970/2013	NEDBANK LTD	10,000,000	-
6	B3769/2015	NEDBANK LTD	25,000,000	-

HISTORIC DOCUMENTS (9)

#	Document	Owner	Amount (R)	Microfilm
1	B1271/2003	LAND & LANDBOUBANK VAN SUID-AFRIKA	15,000,000	2008 0730 3288
2	B1272/2003	LAND & LANDBOUBANK VAN SUID-AFRIKA	10,000,000	2008 0730 3289
3	B6808/1999	-	UNKNOWN	2003 0064 4308
4	B78006/1995	ABSA BANK	UNKNOWN	2003 0064 4302
5	B79329/1997	LANDBANK	UNKNOWN	2003 0064 4305

6	T19586/1975	MERWE ALWYN IGNATIUS VAN DER	UNKNOWN	1995 1013 2019
7	B58050/2005	LAND & LANDBOU ONTWIKKELINGSBANK VAN SUID AFRIKA	3,944,000	2008 0730 3296
8	B118864/2006	LAND & LANDBOU ONTWIKKELINGSBANK VAN SUID AFRIKA	6,000,000	2008 0730 3298
9	B118863/2006	LAND & LANDBOU ONTWIKKELINGSBANK VAN SUID AFRIKA	2,000,000	2008 0730 3297

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

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

modisel@dws.gov.za

Ms L A Modise
(012) 336-7758
12/2/E201/FE

18 OCT 2017

Trustee
MHB Trust (Morester Landgoed)
P O Box 415
CERES
6835

ATTENTION: MR D VAN DER MERWE (EMAIL: denzil@morester.co.za)

Sir

CLASSIFICATION OF A 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 HARMONY DAM ON PORTION 0 OF THE FARM HOUDENBEK 415, DIVISION OF CERES

A. APPLICATION

Application received from Mr Ruan van der Merwe of Sarel Bester Ingenieurs BK dated 31 July 2017 refers.

B. CLASSIFICATION

1. The classification of **Proposed Harmony Dam** is as follows:

Vertical wall height Storage capacity	13 metres 250 000 cubic metres
Size classification Hazard potential rating Category	Medium Low 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.

12/2/E201/FE

C. REQUIREMENTS FOR CONSTRUCTING DAMS WITH A SAFETY RISK

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.

(i) Acquire the services of an approved professional person to design the proposed projects and to draw up plans and specifications for it.

(ii) Apply on an official application form (DW695E available on the website: www.dws.gov.za/DSO) for a licence to **construct**, by submitting to the Director-General a proposed design complying with acceptable dam engineering practices and criteria as set out in Regulation 10 to 14.

1.1 In terms of Regulation 25 an application for a licence to impound after completion of the dams 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.

2. In terms of section 120 of the National Water Act, 1998, the dams must be registered at the Dam Safety Office of this Department within 120 days of the date on which the dams become capable of containing, storing or impounding water. The Form (DW693E) must be completed and submitted to the Dam Safety 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:

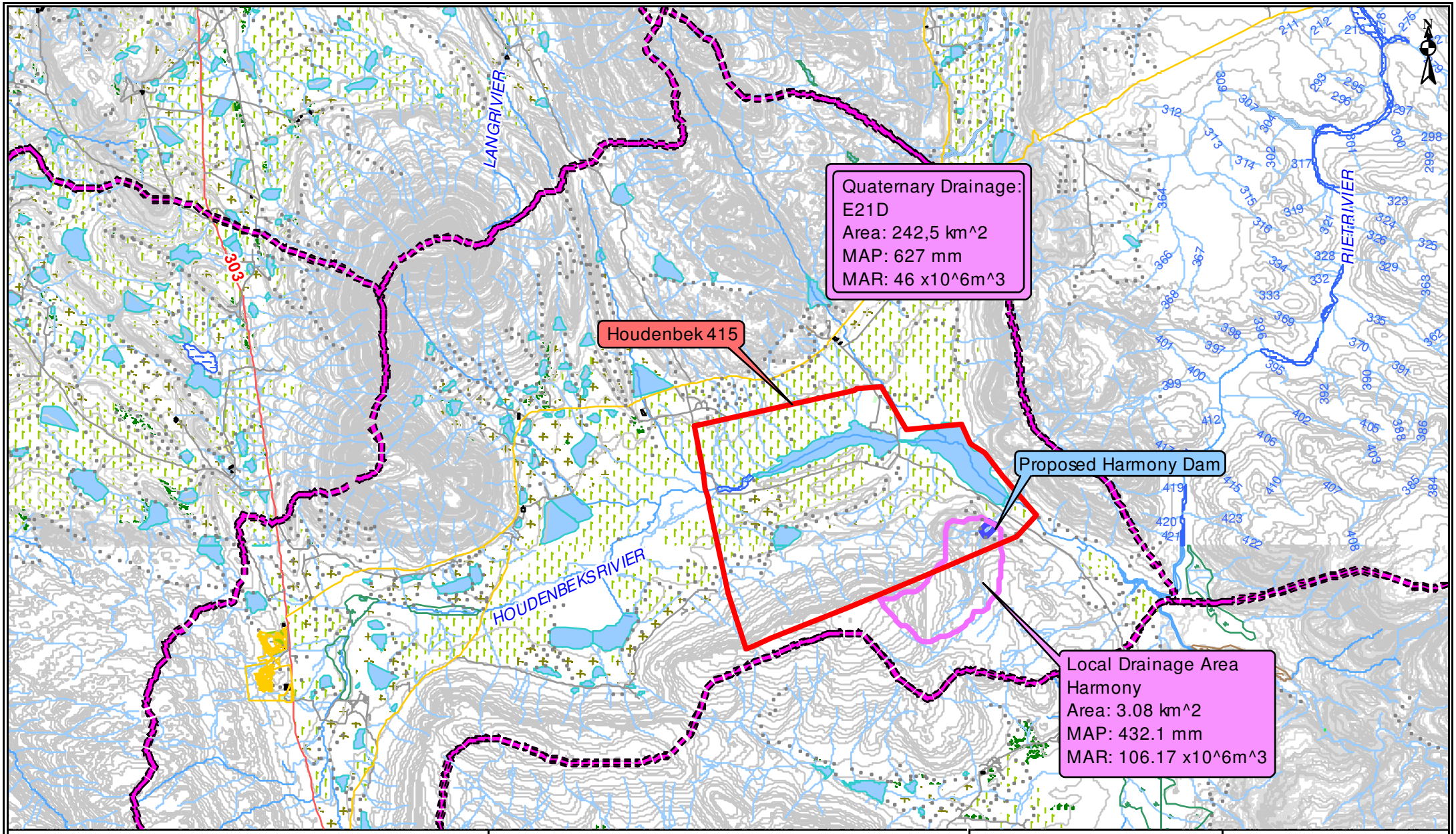
Chief Director: Western Cape
Department of Water and Sanitation
Private Bag X16
SANLAMHOF Tel: (021) 941 6000
7532 Fax: (021) 941 6100

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 L A Modise
Designation: Senior Administration Clerk: Dam Safety Regulation
Date: 18 OCT 2017

Copy to : Mr Ruan van der Merwe (ruan@sbri.co.za)



SAREL BESTER INGENIEURS BK
Raadgewende Siviele Ingenieurs / Consulting Civil Engineers
Argitektuurdienste / Architectural Services
CK1996/09837/23
Bus/Box 21, CERES, 6835
T: 023-312 2017
F: 023-3123802
E: sbi@telkomsa.net
MC BESTER
Pr. Ing., LSAISI: 970598, LSACAP: T1218

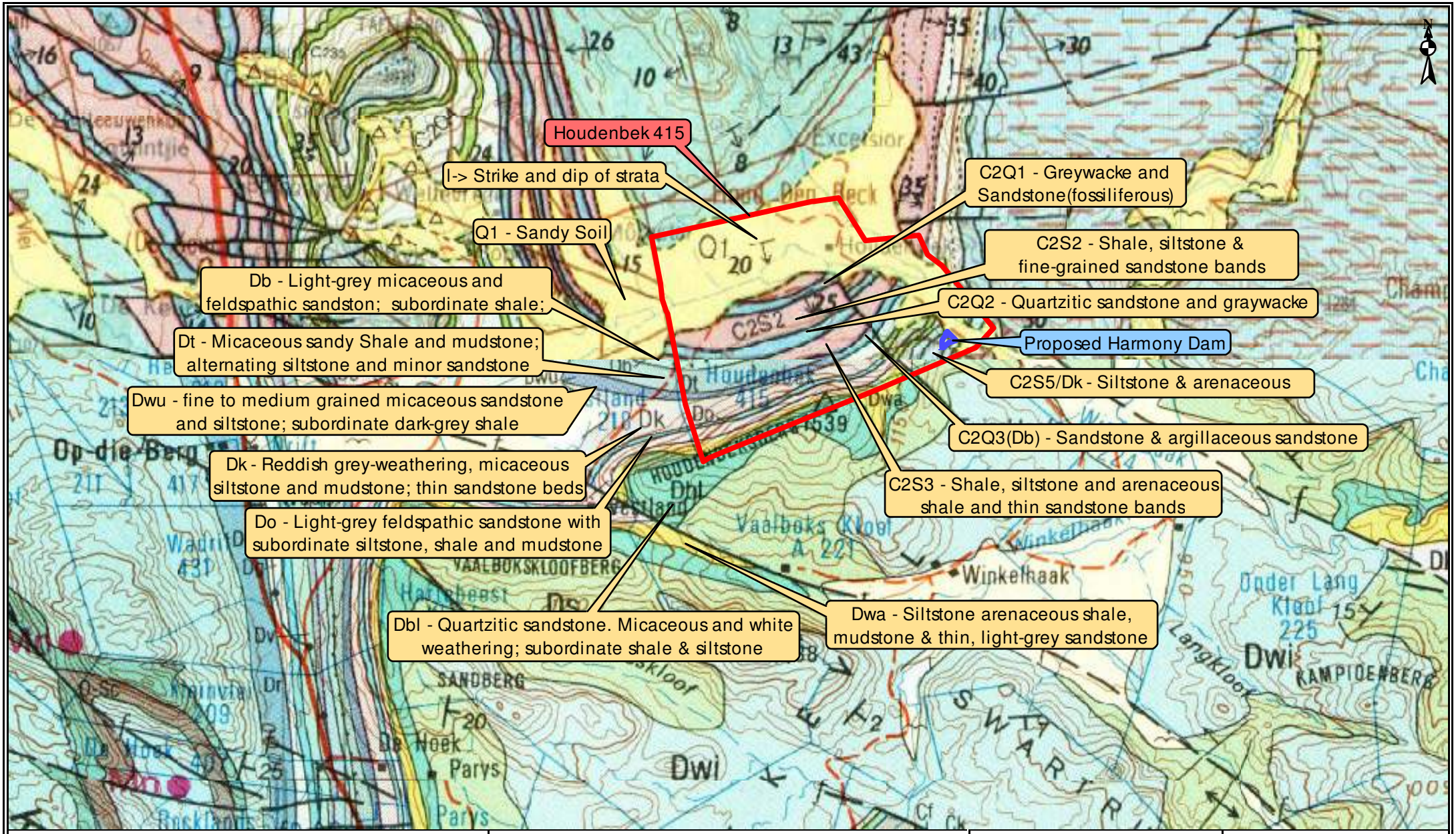
Client: MHB Trust
PO Box 20
Kouebokkeveld
6836

Scale:
1: 100 000

Catchment Area Map
Harmony Dam

Map Ref:
3319AB Gydopas

Project Ref:
1618



SAREL BESTER INGENIEURS BK
Raadgewende Siviele Ingenieurs
Argitektuurdienste

MC BESTER
Pr. Ing., LSAISI:970598, LSACAP:T1218
Posbus 21, CERES, 68.35
Tel 023-3122017

Client: MHB Trust
PO Box 20
Kouebokkeveld
6836

Scale:	Geology Map
1: 100 000	Harmony Dam
Map Ref:	Project Ref:
3219 Worcester	1618

PRELIMINARY EVALUATION OF THE PROPOSED EARTH DAM: QUANTITIES AND COSTING

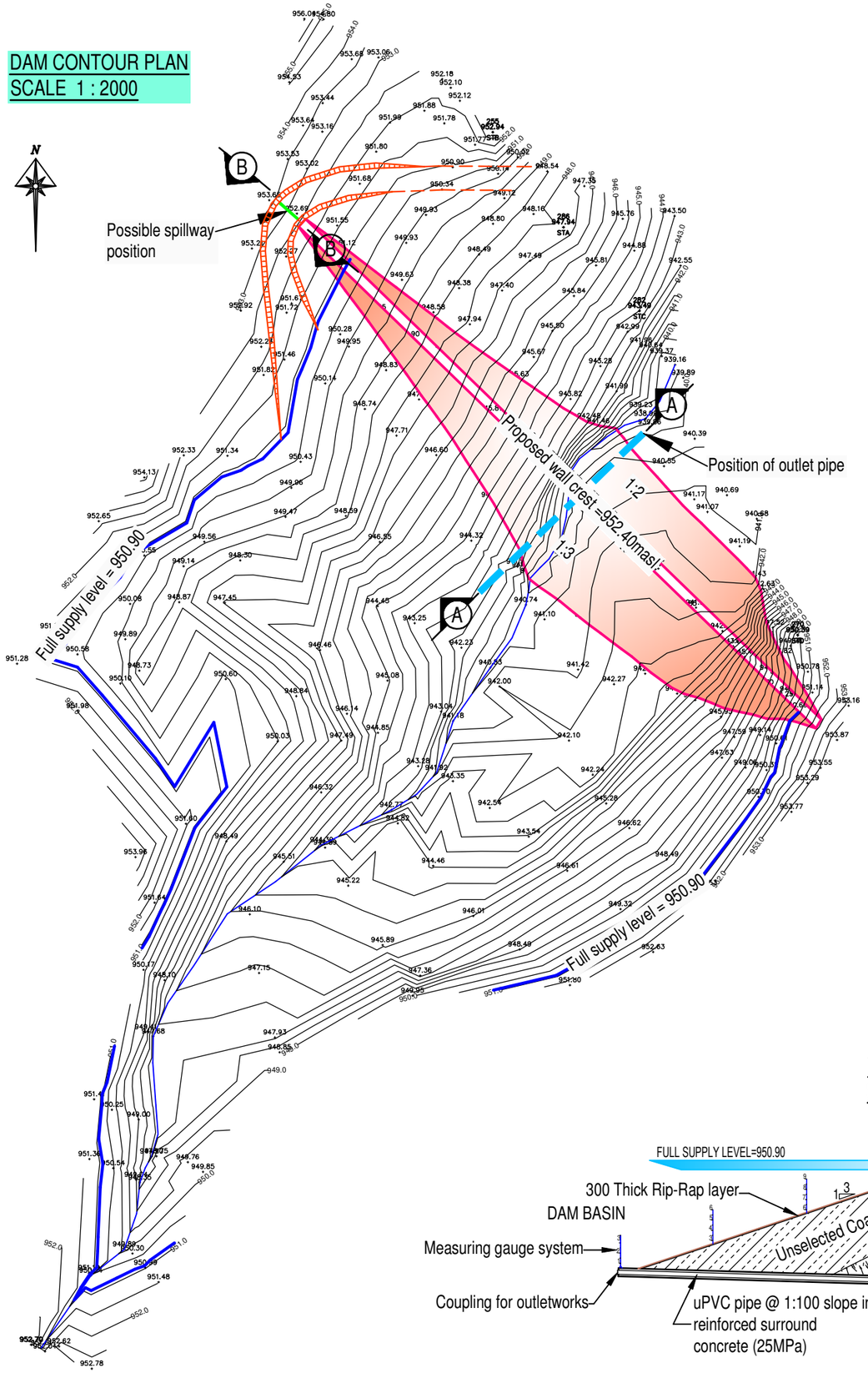
Client:	**Morester Landgoed**	***Project Nr.:***	**1618**	*Version:*	*Okt 2017*
Address:	Posbus 415	***Annexure:***	**A**		
	Ceres, 6835	***Prepared:***	SH	***Report by:***	Charl Bester
Dam:	**HARMONY #2 DAM**	***Date:***	08-Dec-17		SAREL BESTER ENGINEERS
Notes:	1. VAT EXCL.				P.O. Box 21, Ceres 6835
	2. Site 1				Ph: 023-312 2017
	3. Gebasseer op Douw Willemse opmetings				Fax: 086-514 3350

Design Parameters & Assumptions:

Crest width (m):	4.0	*Cut-off depth (m):*	3.00	*Earthmoving Cost (R/m³):*	45.00
Upstream slope 1:	3.0	*Cut-off base (m):*	4.00	*Nominal Engineering Fees (%):*	8.0%
Downstream Slope 1:	2.0	*Cut-off slope 1:*	0.75	*Fees Base Value (R):*	R 11,500,000
Percentage of fill from dam basin:	50%	*Application (m³/ha):*	7,000		

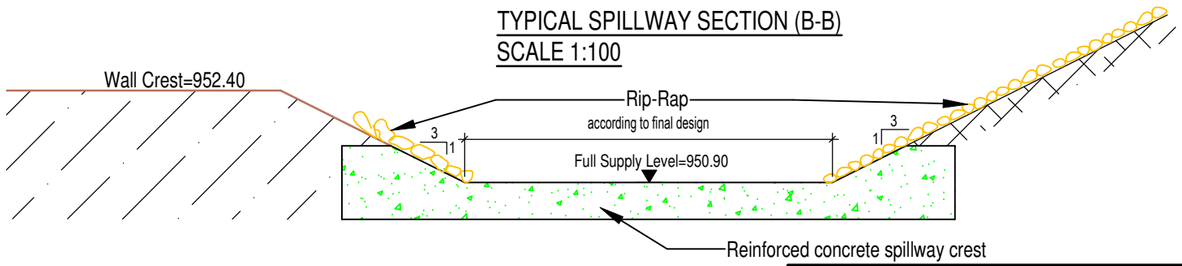
Item	Description		Unit	Stadium / Wall position / Terrain				
				Stadium 1	Stadium 2	Stadium 3	Stadium 4	Stadium 5
	1 EMBANKMENT			*Boland Opmeting*	*SBRI*			
1.1	Wall crest level		masl	951.94	952.40			
1.2	Lowest ground level below wall		masl	938.94	939.60			
1.3	Maximum wall height		m	13.00	12.80	#N/A	#N/A	#N/A
1.4	Wall crest length		m	270.0	280.0			
1.5	Wall volume - excluding cut-off		m³	38,200	47,500			
1.6	Cut-off trench excavation		m³	5,063	5,250	#N/A	#N/A	#N/A
1.7	**Total earthmoving**		**m³**	**43,263**	**52,750**	**#N/A**	**#N/A**	**#N/A**
	2 STORAGE CAPACITY							
2.1	Full supply level		masl	950.64	950.90			
2.2	Draw-off level		masl	939.94	940.50			
2.3	Total free-board		m	1.30	1.50	0.00	0.00	0.00
2.4	Maximum depth above draw-off level		m	10.70	10.40	0.00	0.00	0.00
2.5	Nett capacity from contours		m³	231,000	235,000			
2.6	Capacity gain from excavations		m³	19,100	23,750	0	0	0
2.7	**Potential gross capacity**		**m³**	**250,100**	**258,750**	**0**	**0**	**0**
2.8	Water surface		ha	5.00	5.40			
2.9	Potential irrigation		ha	35.73	36.96	0.00	0.00	0.00
2.10	Average water depth		m	5.00	4.79	#DIV/0!	#DIV/0!	#DIV/0!
2.11	Ratio Storage : Earthworks			5.78	4.91	#N/A	#N/A	#N/A
2.12	Recommended pipe diameter		mm	250	250	150	150	150
	3 COSTING (Excl VAT)							
3.1	Overhead & Preparation	10%	Rand	299,510	365,192	#N/A	#N/A	#N/A
3.2	Earthworks (excavate & construct)	65%	Rand	1,946,813	2,373,750	#N/A	#N/A	#N/A
3.3	Concrete & Outlet works	15%	Rand	449,264	547,788	#N/A	#N/A	#N/A
3.4	Diverse & Unforeseen	10%	Rand	299,510	365,192	#N/A	#N/A	#N/A
3.5			Rand					
3.6	**Estimated Construction Cost**		**Rand**	**2,995,096**	**3,651,923**	**#N/A**	**#N/A**	**#N/A**
3.7	Adjusted Fees percentage		%	10.0%	9.5%	#N/A	#N/A	#N/A
3.8	Engineers costs (ECSA Fees)		Rand	300,799	347,421	#N/A	#N/A	#N/A
3.9	Engineers costs (Disbursements)		Rand					
3.10	**Estimated Engineers Costs**		**Rand**	**300,799**	**347,421**	**#N/A**	**#N/A**	**#N/A**
3.11			Rand					
3.12			Rand					
3.13	**Total estimated capital cost**		**Rand**	**3,295,895**	**3,999,344**	**#N/A**	**#N/A**	**#N/A**
3.14	Capital costs per m³ gross capacity		Rand	13.18	15.46	#N/A	#N/A	#N/A
3.15	Capital costs per irrigated hectare		Rand	92,248	108,195	#N/A	#N/A	#N/A

DAM CONTOUR PLAN
SCALE 1 : 2000

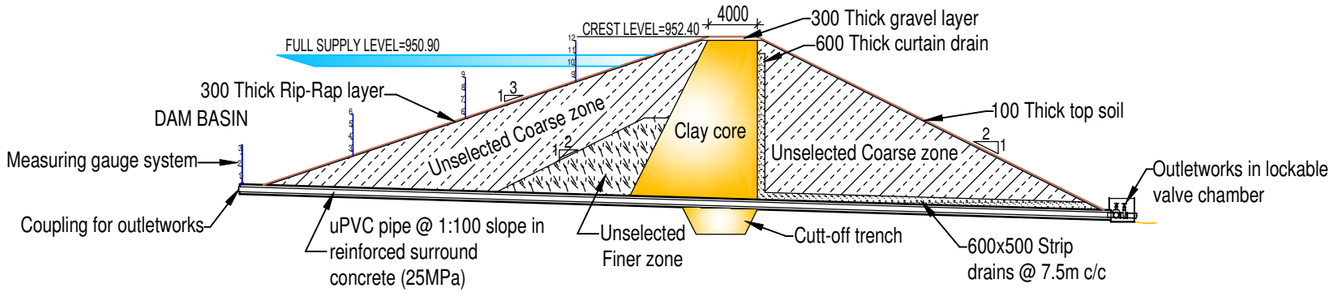


TECHNICAL INFORMATION: HARMONY 266 DAM	
Wall crest level	: 952.40 masl
Wall crest width	: 4.00 m
Wall crest length	: 281.00 m
Lowest ground level at embankment toe	: 939.60 masl
Maximum wall height	: 12.80 m
Upstream slope	1V : 3.00 H
Downstream slope	1V : 2.00 H
Embankment earthfill: cut-off trench excl.	: ±47 500 m³
Total estimated earthfill	: ±52 800 m³
Full supply level	: 950.90 masl
Total freeboard	: 1.50 m
Netto storage capacity	: 250 000 m³
Flooded area	: 5.40 ha
Dam footprint area	: ±6.50 ha

TYPICAL SPILLWAY SECTION (B-B)
SCALE 1:100



TYPICAL SECTION THROUGH EMBANKMENT (A-A)
SCALE 1:500



REVISION

SAREL BESTER ENGINEERS
Consulting Civil Engineers
Architectural Service

..... Date: 23/2/2018
MC BESTER
Pr. Eng., B.Eng., MSAICE:970598, SACAP:T1218
P.O. Box 21
62 Lyell Street
CERES, 6835
Ph: 023-312 2017
Fax: 023-312 3802
e-mail: admin@sbri.co.za

Harmony Trust
P.O. Box 415
CERES
6835

PROJECT:
PROPOSED NEW HARMONY 266 DAM ON THE FARM HOUDENBEK, KOUEBOKKEVELD, CERES

DETAIL:
Contour Plan, Embankment Cross Section & Spillway Section

DRAWN	DATE	SCALE	SHEET
SC Hartzenberg	FEB. 2018	as shown	1 of 1
SURVEYED	DESIGNED	DWG. NUMBER	REV.
D. Willemse	Sarel Bester Engineers	1618-S2-01	

 A3