

**THE PROPOSED DEVELOPMENT OF THE HARMONY
INSTREAM DAM AND ASSOCIATED AGRICULTURAL
AREA ON THE REMAINDER OF FARMS HOUDENBEK
NO. 415 AND WINKELHAAK NO. 224 NEAR DIE DORP
OP DIE BERG, WITZENBERG LOCAL MUNICIPALITY,
WESTERN CAPE**



**DRAFT
ENVIRONMENTAL IMPACT REPORT**

WCDEA&DP REF: 16/3/3/2/B5/2/1016/26

July 2026

HARMONY TRUST

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INDEPENDENCE & CONDITIONS

EnviroAfrica is an independent consulting firm that has no interest in the proposed activity other than fair remuneration for services rendered. Remuneration for services is not linked to approval by decision-making authorities, and EnviroAfrica has no interest in secondary or downstream development as a result of this project. There are no circumstances that compromise the objectivity of this Environmental Impact Report. The findings, results, observations and recommendations given here are based on the author's best scientific and professional knowledge and available information. EnviroAfrica reserves the right to modify aspects of this report, including the recommendations, if new information becomes available which may have a significant impact on the findings of this report.

CONTENTS

INDEPENDENCE & CONDITIONS	3
1. INTRODUCTION	8
2. NEED AND DESIRABILITY	13
3. LEGAL REQUIREMENTS.....	18
3.1 THE CONSTITUTION OF THE REPUB.....	18
LIC OF SOUTH AFRICA.....	18
3.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)	18
3.3 NATIONAL HERITAGE RESOURCES ACT	23
3.4 EIA GUIDELINE AND INFORMATION DOCUMENT SERIES	24
3.6 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT	25
4. ALTERNATIVES.....	26
4.1 SITE ALTERNATIVES FOR THE PROPOSED HARMONY DAM.....	26
4.2 ACTIVITY ALTERNATIVES	27
4.3 LAYOUT ALTERNATIVES	27
4.4 NO-GO ALTERNATIVE	29
4.5 CONCLUSION	29
5. SITE DESCRIPTION	31
5.1 LOCATION.....	31
5.2 VEGETATION	32
5.3.1 Critical Biodiversity Areas and Ecological Support Areas.....	34
5.4 FRESHWATER	35
5.5 CLIMATE.....	37
5.6 SOCIO-ECONOMIC CONTEXT	38
5.7 HERITAGE FEATURES	39
6. PROCESS TO DATE	42
6.1 TASKS UNDERTAKEN TO DATE	42
6.2 TASKS TO BE UNDERTAKEN DURING THE EIA PHASE.....	44
6.3 PROFESSIONAL TEAM.....	44
6.4 PUBLIC PARTICIPATION	45
6.4.1 PUBLIC PARTICIPATION UNDERTAKEN DURING THE EIA PHASE:	47
6.4.2 INTERESTED AND AFFECTED PARTIES	47
7. ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS	49
8. SPECIALIST STUDIES	56
8.1 CRITERIA FOR SPECIALIST ASSESSMENT OF IMPACTS	56
8.2 BRIEFS FOR SPECIALIST STUDIES.....	57
9. ENVIRONMENTAL IMPACT ASSESSMENT, SIGNIFICANCE AND MITIGATION METHODOLOGY ..60	
10.ASSESSMENT OF ENVIRONMENTAL IMPACTS.....	37
10.1 Botanical Impact Assessment	37
10.2 Freshwater Ecological Assessment.....	40
10.3 Hydrological and Environmental Water Requirements Study.....	45
11.SUMMARY OF IMPACTS AND CUMULATIVE EFFECT	48
11.1 Summary of Impacts.....	48
11.1.1 Preferred Alternative – Harmony Instream Dam and Associated Agricultural Development	48

11.1.2	Alternative Dam Layouts (Options 1 and 2)	50
11.1.3	Preferred Agricultural Layout	52
11.1.4	Previous Agricultural Layout (Initial Layout)	54
11.1.5	No-Go Alternative	56
11.2	Cumulative effect	57
12.	CONCLUSION AND RECOMMENDATIONS	59
13.	DETAILS AND EXPERTISE OF THE EAP	61
	Please refer to Appendix 9A for the CV of the EAP.	61

FIGURES

Figure 1:	Google Earth image showing the locality of the proposed Harmony Dam	10
Figure 2:	Cape Winelands District Municipality	12
Figure 3:	Google Earth image of the surrounding landscape	14
Figure 4:	Crop census map indicating surrounding agricultural land uses associated with the proposed Harmony Dam	14
Figure 5:	Google Earth image showing the locality of the proposed Harmony Dam	26
Figure 6:	Proposed Agricultural Area site, looking east	26
Figure 7:	Proposed Dam Area site, looking north-east	26
Figure 8:	SANBI Vegetation map of the area (CapeFarmMapper)	28
Figure 9:	CBAs & SANBI Red List of Ecosystems – Remnants (CapeFarmMapper)	29
Figure 10:	CapeFarmMapper map of the water resources in the area	31
Figure 11:	Meteoblue – Simulated historical climate & weather data for the Op-die-Berg area	32
Figure 12:	Palaeontological sensitivity map	35
Figure 13:	Summary of the EIA process and public participation process	37
Figure 14:	A map of the Red Listed Ecosystems in Houdenberg-Winkel Haak area of the Kouebokkeveld	39
Figure 15:	Sub-catchments and drainage lines associated with the proposed Harmony Instream Dam and agricultural area	42

TABLES

Table 1:	Summary of 2014 EIA Regulations triggered	16
Table 2:	Palaeontological sensitivity rating	33
Table 3:	Tasks undertaken in the EIA to date	35
Table 4:	Members of the professional team	37
Table 5:	Summary of the public participation process	38
Table 6:	Impact Assessment Methodology	40
Table 7:	Required Mean Monthly Environmental Water Requirement (EWR) Flows at the Diversion Site	50
Table 8:	Impact Summary (Preferred Alternative)	47
Table 9:	Impact Summary (Alternative Dam Layouts)	48
Table 10:	Impact Summary (Preferred Agricultural Layout)	51
Table 11:	Impact Summary (Previous Agricultural Layout)	53
Table 12:	Impact Summary (No-Go Alternative)	55

APPENDICES

Appendix 1	Locality Map
Appendix 2	Alternative Agricultural Areas
Appendix 2B	Critical Biodiversity Areas (CBAs)
Appendix 2C	Freshwater
Appendix 2D	Landcover
Appendix 2E	SANBI Red List of Ecosystems
Appendix 2F	Vegetation
Appendix 2G	Agricultural Georeferenced Map
Appendix 2H	Dam Georeferenced Map
Appendix 3A	Site Photos
Appendix 3B	Need and Desirability
Appendix 4A	Newspaper Advert
Appendix 4B	Proof of Posters
Appendix 4C	Proof of Initial Notification Letter
Appendix 4D	I&AP Register – Harmony Dam (POPI Compliant)
Appendix 4E	Comments and Response Report
Appendix 4F	Pre-Application Scoping Report Notification Letter
Appendix 4G	Site Notice (2024)
Appendix 4H	Meeting Discussions
Appendix 4I	Merged Harmony Comments
Appendix 5	DFFE Screening Tool Report
Appendix 6	Preliminary Design Report
Appendix 7	Water Use Licence
Appendix 8A	Botanical Assessment
Appendix 8B	Agricultural Compliance Statement
Appendix 8C	Freshwater Report
Appendix 8D	Heritage Impact Assessment
Appendix 8E	SUMMARY Riet River ER
Appendix 9A	EAP Details
Appendix 9B	EAP EAPASA Registration
Appendix 9C	Impact Assessment and Scoring Matrix
Appendix 10	EMPr

ACRONYMS

BGIS	Biodiversity Geographic Information System
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
WCDEA&DP	Western Cape Department of Environmental Affairs and Development Planning
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act (Act No. 73 of 1989)
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Programme
ESA	Ecological Support Area
EWI	Environmental Water Requirements
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
I&APs	Interested and Affected Parties
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NID	Notice of Intent to Develop
NWA	National Water Act
OESA	Other Ecological Support Area
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
WULA	Water Use Licence Application

1. INTRODUCTION

1.1 BACKGROUND

Agriculture forms a cornerstone of the Cape Winelands District economy, contributing significantly to formal employment opportunities and supporting the livelihoods of local communities.

In 2006, the farm Winkelhaak Remaining Extent No. 224, located in the Koue Bokkeveld and commonly referred to as Harmony, was acquired and established as a B-BBEE agricultural initiative. The farm is owned by Harmony Trust, a 100% black-owned B-BBEE entity, and operates independently while maintaining a close working relationship with its neighbouring partner and mentor, Morester Estate (MHB Boerdery (Pty) Ltd). Harmony Trust has been actively involved in agricultural production for several years and has traded successfully alongside its mentor farm.

Harmony Trust, in collaboration with Morester Estate (MHB Boerdery (Pty) Ltd), proposes to expand the existing agricultural operations through the cultivation and irrigation of additional fruit orchards. This expansion is supported by the development of water storage infrastructure to improve irrigation reliability and long-term sustainability.

The broader expansion strategy includes two proposed instream dams, namely the Harmony Instream Dam (the subject of this application) and the Harmony Dam, which is being advanced under a separate application process. The projects are being assessed independently to ensure that the regulatory process for each development can proceed without undue delay.

A key consideration in the planning process was the identification of suitable dam locations. The B-BBEE-designated property, Winkelhaak RE224, is characterised by relatively flat topography and does not contain a naturally suitable basin for a dam of the required scale. In contrast, the neighbouring property, Houdenberg RE415, owned by Morester Estate (MHB Boerdery (Pty) Ltd), contains topographically suitable sites for dam construction and offers the additional advantage of gravity-fed irrigation to the proposed orchard areas located on Winkelhaak RE224.

As the land suitable for the proposed dam is located on Houdenberg RE415, Harmony Trust will lease the required portion of land from Morester Estate (MHB Boerdery (Pty) Ltd) for the construction and operation of the Harmony Instream Dam. This arrangement is intended as an interim measure, with a long-term objective of subdivision and transfer of ownership to Harmony Trust, thereby strengthening the empowerment objectives and long-term sustainability of the B-BBEE agricultural initiative.

1.2 DESCRIPTION OF THE PROPOSED ACTIVITY

For the Harmony Instream Dam & Associated Agricultural Area Application with WCDEA&DP Reference Number: 16/3/3/2/B5/2/1016/26

Harmony Trust proposes the development of the Harmony Instream Dam on the Remaining Extent of Farm Houdenberg No. 415, together with an associated agricultural development area on the Remaining Extent of Farm Winkelhaak No. 224, located near Op-die-Berg within the Witzenberg Local Municipality, Western Cape.

The proposed development entails the construction of an earth-fill instream dam with an estimated storage capacity of approximately 250 000 m³, a maximum dam wall height of approximately 12.8 m, and a crest length of approximately 280 m. The estimated inundation area at full supply level (FSL) will cover approximately 5.4 hectares on the lower slopes of the Houdenbeks Mountains.

The primary purpose of the dam is to store and supply irrigation water to support an associated agricultural development footprint of approximately 25 hectares (ha). The development is intended to enhance water security, improve irrigation efficiency, and support the long-term sustainability and economic viability of the farming operation.

The dam will be supplied predominantly by runoff from the surrounding catchment, including an unnamed tributary of the Houdenberg River, during periods of surplus winter high-flow. Abstraction will be strictly limited to these high-flow periods in accordance with the conditions of the approved Water Use Licence (WUL No. 01/E21D/AB/9699), and no abstraction will occur during low-flow or baseflow conditions.

The proposed water uses associated with the Harmony Instream Dam are authorised under Water Use Licence No. 01/E21D/AB/9699, issued by the Department of Water and Sanitation (DWS) on 27 January 2023. The licence authorises the abstraction and storage of water subject to specific operational conditions, including restrictions on abstraction during low-flow periods and requirements relating to monitoring, reporting and compliance.

During drier periods, water supply may be supplemented via pumping from the proposed Harmony Dam on Farm No. 414. This component forms part of a separate application process and is not included within the scope of this application. Water transfer, where required, will occur via a pipeline of approximately 1,200 m in length, routed along existing disturbed areas and farm access routes where feasible to minimise environmental disturbance.

Water use and abstraction associated with the development are regulated in terms of the approved Water Use Licence and are subject to oversight through the Koue Bokkeveld Water User Association under the authority of the Department of Water and Sanitation (DWS), ensuring structured monitoring, compliance and reporting.

Associated Infrastructure

The development will require the installation of new irrigation pipeline infrastructure. Water will be conveyed from the dam via a 250 mm diameter (Ø250 mm) Class 9 outlet pipe through the dam wall, which will connect to a pump station located immediately downstream of the dam wall.

From the pump station, a 160 mm diameter pipeline will convey water towards the agricultural development area. This pipeline will follow existing farm roads and disturbed corridors to minimise additional environmental disturbance.

Within the agricultural development area, the main pipeline will branch into smaller distribution pipelines of approximately 125 mm, 90 mm and 65 mm diameter, depending on irrigation block requirements and final design specifications.

The total pipeline length is estimated at approximately 1,200 m, although the final alignment, routing and infrastructure specifications will be confirmed during the detailed design phase.

Additional associated infrastructure will include:

- Irrigation infrastructure within the agricultural development area;
- Access tracks making use of existing farm roads with limited upgrading where required;
- A pump station located below the dam wall; and
- Minor supporting infrastructure required for operation and maintenance.

Agricultural Development Area

The proposed agricultural development area of approximately 25 hectares will comprise orchard establishment and associated irrigation infrastructure. The layout has been refined through the alternatives assessment process to minimise environmental impacts and respond to identified environmental constraints, including biodiversity sensitivities and proximity to watercourses.

Infrastructure will, where feasible, be located within previously disturbed or transformed areas, including existing agricultural land and road reserves, to limit additional environmental disturbance. Buffer areas to watercourses have been informed by the specialist assessments undertaken as part of the EIA process and have been incorporated into the proposed development layout.

Construction Materials

The material required for the construction of the dam wall will be sourced, as far as practicable, from within the dam basin and inundation area. Preliminary observations indicate that suitable in situ materials are available on site.

More granular sandy material will be used as unselected fill within the upstream and downstream embankment zones, while finer clay-rich material will be incorporated into the central core and cut-off zones in accordance with standard earth-fill dam design principles.

Although no detailed geotechnical investigation has been undertaken at this stage, similar dams in the surrounding area have demonstrated acceptable performance using comparable materials. The potential presence of lightly dispersive soils has been noted based on site observations and will be addressed during the detailed design phase through appropriate engineering measures, including compaction control, possible chemical stabilisation, and/or the incorporation of filter layers.

The suitability and availability of construction materials have been preliminarily assessed through the engineering investigations undertaken for the project and will be further confirmed during the detailed design phase.

Environmental Context

The proposed development is located within the broader Koue Bokkeveld Mountain Catchment Area, a sensitive environmental system that plays an important role in regional hydrological functioning, water supply and biodiversity support.

The implications of the development for the receiving environment, including potential impacts on aquatic systems, biodiversity, downstream users and cumulative catchment functioning, have been assessed through specialist studies undertaken as part of the Environmental Impact Assessment (EIA) process.

The specialist studies identified and assessed the following key issues:

- Downstream flow impacts;
- Cumulative catchment effects;
- Biodiversity sensitivities;
- Agricultural transformation impacts; and
- Operational water management and abstraction controls.

The findings of these specialist studies have informed the impact assessment and the identification of mitigation and management measures contained within this Draft Environmental Impact Report.

Regulatory Context

The application is being assessed through a full Environmental Impact Assessment process in accordance with the National Environmental Management Act (Act No. 107 of 1998) and the Environmental Impact Assessment Regulations, 2014 (as amended).

The approximate centroid coordinates of the proposed Harmony Instream Dam are:

S 32°59'47.00"; E 19°27'50.00"

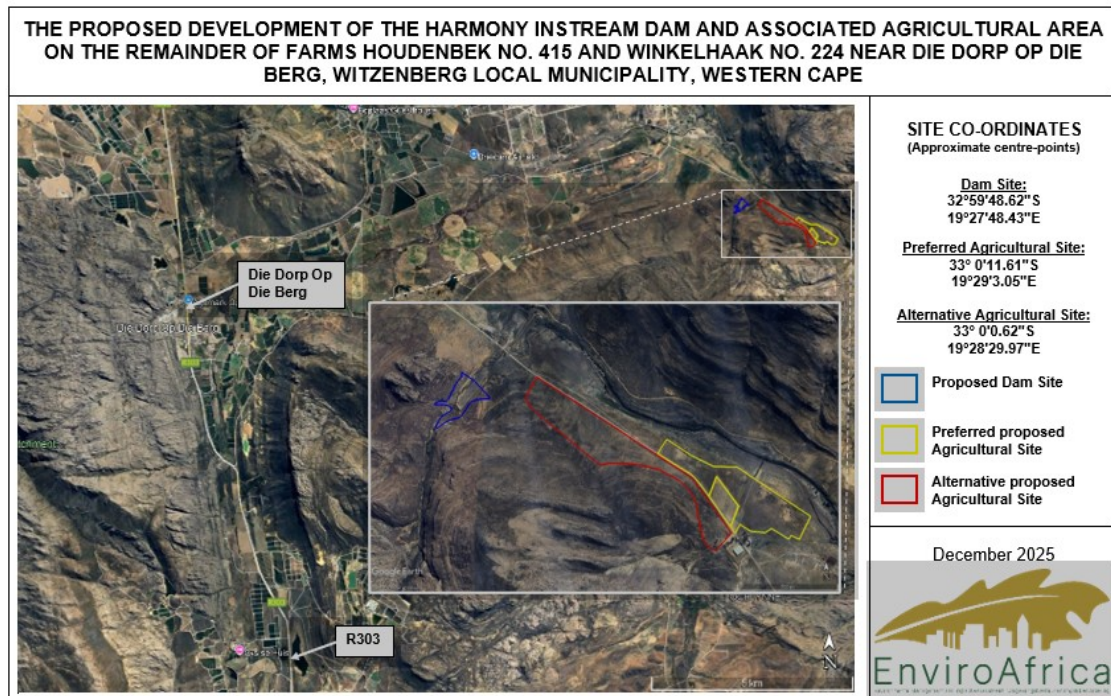


Figure 1: Google Earth image of the proposed property and the development footprint (yellow polygon)

1.3 Water Use Licence

On 27 January 2023, Harmony Trust was granted a Water Use Licence (Licence No. 01/E21D/AB/9699) by the Department of Water and Sanitation (DWS) for water use activities within the Olifants–Doorn Water Management Area, Western Cape.

The Water Use Licence authorises water use activities associated with the construction and operation of two dams, namely:

- A dam with a storage capacity of approximately 2,000,000 m³ (referred to as the Toeka Dam); and
- A dam with a storage capacity of approximately 250,000 m³ (referred to as the Harmony Instream Dam).
- Both dams are authorised to be located on the Remaining Extent of Farm Houdenberg No. 415.
- The licence further authorises Harmony Trust to abstract and store water as follows:
- Up to 715,000 m³ per annum from the Houdenberg River; and
- Up to 250,000 m³ per annum from an unnamed tributary of the Houdenberg River.

The authorised water will be stored within the approved dams and utilised for irrigation purposes in support of the Harmony Trust B-BBEE agricultural development, subject to strict compliance with the conditions of the Water Use Licence.

The Water Use Licence contains a number of operational and monitoring requirements, including restrictions on abstraction during low-flow conditions, requirements relating to flow monitoring and reporting, and measures aimed at protecting downstream water users and aquatic ecosystem functioning.

Water use and abstraction associated with the development are regulated in terms of the approved Water Use Licence and are subject to oversight through the Koue Bokkeveld Water User Association under the authority of the Department of Water and Sanitation (DWS).

The following water uses have been authorised in terms of Section 21 of the National Water Act, 1998 (Act No. 36 of 1998):

- Section 21(a): Taking water from a water resource;
- Section 21(b): Storing water;
- Section 21(c): Impeding or diverting the flow of water in a watercourse; and
- Section 21(i): Altering the bed, banks, course, or characteristics of a watercourse.

2. NEED AND DESIRABILITY

The applicant, Harmony Trust, proposes to further develop an existing 100% black-owned B-BBEE agricultural enterprise. Harmony Trust has been actively engaged in agricultural production for several years and has traded successfully in partnership with its neighbouring mentor farm, Morester Estate (MHB Boerdery (Pty) Ltd).

The proposed development forms part of a planned expansion of fruit orchard cultivation, requiring a reliable and sustainable irrigation water supply to ensure long-term agricultural viability. The development of water storage infrastructure is therefore essential to support continued production, improve water-use efficiency, and reduce vulnerability to climatic variability. The project is also expected to contribute to permanent employment opportunities and strengthen local rural livelihoods within the Koue Bokkeveld region.

The need for the proposed Harmony Instream Dam is directly linked to increasing water insecurity in the agriculturally intensive Koue Bokkeveld area near Ceres. The region is characterised by highly variable rainfall patterns and episodic winter runoff, with limited reliable water availability during the growing season. The proposed dam will store surplus winter high-flow runoff for use during drier periods, thereby improving the temporal distribution of water supply without increasing the overall authorised abstraction volume.

The desirability of the proposed development must be considered within the context of both agricultural sustainability and environmental sensitivity, particularly given its location within the broader Koue Bokkeveld Mountain Catchment Area (MCA). These areas are recognised for their importance in maintaining hydrological functioning, water yield and ecological integrity. In this regard, the proposed development has been informed by a comprehensive alternatives assessment process, which considered different dam locations, agricultural layouts and infrastructure configurations.

Through this process, the preferred alternative was identified as the option that best balances engineering feasibility, water supply requirements and environmental constraints. The selected dam site utilises a naturally suitable topographical basin, thereby reducing the extent of required disturbance, while the agricultural layout has been refined to avoid, as far as practicable, sensitive areas and to utilise previously disturbed or transformed land.

In accordance with the mitigation hierarchy, efforts have been made to:

- Avoid impacts where feasible through site selection and layout refinement;
- Minimise impacts through footprint optimisation and the use of existing disturbed corridors;
- Rehabilitate disturbed areas following construction; and
- Implement monitoring and management measures to address residual impacts.

It is acknowledged that the proposed development will result in impacts on indigenous vegetation, including areas associated with Critically Endangered Kouebokkeveld Alluvium Fynbos. These impacts have been assessed through the specialist botanical assessment and have informed the refinement of the development footprint and the identification of appropriate mitigation measures. The significance of residual impacts has been evaluated as part of the Environmental Impact Assessment process.

Specialist studies have identified sensitivities relating to aquatic systems, biodiversity and heritage resources. The findings of these studies indicate that, with the implementation of the recommended mitigation and management measures, impacts can be reduced to acceptable levels. These measures include the establishment of buffer areas, rehabilitation of disturbed areas, protection of heritage resources, implementation of operational controls and ongoing environmental monitoring. Importantly, abstraction is

limited to surplus winter high-flow events, and water use is regulated through the Koue Bokkeveld Water User Association under the authority of the Department of Water and Sanitation (DWS), providing a structured and monitored framework for compliance.

The precautionary principle has been applied in the identification and assessment of impacts and the development of mitigation measures. Key issues, including downstream flow impacts, cumulative catchment effects, biodiversity sensitivities and heritage considerations, have been assessed through the specialist studies undertaken as part of the EIA process.

The proposed development has also been considered in terms of reasonable and feasible alternatives. Alternative dam locations, agricultural layouts and infrastructure configurations were investigated during the planning and assessment process. While off-channel storage options and alternative locations were considered, these were found to be constrained by topography, engineering feasibility and the availability of suitable dam basins within the project area. The selected instream option represents the most feasible means of capturing episodic runoff while minimising additional infrastructure requirements and associated disturbance.

Accordingly, the proposed Harmony Instream Dam is considered a necessary intervention to improve water security for the agricultural operation, while the associated impacts are capable of being appropriately managed through the implementation of mitigation, monitoring and management measures. The development supports agricultural productivity, rural economic resilience and transformation objectives, while maintaining compliance with applicable environmental and regulatory requirements.

While environmental sensitivities are acknowledged, the project represents a balanced and considered approach that seeks to meet socio-economic needs while upholding environmental stewardship. The findings of the specialist studies indicate that the preferred development alternative is feasible, subject to the implementation of the recommended mitigation and management measures contained within this Environmental Impact Assessment process.

2.1 Location and Accessibility

The proposed location of the Harmony Instream Dam has been identified as suitable for dam construction based on a combination of engineering, hydrological, environmental and operational considerations, following an iterative alternatives assessment process.

From an engineering perspective, the selected site provides a favourable natural basin configuration, enabling the required storage capacity to be achieved with a relatively limited dam wall footprint. This contributes to improved structural efficiency, reduced earthworks requirements and optimised long-term project life-cycle costs.

From a hydrological perspective, the site is located within a catchment area that allows for the capture of episodic surplus winter runoff, consistent with the operational intent of storing water during high-flow periods for use during drier seasons, subject to the conditions of the approved Water Use Licence.

Environmental considerations informed the selection and refinement of the preferred layout. The preferred location was identified as the option that, while not impact-free, represents the least environmentally damaging feasible alternative when compared to the other assessed options. The layout has been refined to:

- Avoid, as far as practicable, areas of highest ecological sensitivity;

- Minimise disturbance to watercourses and associated riparian areas; and
- Exclude identified heritage resources from the development footprint.

Operationally, the selected site allows for efficient integration with the associated agricultural development area, including optimised conveyance of water through the proposed irrigation infrastructure. This reduces unnecessary infrastructure duplication and limits additional disturbance.

The preferred site represents the outcome of balancing competing constraints, including topography, water availability, environmental sensitivities and infrastructure requirements, and is considered the most feasible and practical option within the project area.

Access to the proposed dam site will be obtained via existing farm roads, which will be utilised with minimal upgrading where required. This approach avoids the need for new access routes and reduces additional environmental disturbance associated with construction activities.

2.2 Compatibility with the Surrounding Area

The site of the proposed Harmony Instream Dam is situated within a landscape already characterised by established agricultural land uses, including cultivated fields, orchards, and existing farm dams. The visual and functional character of the area is therefore predominantly rural and agrarian, with farming-related infrastructure forming an integral and expected component of the landscape.

The construction of the proposed Harmony Instream Dam and associated irrigation infrastructure is not expected to result in a material change to the existing land-use pattern, as it is consistent with the ongoing agricultural use of the surrounding properties. The introduction of an additional water storage structure is considered compatible with the prevailing land use, given the presence of similar dams and irrigation infrastructure within the broader area.

In terms of visual character, the proposed dam will be integrated into the existing topography, with the surrounding landform and vegetation providing a degree of natural screening. The scale and form of the dam are not anticipated to result in a visually dominant or intrusive feature when viewed within the broader landscape context.

Visibility of the development is expected to be localised, with limited exposure from public vantage points. No formally designated scenic routes or identified high-sensitivity visual receptors occur within the immediate vicinity of the site. As such, the development is not expected to significantly alter the sense of place, which is already defined by agricultural activity and associated infrastructure.

From a cumulative perspective, the proposed development will incrementally add to existing agricultural infrastructure within the area; however, it remains consistent with the established rural character and land-use function of the Koue Bokkeveld region.

Overall, the proposed development is considered compatible with the surrounding area, and the anticipated visual impact is expected to be low. This conclusion is supported by the findings of the Environmental Impact Assessment process, which confirmed that the proposed development is consistent with the existing agricultural character of the area and is unlikely to result in a significant adverse impact on the visual quality, sense of place, or rural landscape character of the Koue Bokkeveld region.

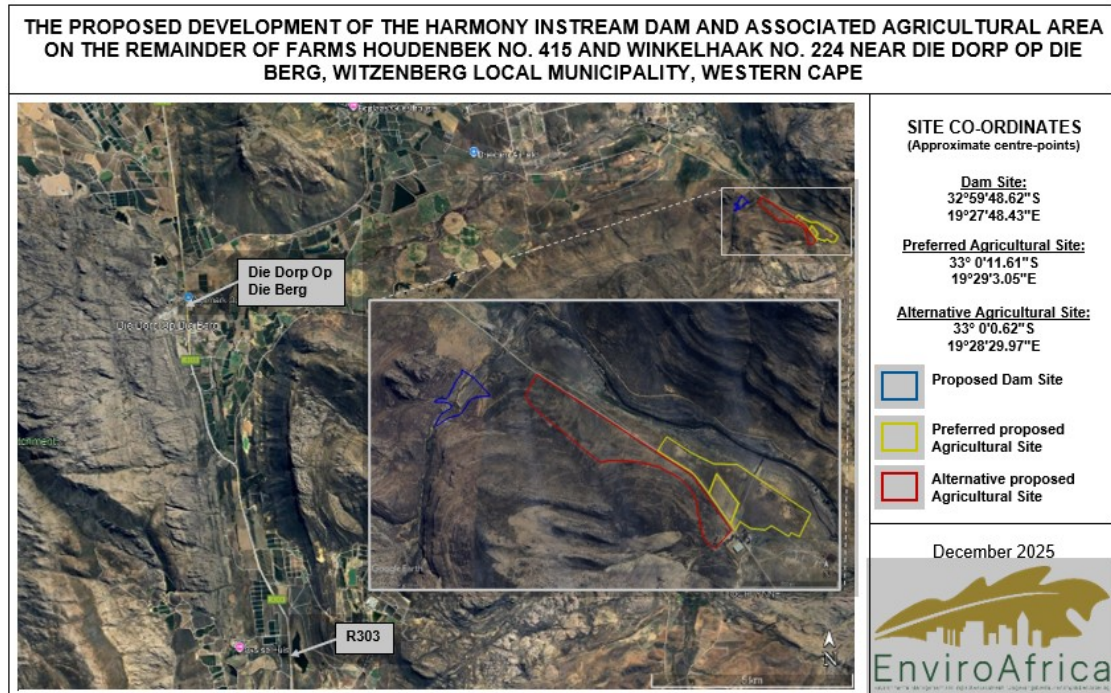


Figure 2: Google Earth image of the proposed property and the development footprint (yellow polygon)

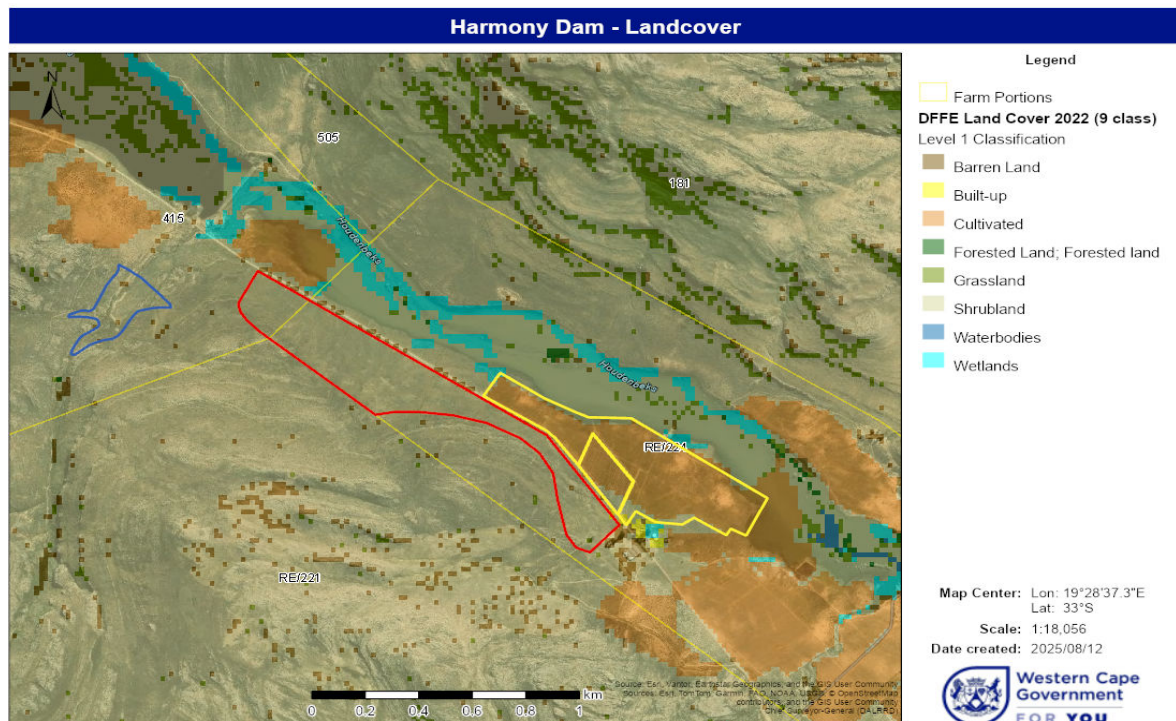


Figure 3: Landcover within and surrounding the proposed Harmony Instream Dam and associated agricultural development area. The figure illustrates the distribution of cultivated land, natural vegetation, wetlands and watercourses in relation to the proposed development footprint, providing context for the assessment of land-use patterns and potential environmental sensitivities.

The proposed Harmony Instream Dam and associated agricultural development are not anticipated to result in significant adverse effects on human health, well-being, or the existing rural sense of place. The operational phase of the development is not expected to generate significant noise, odours, emissions, or other nuisance impacts typically associated with industrial or urban land uses. Construction-related disturbances, including noise, dust, traffic, and earthworks activities, will be temporary and localised in nature and will be managed through the implementation of mitigation measures contained within the Environmental Management Programme (EMPr).

Given that the proposed activity comprises agricultural water storage infrastructure and associated orchard development within an established agricultural landscape, the development is considered compatible with surrounding land uses. The broader area is characterised by cultivated lands, orchards, irrigation infrastructure, farm roads, and existing farm dams associated with agricultural production within the Koue Bokkeveld region. The proposed Harmony Instream Dam and associated irrigation infrastructure are therefore expected to integrate with the prevailing rural and agricultural character of the area.

The proposed development has been refined through the alternatives assessment process to minimise impacts on environmental and heritage sensitivities, including the incorporation of no-go buffers around identified heritage resources and the avoidance of higher sensitivity areas where feasible. The development footprint is not anticipated to result in a substantial change to the overall visual character of the landscape or the area's agricultural sense of place.

Consequently, the proposed development is anticipated to have a low visual and social impact and is not expected to result in an unacceptable alteration of the area's visual character, tranquillity, rural landscape setting, or cultural sense of place.

3. LEGAL REQUIREMENTS

This Environmental Impact Assessment (EIA) is being undertaken in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), read together with the Environmental Impact Assessment Regulations, 2014 (as amended), promulgated under Section 24(5) of NEMA.

In addition to NEMA and the associated EIA Regulations, several other pieces of environmental legislation are applicable to the proposed development and have been considered as part of this assessment process. The key environmental legislation relevant to the proposed Harmony Instream Dam and associated agricultural development is briefly outlined below.

3.1 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA

Section 24 of the Constitution of the Republic of South Africa, 1996, establishes the fundamental right of every person to an environment that is not harmful to their health or well-being. The Constitution further places an obligation on the State to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure ecologically sustainable development while promoting justifiable social and economic development.

3.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), as amended, provides the legislative framework for cooperative environmental governance and establishes principles for environmental management in South Africa.

NEMA makes provision for the identification, assessment and management of activities that may significantly affect the environment and which require environmental authorisation from the relevant competent authority prior to commencement.

In terms of Section 24 of NEMA, listed activities identified in terms of the Environmental Impact Assessment Regulations, 2014 (as amended), require environmental authorisation before such activities may commence. The EIA Regulations, 2014, were promulgated on 04 December 2014 in terms of Chapter 5 of NEMA and were subsequently amended on 07 April 2017. The Regulations include:

- Listing Notice 1 (GN R327);
- Listing Notice 2 (GN R325); and
- Listing Notice 3 (GN R324).

Listing Notice 2 applies to activities requiring a Scoping and Environmental Impact Assessment (S&EIR) process, while Listing Notices 1 and 3 generally apply to Basic Assessment processes.

The proposed Harmony Instream Dam and associated agricultural expansion trigger activities listed in Listing Notice 2 and are therefore subject to a Scoping and Environmental Impact Assessment process in terms of the EIA Regulations, 2014 (as amended).

In terms of Section 24(5) of NEMA, environmental authorisation is required for the identified listed activities associated with the proposed Harmony Instream Dam and associated agricultural development (refer to Table 1).

The applicable listed activities identified for the proposed development are discussed in Table 1 below.

Table 1: Summary of 2014 EIA regulations triggered

No.	Listed Activities as per Listing Notice 1, 2 and 3 (GN R327, R324, R325)	Applicability to the development
Government Notice R327 (Listing Notice 1)		
12.	The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres. (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs; a) within a watercourse; b) in front of a development setback; or if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse	The Harmony Instream Dam will have a total development footprint of approximately 6.5 hectares, including an inundation area of approximately 5.4 hectares at full supply level. The dam is located within a watercourse, namely an unnamed tributary of the Houdenberg River. As an instream dam, the development will be constructed within the natural flow path of the watercourse and will result in the impeding and storage of water within the channel. The development footprint significantly exceeds the 100 square metre threshold and therefore triggers Activity 12.
19.	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse; but excluding where such infilling, depositing, dredging, excavation, removal or moving: a) will occur behind a development setback b) is for maintenance purposes undertaken in accordance with a maintenance management plan; c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies	The Harmony Instream Dam is located within a watercourse and requires the excavation, removal and placement of material exceeding 10 cubic metres within the watercourse. Construction activities include: • Excavation of the dam basin; • Reshaping of the bed and banks of the watercourse; • Placement of material for the dam embankment and associated infrastructure; and • Construction of spillway and outlet structures. These activities will occur directly within the watercourse and are not associated with maintenance activities or excluded infrastructure. The development, therefore, triggers Activity 19.

No.	Listed Activities as per Listing Notice 1, 2 and 3 (GN R327, R324, R325)	Applicability to the development
27.	The clearance of an area of 1 ha or more, but less than 20 ha of indigenous vegetation	The Harmony Instream Dam will result in the clearance of indigenous vegetation exceeding 1 hectare but less than 20 hectares, associated with the dam footprint of approximately 6.5 hectares, including the inundation area at full supply level (approximately 5.4 hectares), the dam wall, spillway and associated construction areas. The development is located within the Koue Bokkeveld Mountain Catchment Area, where indigenous vegetation occurs. The construction of the dam and associated infrastructure, therefore, requires the clearing of indigenous vegetation within the development footprint, triggering this activity. The associated agricultural development area is located largely within previously disturbed and historically cultivated land and does not form part of the indigenous vegetation clearance assessed under this activity.
Government Notice R325 (Listing Notice 2)		
16.	Development of a dam, where the highest part of the dam wall, measured from the outside toe of the wall to the highest part of the wall, is 5m or higher or where the highwater mark of the dam covers an area of 10ha or more	The Harmony Instream Dam will have a dam wall height of approximately 12.8 metres, measured from the outside toe of the wall to the highest point of the crest. As the dam wall height exceeds the 5 metre threshold, the development triggers Activity 16.
Government Notice R324 (Listing Notice 3)		
12.	The clearance of an area of 300 square metres or more of indigenous vegetation, except where such clearance of vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.	The Harmony Instream Dam requires the clearance of indigenous vegetation exceeding 300 square metres within the dam footprint and associated construction areas. The development is located within environmentally sensitive areas, including: • Areas mapped as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESA 1) in the Western Cape Biodiversity Spatial Plan; and • The Koue Bokkeveld Mountain Catchment Area. The vegetation clearance is required for the construction of the dam and associated infrastructure and is not related to maintenance

No.	Listed Activities as per Listing Notice 1, 2 and 3 (GN R327, R324, R325)	Applicability to the development
		activities. Given that the clearance exceeds the 300 square metre threshold and occurs within identified sensitive areas, the development triggers Listing Notice 3 Activity 12.
14.	The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs a) within a watercourse; b) in front of a development setback; or if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse, excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.	The Harmony Instream Dam will have a total development footprint of approximately 6.5 hectares, including an inundation area of approximately 5.4 hectares, and is located within a watercourse, namely an unnamed tributary of the Houtenbek River. As an instream dam, the development will be constructed within the natural flow path of the watercourse and will result in the impeding and storage of water within the channel. The development footprint significantly exceeds the 10 square metre threshold and occurs within a watercourse. The development, therefore, triggers Listing Notice 3 Activity 14.

The Scoping phase has been completed in accordance with the EIA Regulations, 2014 (as amended), and this Environmental Impact Assessment Report is submitted to WCDEADP for consideration as part of the Scoping and Environmental Impact Assessment process.

The environmental management principles contained in Section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), have informed the assessment of the proposed Harmony Instream Dam and associated agricultural development. These principles serve as the foundation for environmental decision-making in South Africa and have been considered throughout the Environmental Impact Assessment process.

The key principles relevant to the proposed development are summarised below.

People and Their Needs

Environmental management must place people and their needs at the forefront of decision-making while serving their physical, psychological, developmental, cultural and social interests equitably. The proposed development is anticipated to contribute positively to rural economic activity, agricultural productivity, employment creation and the long-term sustainability of the Harmony Trust B-BBEE farming enterprise within the Koue Bokkeveld region.

Sustainable Development

Sustainable development requires the integration of social, economic and environmental factors into planning, implementation and decision-making processes. The proposed development has therefore been assessed in terms of its potential impacts on biodiversity, freshwater resources, agricultural land capability, heritage resources and socio-economic conditions. Mitigation measures and environmental management controls have been incorporated to minimise environmental impacts and promote long-term sustainability.

Waste Management and Pollution Prevention

The generation of waste and pollution associated with construction and operational activities will be minimised where feasible and managed in accordance with the Environmental Management Programme (EMPr) and applicable environmental legislation. Measures will be implemented to prevent pollution, soil degradation, erosion and contamination of water resources.

Responsible and Equitable Resource Use

Natural resources must be utilised in a responsible and equitable manner that considers the needs of present and future generations. The proposed development seeks to improve agricultural water security through the regulated storage and use of surplus winter runoff in accordance with the approved Water Use Licence (WUL No. 01/E21D/AB/9699) and associated operational controls.

Anticipation and Mitigation of Environmental Impacts

Potential environmental impacts associated with the proposed development have been identified and assessed through specialist investigations and the Environmental Impact Assessment process. Where impacts cannot be avoided entirely, mitigation measures have been identified to minimise, manage and rehabilitate affected areas where feasible.

Public Participation

The Environmental Impact Assessment process incorporates a transparent and inclusive public participation process in accordance with the EIA Regulations, 2014 (as amended). Interested and Affected Parties (I&APs), including organs of state, neighbouring landowners, stakeholders and members of the public, have been afforded the opportunity to review project information and submit comments throughout the assessment process.

Integrated Environmental Management

Environmental, social, technical and economic considerations have been integrated into the assessment of alternatives and the identification of the preferred development option. The assessment process seeks to identify a development alternative that is environmentally acceptable while remaining technically and economically feasible.

Holistic Consideration of Environmental Effects

The assessment has considered the potential effects of the proposed development on ecological systems, water resources, heritage resources, agricultural productivity and surrounding communities. Cumulative impacts and broader catchment-scale considerations have also been incorporated into the assessment process to support informed and balanced decision-making.

3.3 NATIONAL HERITAGE RESOURCES ACT

The protection and management of heritage resources in South Africa are governed by the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA). The South African Heritage Resources Agency (SAHRA) is the national authority responsible for heritage resource management. In the Western Cape, this function is administered by Heritage Western Cape (HWC), which serves as the relevant provincial heritage authority.

In terms of Section 38 of the NHRA, certain categories of development may trigger the requirement for heritage assessment. Section 38(8) further provides that where heritage impacts are assessed as part of an Environmental Impact Assessment (EIA) process, a separate standalone Heritage Impact Assessment (HIA) process is not required, provided that the heritage assessment included within the EIA is considered adequate by the relevant heritage authority.

The NHRA requires that the relevant heritage authority be notified of proposed developments that may impact heritage resources, including:

- Any development or activity that will change the character of a site exceeding 5 000 m² in extent.

The following provisions of the NHRA are also applicable to the proposed development:

- Section 34(1): No person may alter or demolish any structure or part of a structure older than 60 years without a permit issued by the relevant heritage authority;
- Section 35(4): No person may destroy, damage, excavate, alter or remove from its original position any archaeological or palaeontological material without a permit issued by the relevant heritage authority; and
- Section 36(3): No person may destroy, damage, alter, exhume or remove any grave or burial ground older than 60 years, situated outside a formal cemetery administered by a local authority, without a permit issued by the relevant heritage authority.

A Notice of Intent to Develop (NID) was submitted to Heritage Western Cape in terms of Section 38 of the NHRA. Heritage investigations undertaken for the proposed Harmony Instream Dam identified archaeological and rock art resources within the broader project area, including the recorded heritage sites HMY1, HMY2 and HMY3.

An Archaeological Impact Assessment (AIA) and subsequent heritage investigations have been undertaken as part of the Environmental Impact Assessment process. These investigations identified HMY1 and HMY2 as heritage resources of high local significance (Grade IIIA) and recommended the implementation of a 40–50 metre no-go buffer around these sites. These buffers have been incorporated into the preferred development layout to avoid direct impacts on the identified heritage resources.

The findings and recommendations of the heritage specialist studies have been incorporated into this Environmental Impact Report and have informed the refinement of the proposed development footprint and associated mitigation measures.

3.4 EIA GUIDELINE AND INFORMATION DOCUMENT SERIES

The following guidelines and information documents form part of the Western Cape Department of Environmental Affairs and Development Planning's (WCDEADP) Environmental Impact Assessment Guideline and Information Document Series (October 2011) and have informed the Scoping and Environmental Impact Assessment process for the proposed development:

- ✓ *Guideline on Transitional Arrangements;*
- ✓ *Guideline on Alternatives;*
- ✓ *Guideline on Public Participation;*
- ✓ *Guideline on Exemption Applications;*
- ✓ *Guideline on Appeals;*
- ✓ *Guideline on Need and Desirability;*
- ✓ *Information Document on the Interpretation of the Listed Activities; and*
- ✓ *Information Document on Generic Terms of Reference for Environmental Assessment Practitioners (EAPs) and Project Schedules.*

3.5 NATIONAL WATER ACT

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) provides the legislative framework for the protection, use, development, conservation, management and control of South Africa's water resources.

The Act promotes the sustainable and equitable use of water resources and establishes the principles of Integrated Water Resource Management (IWRM), recognising water as a scarce and valuable national resource that must be managed in the public interest.

In addition to the requirements of the National Environmental Management Act, 1998 (Act No. 107 of 1998) governing the Environmental Impact Assessment (EIA) process, the proposed development is subject to the requirements of the National Water Act. The Department of Water and Sanitation (DWS) is the competent authority responsible for the administration of the Act and associated water use authorisations.

On 27 January 2023, Harmony Trust was granted a Water Use Licence (WUL No. 01/E21D/AB/9699) by the Department of Water and Sanitation for water use activities within the Olifants–Doorn Water Management Area.

The Water Use Licence authorises water use activities associated with the construction and operation of the Toeka Dam and the Harmony Instream Dam, including the abstraction and storage of water for irrigation purposes. The licence authorises the abstraction of up to 715,000 m³ per annum from the Houdenberg River and up to 250,000 m³ per annum from an unnamed tributary of the Houdenberg River for storage within the authorised dams.

The authorised water uses include:

- Section 21(a): Taking water from a water resource;
- Section 21(b): Storing water;
- Section 21(c): Impeding or diverting the flow of water in a watercourse; and
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

The Water Use Licence regulates authorised abstraction volumes, operational requirements, monitoring obligations and environmental management measures to ensure compliance with sustainable water resource management principles and the protection of downstream water users and aquatic ecosystem functioning.

Water use and abstraction associated with the development are further regulated through the Koue Bokkeveld Water User Association under the authority of the Department of Water and Sanitation, providing a structured framework for compliance monitoring and reporting.

Copies of the relevant water use authorisations are included in Appendix 12.

3.6 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), forms part of the suite of environmental legislation enacted under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). Related legislation within the broader environmental management framework includes the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003), the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), the National Environmental Management: Integrated Coastal Management Act, 2008 (Act No. 24 of 2008), and the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008).

NEMBA provides the legislative framework for the conservation and management of South Africa's biodiversity, including the protection of ecosystems and species of conservation concern and the sustainable use of indigenous biological resources.

Chapter 4 of NEMBA deals with threatened or protected ecosystems and species, threatening processes, and restricted activities involving such ecosystems or species. Sections 52–57 provide mechanisms for the identification and listing of threatened ecosystems and species requiring national protection, as well as measures aimed at preventing biodiversity loss and promoting conservation management.

In terms of NEMBA, lists of Threatened Ecosystems and Threatened or Protected Species (TOPS) may be published and must be considered during environmental assessment processes where applicable.

The proposed Harmony Instream Dam and associated agricultural development occur within a landscape containing mapped biodiversity priority areas, including Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), as identified in the Western Cape Biodiversity Spatial Plan. The broader project area also contains vegetation types of conservation significance, including Winterhoek Sandstone Fynbos and areas associated with Critically Endangered Kouebokkeveld Alluvium Fynbos.

Specialist botanical and biodiversity assessments, together with a Site Sensitivity Verification, have been undertaken as part of the Environmental Impact Assessment process to evaluate the ecological condition of the site, identify biodiversity sensitivities, and assess the potential impacts of the proposed development on biodiversity resources. The findings of these specialist studies have informed the refinement of the development footprint, the assessment of alternatives, and the identification of mitigation and management measures incorporated into this Environmental Impact Report.

4. ALTERNATIVES

In accordance with the Environmental Impact Assessment Regulations, 2014 (as amended), reasonable and feasible alternatives associated with the proposed Harmony Instream Dam and associated agricultural development have been considered as part of the Scoping and Environmental Impact Assessment process. The consideration of alternatives included site alternatives, activity alternatives, layout alternatives and the no-go alternative.

4.1 SITE ALTERNATIVES FOR THE PROPOSED HARMONY DAM

The identification of suitable sites for the proposed Harmony Instream Dam was constrained by the physical characteristics of the land available to Harmony Trust, the location of the associated agricultural development area, and the engineering and hydrological requirements necessary to provide adequate irrigation water storage.

The associated agricultural development is located on the Remaining Extent of Farm Winkelhaak No. 224, which is owned by Harmony Trust. However, the property is characterised by relatively flat topography and does not contain a suitable natural basin capable of accommodating a dam with the required storage capacity. Consequently, the construction of a dam on the Remaining Extent of Farm Winkelhaak No. 224 was not considered technically feasible from either an engineering or hydrological perspective.

The selected dam site is therefore located on the neighbouring Remaining Extent of Farm Houdenberg No. 415, owned by Morester Estate (MHB Boerdery (Pty) Ltd), where suitable topographical, geological and hydrological conditions exist. The selected locality provides a favourable basin configuration, sufficient runoff yield, proximity to the proposed agricultural development area and access to existing farm infrastructure. The site also enables the lawful storage of authorised surplus winter high flows in accordance with Water Use Licence No. 01/E21D/AB/9699 to support irrigation requirements.

Alternative sites within the broader project area were considered during the planning and Environmental Impact Assessment process. However, these alternatives were either topographically unsuitable, hydrologically constrained, environmentally more sensitive, associated with greater impacts on freshwater resources, indigenous vegetation and heritage resources, or incapable of providing the required storage capacity in a technically, environmentally and economically feasible manner.

The selected site also enables the associated agricultural development to be integrated with the proposed water storage infrastructure while allowing the agricultural layout to be refined, as far as reasonably practicable, to avoid environmentally sensitive areas and utilise existing cultivated or previously transformed land where feasible.

Based on the alternatives assessment, informed by the engineering investigations and the findings of the botanical, freshwater, agricultural and heritage specialist assessments, no other reasonable or feasible site alternatives were identified that would provide a more appropriate balance between engineering feasibility, operational requirements, agricultural productivity and environmental protection. The selected site on the Remaining Extent of Farm Houdenberg No. 415 is therefore regarded as the preferred and most appropriate site alternative for the proposed Harmony Instream Dam.

4.2 ACTIVITY ALTERNATIVES

The proposed Harmony Instream Dam is intended to provide a reliable and sustainable irrigation water supply to support the associated agricultural development during periods of reduced runoff and seasonal water scarcity.

The need for additional water storage arises from the seasonal nature of water availability within the Koue Bokkeveld region, where runoff occurs predominantly during the winter rainfall season, while irrigation demand is greatest during the dry summer months. The proposed dam will enable the lawful storage of authorised surplus winter high flows for subsequent use during the irrigation season, thereby improving water security, irrigation reliability and the long-term resilience of the farming enterprise.

A range of activity alternatives was considered during the planning and Environmental Impact Assessment process. These included the No-Go Alternative, as well as alternative dam layouts, agricultural layouts and associated infrastructure configurations. The preferred development alternative was identified as the option that best balances water storage requirements, engineering feasibility, operational efficiency and environmental considerations while minimising potential impacts on identified environmental sensitivities.

The Agricultural Compliance Statement confirmed that the proposed agricultural development area is suitable for irrigated deciduous fruit production and that the availability of reliable irrigation water will improve agricultural productivity, water security and the long-term sustainability of the farming enterprise.

The proposed Harmony Instream Dam therefore represents the most feasible and practical means of storing authorised surplus winter high flows for subsequent use during the irrigation season, in accordance with Water Use Licence No. 01/E21D/AB/9699.

Without the proposed dam, the associated agricultural development would remain constrained by limited and variable water availability, reducing agricultural productivity, drought resilience and the long-term sustainability of the farming enterprise. The No-Go Alternative would therefore not achieve the primary objective of improving water security to support sustainable agricultural production and the continued development of the Harmony Trust 100% black-owned B-BBEE farming enterprise.

4.3 LAYOUT ALTERNATIVES

Several dam wall layout alternatives were considered during the conceptual engineering design and environmental assessment process to identify the most technically feasible, environmentally acceptable and operationally efficient configuration for the proposed Harmony Instream Dam.

Dam Layout Alternatives

Option 1 positioned the dam wall higher within the valley. This alternative would have resulted in a larger inundation footprint, greater loss of indigenous vegetation, increased impacts on freshwater features and a higher likelihood of affecting identified heritage resources, including rock art sites. It was therefore considered less favourable from both an environmental and heritage perspective.

Option 2 comprised a smaller dam wall alignment located further upstream. Although this option reduced certain environmental impacts, it did not provide sufficient storage capacity to satisfy the long-term irrigation requirements of the proposed agricultural development and was therefore not considered functionally or economically viable.

Option 4 incorporated an additional southern saddle wall to avoid identified heritage resources. Although this option reduced direct impacts on heritage features, it would have substantially increased the overall development footprint, construction complexity, earthworks and associated costs, while also resulting in greater disturbance of indigenous vegetation and freshwater habitats. Consequently, this alternative was considered environmentally and economically impractical.

Option 3 (Preferred Alternative) positions the dam wall lower within the valley and was identified as the preferred layout alternative. This option avoids direct impacts on identified heritage resources, ensures that the full supply level remains outside the established heritage buffer zones, reduces impacts on indigenous vegetation and freshwater features relative to the other layout alternatives, and provides sufficient storage capacity to support the proposed agricultural development.

Based on the findings of the engineering investigations, specialist assessments and environmental screening process, Option 3 was identified as the preferred layout alternative as it provides the most appropriate balance between engineering feasibility, operational efficiency, heritage avoidance, water storage requirements and reduced environmental disturbance.

The proposed Harmony Instream Dam will have a storage capacity of approximately 250 000 m³, a maximum wall height of approximately 12.8 m, a crest length of approximately 280 m, and an inundation area of approximately 5.4 ha at Full Supply Level (FSL).

Agricultural Development Layout

The associated agricultural development layout has been refined through the alternatives assessment process and informed by specialist investigations, environmental screening, agricultural suitability, engineering constraints and comments received during the public participation process.

The preferred agricultural layout comprises approximately 25 ha and has been designed, as far as reasonably practicable, to avoid environmentally sensitive areas while utilising existing cultivated or previously transformed land where feasible. The layout has also been refined to respond to biodiversity sensitivities, freshwater constraints, heritage considerations, agricultural suitability and existing farm infrastructure.

No permanent agricultural infrastructure is proposed within identified sensitive freshwater areas or heritage buffer zones. The proposed activities within the agricultural development area will primarily comprise orchard establishment, irrigation infrastructure, soil preparation and associated farm access tracks.

The Agricultural Compliance Statement confirmed that the proposed agricultural development is suitable for irrigated deciduous fruit production and that the availability of reliable irrigation water from the proposed dam will improve agricultural productivity, water security and the long-term sustainability of the farming enterprise.

The preferred agricultural layout therefore represents the most appropriate balance between agricultural productivity, engineering feasibility and environmental protection, while minimising potential impacts on identified environmental sensitivities.

4.4 NO-GO ALTERNATIVE

The No-Go Alternative refers to the option of not proceeding with the proposed Harmony Instream Dam and associated agricultural development.

Under the No-Go Alternative, the proposed irrigation water storage infrastructure would not be constructed, and the associated agricultural development would remain constrained by limited and variable water availability. Consequently, the long-term sustainability, resilience and productive potential of the farming enterprise would be reduced.

While the No-Go Alternative would avoid the direct environmental impacts associated with the construction and operation of the proposed Harmony Instream Dam and associated agricultural development, it would also result in the loss of the anticipated agricultural and socio-economic benefits associated with the project. These include improved agricultural productivity, enhanced drought resilience, increased water security, long-term irrigation reliability, employment creation, local economic benefits and support for the continued growth of the 100% black-owned B-BBEE agricultural enterprise.

The Agricultural Compliance Statement confirmed that the proposed agricultural development is suitable for irrigated deciduous fruit production and that the availability of reliable irrigation water would improve agricultural productivity, water security and the long-term sustainability of the farming enterprise. These benefits would not be realised under the No-Go Alternative.

The No-Go Alternative would also result in the continued underutilisation of the lawful water storage opportunity authorised under Water Use Licence No. 01/E21D/AB/9699, which provides for the regulated storage and use of surplus winter flows to support agricultural production.

Although the No-Go Alternative would avoid direct impacts on freshwater resources, indigenous vegetation, heritage resources and the surrounding landscape associated with the proposed development, it would not address the identified need for improved water security to support sustainable agricultural production within the Koue Bokkeveld region.

Based on the engineering investigations, specialist assessments and the findings of this Environmental Impact Assessment, the No-Go Alternative has not been identified as the preferred alternative, as it would not achieve the primary objectives of the proposed development or realise the long-term agricultural, socio-economic and water security benefits associated with the project.

4.5 CONCLUSION

The assessment of alternatives for the proposed Harmony Instream Dam and associated agricultural development has demonstrated that the preferred development alternative represents the most technically feasible, operationally efficient and environmentally acceptable option within the constraints of the site and the surrounding catchment.

Site alternatives were limited by the absence of suitable topographic, hydrological and engineering conditions on the Remaining Extent of Farm Winkelhaak No. 224, where the associated agricultural development is proposed. The selected dam site on the Remaining Extent of Farm Houdenberg No. 415 provides favourable engineering characteristics, suitable hydrological conditions, adequate runoff yield and effective integration with the associated agricultural development.

Alternative dam layouts, agricultural layouts and associated infrastructure configurations were assessed throughout the planning and Environmental Impact Assessment process. The preferred dam and agricultural layouts were progressively refined through engineering investigations, environmental screening, specialist assessments and the consideration of comments received during the public participation process to avoid or minimise environmental impacts, where reasonably practicable.

The preferred dam layout (**Option 3**) was selected following consideration of engineering feasibility, water storage requirements, biodiversity sensitivities, freshwater constraints, agricultural requirements and heritage resources. The preferred layout avoids direct impacts on identified heritage resources, maintains the recommended heritage buffer zones, reduces impacts on indigenous vegetation and freshwater features relative to the other layout alternatives considered, and provides sufficient storage capacity to support the proposed agricultural development.

The preferred agricultural layout has similarly been refined to utilise existing cultivated or previously transformed land where feasible, while avoiding environmentally sensitive areas as far as reasonably practicable. The layout has been informed by biodiversity, freshwater, heritage and agricultural specialist input, as well as engineering constraints. The Agricultural Compliance Statement confirmed that the proposed agricultural development is suitable for irrigated deciduous fruit production and that the availability of reliable irrigation water will improve agricultural productivity, water security and the long-term sustainability of the farming enterprise.

The No-Go Alternative would avoid the direct environmental impacts associated with the construction and operation of the proposed development. However, it would not achieve the identified project objectives and would result in the loss of the anticipated agricultural, socio-economic and water security benefits associated with the project, including improved irrigation reliability, enhanced agricultural productivity, increased drought resilience, employment opportunities and support for the continued growth of the Harmony Trust 100% black-owned B-BBEE farming enterprise.

Based on the engineering investigations, specialist assessments and the findings of this Environmental Impact Assessment, the preferred development alternative is considered to provide the most appropriate balance between environmental protection, engineering feasibility, agricultural productivity and socio-economic benefit. It is therefore regarded as the preferred alternative and is considered suitable for decision-making by the competent authority as part of the Environmental Impact Assessment process.

5. SITE DESCRIPTION

5.1 LOCATION

The proposed Harmony Instream Dam is located on the Remaining Extent of Farm Houdenberg No. 415, near Op-die-Berg within the Witzenberg Local Municipality, Cape Winelands District Municipality, Western Cape Province. The associated agricultural development area is located on the Remaining Extent of Farm Winkelhaak No. 224 and is intended to support the agricultural operations of Harmony Trust.

The dam site is situated within the Koue Bokkeveld region and falls within the Houdenberg River catchment (Quaternary Catchment E21D) of the Olifants–Doorn Water Management Area.

The approximate central coordinates of the proposed Harmony Instream Dam are 32°59'47.00" S and 19°27'50.00" E.

Access to the site is obtained via the R303, with the proposed dam location accessed by means of existing internal farm roads, requiring only limited upgrading where necessary. The associated agricultural development area has been planned in conjunction with the proposed dam to optimise irrigation efficiency while avoiding environmentally sensitive areas as far as reasonably practicable.

The preferred development layout has been informed by engineering investigations, specialist assessments and the alternatives assessment process. The layout has been refined to avoid or minimise impacts on freshwater resources, indigenous vegetation, heritage resources and other identified environmental sensitivities where reasonably practicable, while maintaining the operational requirements and objectives of the proposed development.

(see Figure 1 and **Appendix 1**).

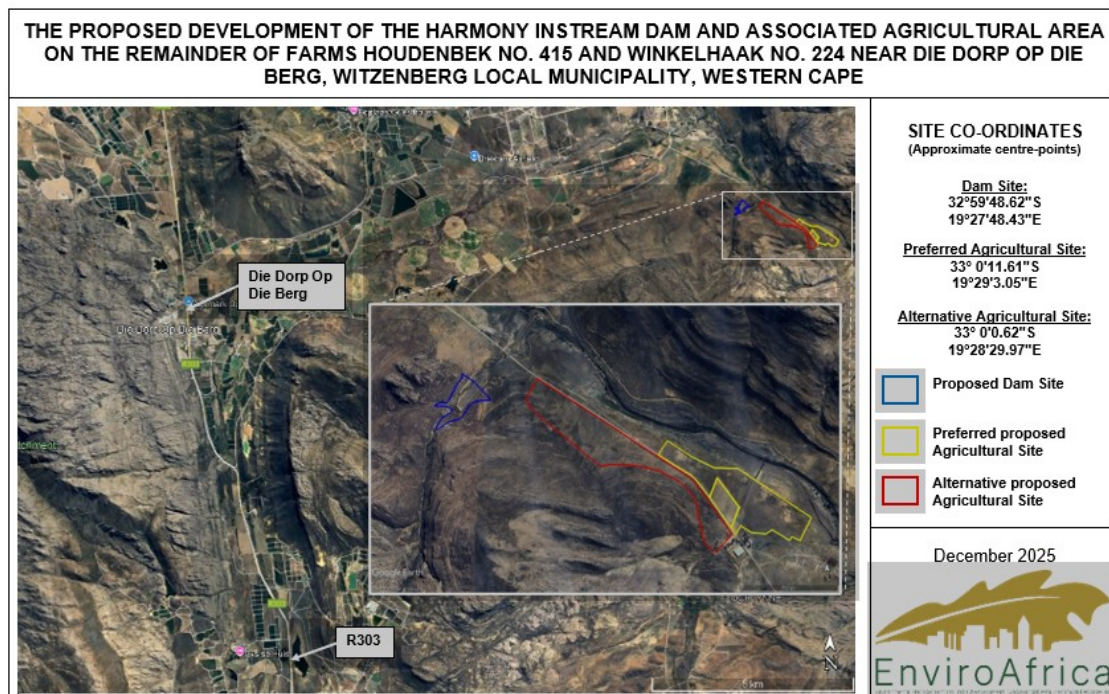


Figure 5: Google Earth image showing the locality of the proposed Harmony Dam.



Figure 6: Proposed Agricultural Area site.



Figure 7: Proposed Dam Area site

5.2 VEGETATION

Vegetation mapping obtained from CapeFarmMapper and the Western Cape Biodiversity Spatial Plan, together with the findings of the specialist botanical assessment, confirmed that the proposed Harmony Instream Dam footprint occurs predominantly within Winterhoek Sandstone Fynbos, with smaller areas of Kouebokkeveld Alluvium Fynbos occurring within the broader project area.

In terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) and the National List of Ecosystems that are Threatened and in Need of Protection (Government Gazette No. 47526 of 2022), Kouebokkeveld Alluvium Fynbos is classified as Critically Endangered. Both vegetation types are considered to be of high ecological value and contribute to the biodiversity importance of the Kouebokkeveld landscape.

A specialist botanical assessment was undertaken as part of the Environmental Impact Assessment process to verify the vegetation communities present within the project area, assess their ecological condition and identify areas of environmental sensitivity. The assessment confirmed the presence of indigenous vegetation within portions of the proposed dam footprint and broader project area, including areas of relatively intact fynbos vegetation.

The findings of the botanical assessment informed the refinement of both the proposed dam layout and the associated agricultural development layout. Alternative layouts were considered to reduce impacts on higher sensitivity vegetation, minimise the loss and fragmentation of indigenous vegetation, and avoid unnecessary disturbance where reasonably practicable. The preferred development layout was identified as the option that provides the most appropriate balance between engineering feasibility, operational requirements and ecological considerations.

Although the proposed development will result in the permanent loss of indigenous vegetation within the dam footprint and associated infrastructure areas, the extent and significance of these impacts have been comprehensively assessed through the specialist botanical assessment. Appropriate mitigation and management measures have been incorporated into the Environmental Impact Assessment and Environmental Management Programme (EMPr) to minimise residual impacts as far as reasonably practicable.

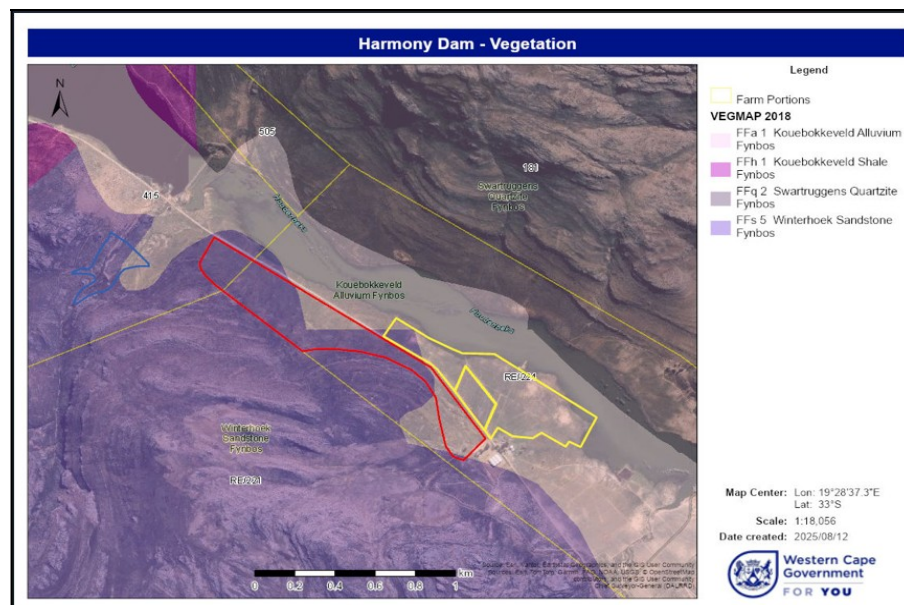


Figure 8: SANBI Vegetation map of the area (CapeFarmMapper).

5.3.1 Critical Biodiversity Areas and Ecological Support Areas

According to the CapeFarmMapper biodiversity overlay and the Western Cape Biodiversity Spatial Plan (WCBSP), the proposed Harmony Instream Dam footprint is located within a mapped Critical Biodiversity Area (CBA) and intersects an Ecological Support Area (ESA) Category 1: Aquatic.

Critical Biodiversity Areas (CBAs) are areas required to meet biodiversity conservation targets and are intended to be maintained in a natural or near-natural state to support biodiversity patterns and ecological processes. Transformation within these areas should be avoided where possible and only considered where biodiversity objectives can be maintained.

Ecological Support Areas (ESAs), although not required to meet biodiversity targets directly, are important for maintaining the ecological functioning of adjacent CBAs, supporting landscape connectivity and sustaining ecosystem services such as water regulation, sediment control and habitat connectivity. The management objective for ESA Category 1 areas is to maintain ecological functionality in a near-natural state, with only limited and appropriately managed disturbance where ecological functioning is not compromised.

The proposed Harmony Instream Dam is also located within the Koue Bokkeveld Mountain Catchment Area, proclaimed in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970). This designation recognises the hydrological and ecological importance of the catchment and requires careful consideration of potential impacts on catchment integrity, downstream flow regimes, water resources and biodiversity.

Although development within a proclaimed Mountain Catchment Area is not prohibited, it requires that potential impacts be appropriately assessed, justified and managed in accordance with the applicable environmental and water resource legislation.

The botanical, freshwater and agricultural specialist assessments undertaken as part of the Environmental Impact Assessment considered the implications of the site's CBA, ESA and Mountain Catchment Area status. These assessments informed the refinement of the preferred development layout, the evaluation of alternatives and the identification of mitigation measures aimed at avoiding or minimising impacts on biodiversity features, ecological processes and catchment functioning where reasonably practicable.

The specialist assessments concluded that, although the proposed development will result in unavoidable impacts on biodiversity features within the project area, the preferred development layout represents the most environmentally acceptable and technically feasible alternative. Appropriate mitigation, rehabilitation and monitoring measures have been incorporated into the Environmental Management Programme (EMPr) to minimise residual impacts and support the long-term ecological functioning and integrity of the receiving environment.

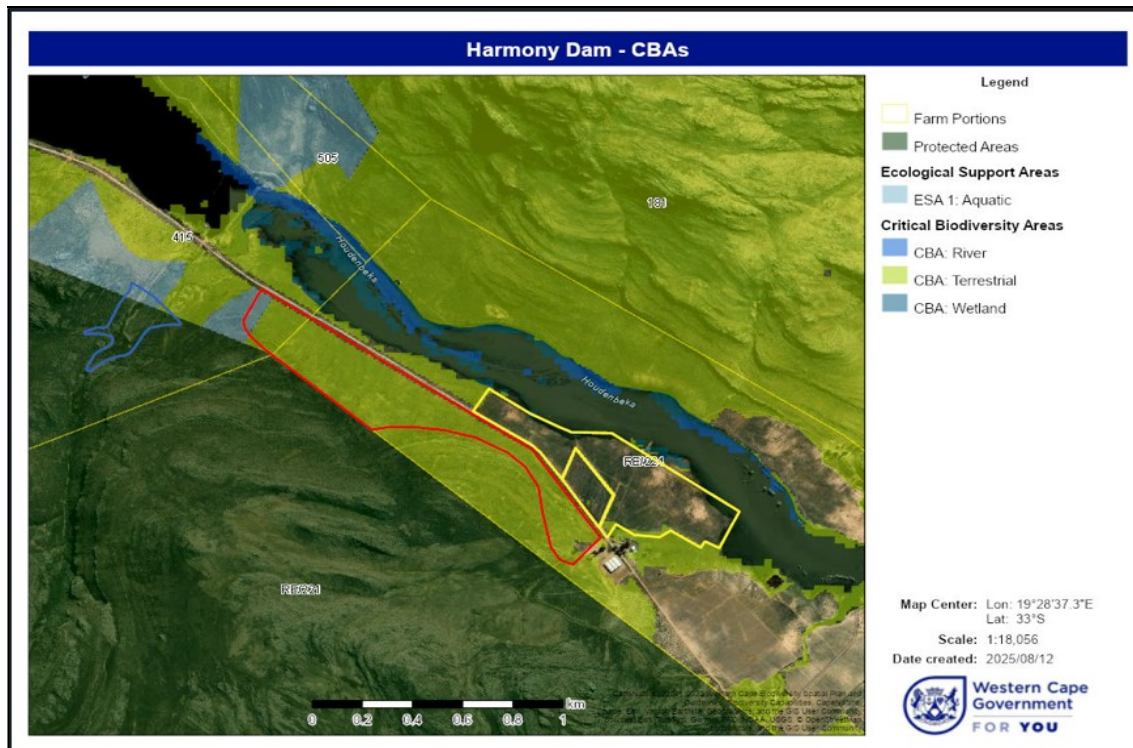


Figure 9: CBAs & SANBI Red List of Ecosystems - Remnants (CapeFarmMapper).

A Botanical assessment was conducted (**Appendix 8A**), and findings are discussed in Section 10 of the EIR.

5.4 FRESHWATER

The proposed Harmony Instream Dam and associated agricultural development are located within the Houdenbek River catchment, which forms part of the upper Doring River system within the Olifants–Doorn Water Management Area. The project area is situated within the Koue Bokkeveld Mountain Catchment Area and includes the Houdenbek River, ephemeral drainage features and associated riparian habitats.

A Freshwater Assessment was undertaken as part of the Environmental Impact Assessment process to evaluate the ecological condition, sensitivity and functioning of the freshwater features associated with the proposed development. The assessment considered the proposed dam, the associated agricultural development on the Remaining Extent of Farm Winkelhaak No. 224, the Houdenbek River and associated drainage features, and the potential effects of the development on downstream freshwater ecosystems.

The assessment confirmed that the drainage features associated with the agricultural development function primarily as ephemeral runoff channels that convey stormwater during rainfall events. These features have been influenced by historical agricultural activities and associated infrastructure and generally exhibit limited aquatic ecological sensitivity. The Houdenbek River has also been influenced by historical agricultural development and lawful water resource utilisation and is considered to represent a modified freshwater system.

Potential freshwater impacts associated with the proposed development include:

- Disturbance of freshwater habitats during construction of the proposed dam and associated infrastructure;

- Disturbance of ephemeral drainage features during orchard establishment;
- Alteration of local surface-water runoff patterns and sediment transport processes;
- Increased erosion and sedimentation during construction activities;
- Potential impacts on downstream water quality and freshwater ecological functioning; and
- Cumulative impacts associated with existing agricultural land use and water resource development within the broader catchment.

The Freshwater Assessment concluded that these impacts can be reduced to acceptable levels through the implementation of appropriate mitigation and management measures. Key mitigation measures include:

- Compliance with all conditions of Water Use Licence No. 01/E21D/AB/9699, including the maintenance of environmental flow requirements;
- Implementation of erosion and sediment control measures throughout the construction phase;
- Appropriate stormwater management and irrigation system design;
- Maintenance of downstream drainage connectivity and natural hydrological functioning where reasonably practicable;
- Protection of water quality through appropriate construction and operational management measures;
- Rehabilitation of disturbed riparian and freshwater areas following construction; and
- Ongoing environmental monitoring and implementation of the Environmental Management Programme (EMPr).

The findings of the Freshwater Assessment informed the refinement of the preferred development layout, the assessment of alternatives and the development of mitigation measures incorporated into this Environmental Impact Assessment Report and the Environmental Management Programme (EMPr). The preferred development alternative was selected to minimise impacts on freshwater resources while achieving the project objectives and maintaining compliance with the applicable water resource management requirements.

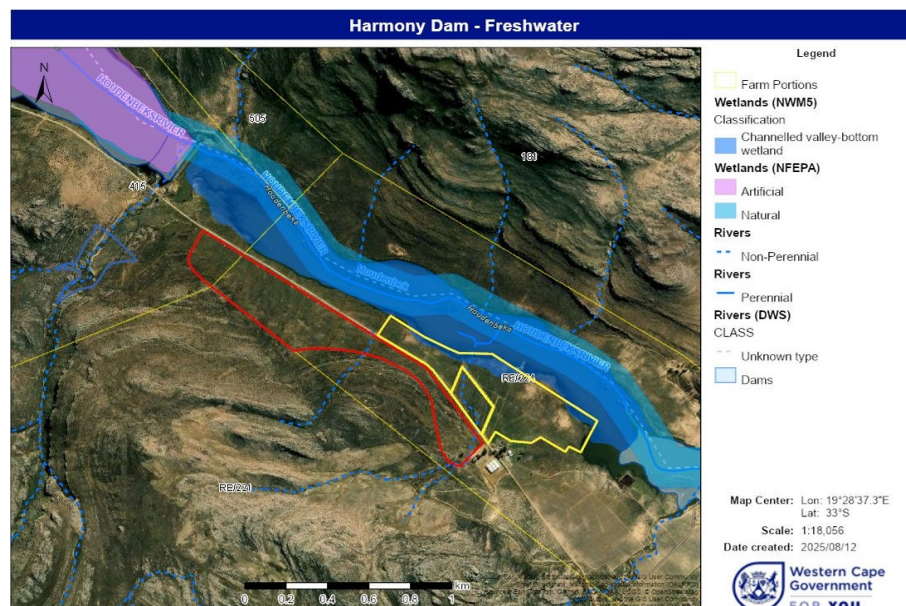


Figure 10: CapeFarmMapper map of the water resources in the area.

A Freshwater Impact Assessment has been undertaken (**Appendix 8C**), and the findings are discussed in Section 10 of the EIR.

5.5 CLIMATE

The proposed development area is located within the Koue Bokkeveld region near Op-die-Berg, which experiences a Mediterranean-type climate characterised by cool, wet winters and warm, dry summers. Rainfall occurs predominantly during the winter months and is strongly influenced by frontal weather systems associated with the Western Cape winter rainfall region.

The average annual temperature within the Op-die-Berg area is approximately 13.5°C, while the average annual rainfall is approximately 432 mm. January is typically the warmest and driest month, with average temperatures of approximately 19.8°C and average rainfall of approximately 6 mm. July is generally the coldest month, with average temperatures of approximately 7.6°C, while May typically records the highest average monthly rainfall of approximately 79 mm.

The Koue Bokkeveld region is characterised by considerable inter-annual climatic variability, particularly in relation to rainfall, runoff and streamflow. Periodic droughts, below-average winter rainfall and increasing climate variability have affected agricultural production and water availability within the region over recent decades.

Climate information for the project area was obtained from Meteoblue climate datasets for the Op-die-Berg area. These datasets are based on long-term weather model simulations and provide an indication of regional climatic conditions, including temperature, rainfall, wind patterns and seasonal variability.

The proposed Harmony Instream Dam is intended to improve agricultural resilience to climate variability by providing the lawful storage of authorised surplus winter high flows for subsequent use during the irrigation season. The development will improve the reliability of irrigation water supply during periods of reduced runoff while supporting the long-term sustainability of the associated agricultural development.

Potential climate-related risks associated with the proposed development include increased evaporation losses from the storage dam, reduced inflows during prolonged drought periods, and the cumulative effects of climate variability and climate change on regional water availability. These risks have been considered during the engineering design process and through the operational management framework applicable to the proposed development.

The proposed development is therefore intended to enhance water security and agricultural resilience within the Koue Bokkeveld region while operating within the abstraction limits, operational controls and environmental requirements prescribed by Water Use Licence No. 01/E21D/AB/9699.

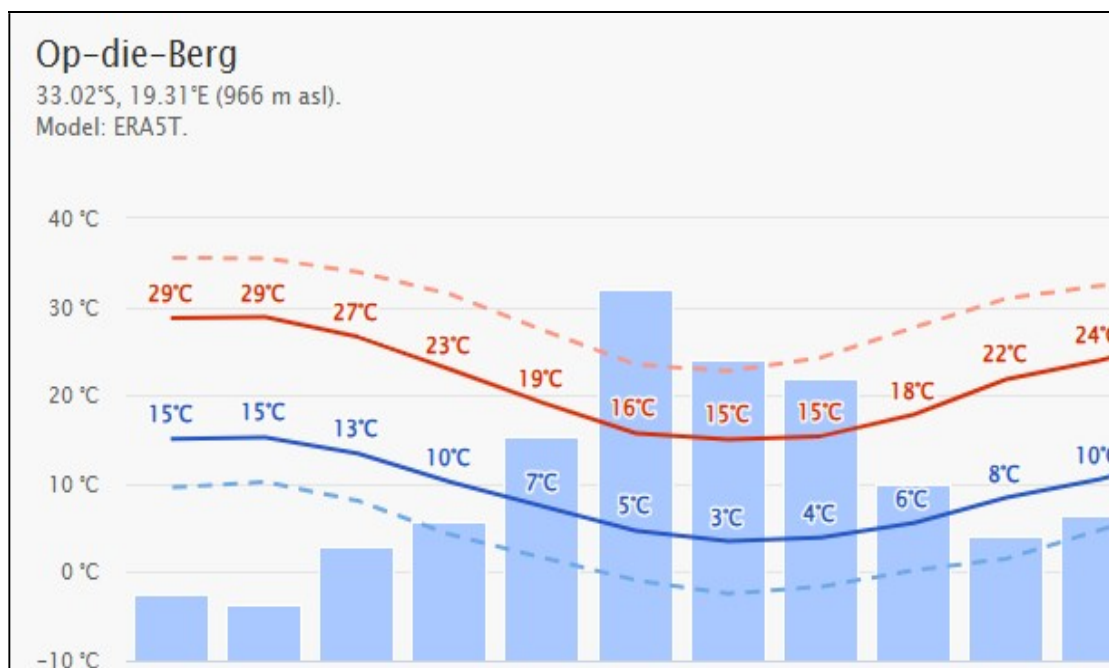


Figure 11: Meteoblue¹ - Simulated historical climate & weather data for the Op-die-Berg area

5.6 SOCIO-ECONOMIC CONTEXT

The Cape Winelands District Municipality, within the Western Cape Province, is recognised for its strong agricultural economy and strategic focus on sustainable rural development. Agriculture remains a key economic sector within the district and contributes significantly to employment, agro-processing, exports and regional economic growth.

The Cape Winelands District Municipality Integrated Development Plan (IDP) and associated strategic planning documents place emphasis on strengthening the agricultural sector, improving infrastructure, promoting sustainable natural resource management and supporting inclusive socio-economic development. Particular focus is placed on rural livelihood enhancement, employment creation, economic resilience and expanding opportunities for historically disadvantaged communities.

The proposed Harmony Instream Dam and associated agricultural development are consistent with these regional development objectives by supporting agricultural productivity, improving irrigation water security and strengthening the long-term sustainability of farming activities within the Koue Bokkeveld region.

The Witzenberg Local Municipality is characterised by an economy that is strongly dependent on agriculture, particularly deciduous fruit production, viticulture, agri-processing and related agricultural support services. Agriculture remains a significant contributor to employment, household income and economic activity within the municipal area.

The Witzenberg Local Municipality's development strategies similarly promote sustainable agricultural development, investment in supporting infrastructure, responsible natural resource management and broad-

¹ https://www.meteoblue.com/en/weather/historyclimate/climatemodelled/frere_south-africa_1003654

based economic participation. The provision of reliable water infrastructure is recognised as an important component of maintaining agricultural productivity and improving resilience to climatic variability.

The proposed development by Harmony Trust is considered compatible with these municipal development objectives. The project has the potential to contribute positively to the local economy through:

- Expansion of irrigated deciduous fruit production;
- Improved long-term irrigation water security;
- Employment opportunities during the construction and operational phases;
- Support for local contractors, suppliers and agricultural value chains; and
- The continued growth and sustainability of a 100% black-owned B-BBEE agricultural enterprise.

The proposed agricultural development forms part of Harmony Trust's broader agricultural growth strategy and supports regional objectives relating to agricultural transformation, rural economic development and the sustainable use of agricultural land within the Koue Bokkeveld region.

The Agricultural Compliance Statement concluded that the proposed development is suitable for irrigated deciduous fruit production and that improved irrigation water security will enhance agricultural productivity and contribute to the long-term sustainability of the farming enterprise. Subject to the implementation of the recommended mitigation and management measures, the proposed development is expected to generate positive socio-economic benefits through increased agricultural production, sustained employment opportunities and continued support for the local agricultural economy.

5.7 HERITAGE FEATURES

In terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), heritage resources include archaeological, palaeontological, historical, cultural and landscape resources of heritage significance. Due to the nature and scale of the proposed development, a Heritage Impact Assessment (HIA) and Palaeontological Impact Assessment (PIA) were undertaken as part of the Environmental Impact Assessment (EIA) process to assess the potential impacts of the proposed Harmony Instream Dam and associated agricultural development on heritage resources.

A Notice of Intent to Develop (NID) was submitted to Heritage Western Cape (HWC) in terms of Section 38 of the NHRA. Heritage Western Cape confirmed that the proposed development triggered the provisions of Section 38 of the NHRA and required that both a Heritage Impact Assessment and a Palaeontological Impact Assessment be undertaken by suitably qualified specialists.

The Heritage Impact Assessment undertaken by ACRM (Kaplan, 2026) identified no archaeological resources of medium or high significance within the proposed development footprint that would preclude the development. A small scatter of isolated Earlier Stone Age (ESA) artefacts was recorded within portions of the broader agricultural area; however, these artefacts occur within a previously disturbed agricultural context, are not associated with intact archaeological deposits, and were assessed as being of low archaeological significance and Not Conservation Worthy (NCW). No archaeological mitigation is therefore required for these isolated finds.

The Heritage Impact Assessment confirmed that the most significant heritage resources associated with the project comprise two previously recorded rock art sites (HMY1 and HMY2) located outside the proposed development footprint. Both sites are situated approximately 50–100 m beyond the Full Supply Level (FSL) of the proposed dam and will not be directly affected or inundated by the proposed development. To ensure their continued protection, a minimum 50 m No-Go buffer shall be maintained around both rock art sites throughout all phases of the project. These areas shall be clearly demarcated prior to the commencement of

construction, and no construction activities, material stockpiling, vehicle access or personnel shall be permitted within the protected buffer areas.

The Heritage Impact Assessment further identified an abandoned labourer's cottage of low local heritage significance (Grade IIIC). As this structure will not be directly affected by the proposed development, no mitigation measures are required.

A Heritage Agreement, in terms of Section 42 of the National Heritage Resources Act, shall be concluded between the landowner and Heritage Western Cape for the long-term protection and management of the recorded rock art sites, in accordance with the recommendations of the Heritage Impact Assessment.

The Palaeontological Impact Assessment (Bamford, 2024) assessed the project area as occurring within geological formations that are mapped as having high palaeontological sensitivity on the SAHRIS palaeosensitivity map. However, the specialist concluded that the proposed development footprint has been substantially disturbed by historical agricultural activities, soil cultivation and weathering, significantly reducing the likelihood of encountering palaeontological resources within the disturbed surface layers.

Although the probability of encountering fossils during construction is considered low, there remains a small possibility that fossil material may occur within previously undisturbed subsurface geological formations encountered during excavation. Accordingly, a Fossil Chance Find Protocol shall be implemented throughout the construction phase. Should any fossil material or previously unidentified archaeological resources be uncovered during construction, all work within the immediate vicinity of the discovery shall cease immediately, the Environmental Control Officer (ECO) shall be notified, and Heritage Western Cape shall be consulted before work resumes.

Table 1: Palaeontological sensitivity rating

Colour	Sensitivity	Required action
Red	Very High	Field assessment and a Fossil Chance Find Protocol are required.
Orange / Yellow	High	A desktop study is required and, depending on the outcome, a field assessment may be required.
Green	Moderate	A desktop study is required.
Blue	Low	No palaeontological studies are required; however, a Fossil Chance Find Protocol is required.
Grey	Insignificant / Zero	No palaeontological studies are required.
White / Clear	Unknown	A minimum desktop study is required. As additional information becomes available, the SAHRIS palaeosensitivity map will be updated accordingly.

SAHRIS palaeosensitivity map indicating the proposed Harmony Instream Dam on the Remaining Extent of Farm Houdenbek No. 415 (blue outline) and the associated agricultural development on the Remaining Extent of Farm Winkelhaak No. 224 (yellow outline). The background colours indicate the relative palaeontological sensitivity of the underlying geology, where red indicates very high sensitivity, orange/yellow indicates high sensitivity, green indicates moderate sensitivity, blue indicates low sensitivity, and grey indicates insignificant or zero sensitivity (*Source: Bamford, 2024*).

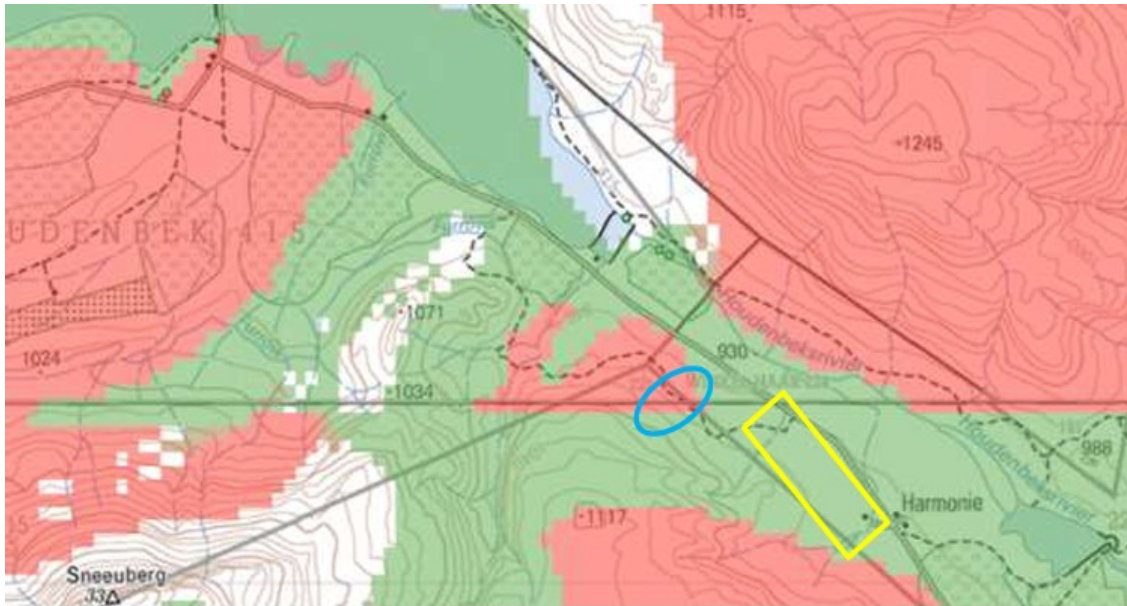


Figure 5: Palaeontological sensitivity map: SAHRIS palaeosensitivity map for the site for the proposed Harmony dam (blue outline) and agricultural fields (yellow outline) on Farm Houdenbek 415. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = moderate; blue = low; grey = insignificant/zero.

No graves or formal burial grounds were identified within the footprint of the proposed Harmony Instream Dam or the associated agricultural development area. The Heritage Impact Assessment also confirmed that no buildings or structures of medium or high heritage significance will be directly affected by the proposed development. An abandoned labourer's cottage of low local heritage significance (Grade IIIC) was identified within the broader study area; however, it lies outside the development footprint and will not be impacted by the proposed works.

The most significant heritage resources associated with the project comprise two previously recorded rock art sites (HMY1 and HMY2) situated approximately 50–100 m beyond the Full Supply Level (FSL) of the proposed dam. These sites fall outside the development footprint and will not be directly affected, provided that the recommended 50 m No-Go buffer is maintained throughout all phases of the project.

The broader cultural landscape is characterised predominantly by long-established agricultural land uses, including deciduous fruit orchards, cultivated fields, farm roads, irrigation infrastructure, farmsteads and associated agricultural activities, reflecting the historic agricultural character of the Koue Bokkeveld region.

The Houdenbek River corridor and the surrounding mountain landscape contribute to the scenic and cultural character of the area. As the proposed development has been refined to avoid direct impacts on identified heritage resources and incorporates the recommended heritage mitigation measures, it is not expected to result in a significant adverse impact on the cultural landscape or rural sense of place.

6. PROCESS TO DATE

This section outlines the Environmental Impact Assessment (EIA) process undertaken for the proposed Harmony Instream Dam and associated agricultural development. It includes a summary of the activities completed during the Scoping Phase and Environmental Impact Assessment (EIA) Phase, the specialist investigations undertaken, the members of the project team involved in the assessment process, and the Public Participation Process conducted in accordance with the Environmental Impact Assessment Regulations, 2014 (as amended).

The section further provides an overview of the comments received from Interested and Affected Parties (I&APs), commenting authorities and Organs of State, and describes how these comments have informed the assessment process, specialist investigations, project design and identification of mitigation measures. (as amended).

6.1 TASKS UNDERTAKEN TO DATE

Table 3: Tasks undertaken in the EIA to date.

DATE	TASK
SCOPING PHASE	
08 August – 13 September 2024	Initial public participation process, including newspaper advertisements, site notices, notification letters and registration of Interested and Affected Parties (I&APs).
18 November 2024	Submission of the Notice of Intent (NOI) to the Western Cape Department of Environmental Affairs and Development Planning (WCDEA&DP).
15 May – 19 June 2025	Distribution of notifications regarding the availability of the Pre-Application Draft Scoping Report and commencement of a 30-day public review and comment period.
November 2025	Submission of the NEMA Application Form to WCDEA&DP.
November 2025	Acknowledgement of receipt of the NEMA Application by WCDEA&DP.
26 February – 31 March 2026	Distribution of notifications regarding the availability of the Draft Scoping Report and commencement of a 30-day public review and comment period.
April 2026	Compilation of the Final Scoping Report, Plan of Study for EIA and Comments and Responses Report.
April 2026	Submission of the Final Scoping Report and Plan of Study for EIA to WCDEA&DP.
May 2026	Acceptance of the Final Scoping Report and Plan of Study for EIA by WCDEA&DP.
ENVIRONMENTAL IMPACT ASSESSMENT PHASE (CURRENT PHASE)	
May – July 2026	Specialist investigations were undertaken and an Environmental Impact Assessment process was

	conducted.
June – July 2026	Compilation of the Draft Environmental Impact Report (EIR) and Environmental Management Programme (EMPr).
July – August 2026	Draft Environmental Impact Report (EIR) and Environmental Management Programme (EMPr) made available to Registered Interested and Affected Parties, Organs of State and commenting authorities for a 30-day review and comment period.
August – September 2026	Compilation of the Final Environmental Impact Report, EMPr and Comments and Responses Report.
September 2026	Submission of the Final Environmental Impact Report and EMPr to WCDEADP for decision-making.

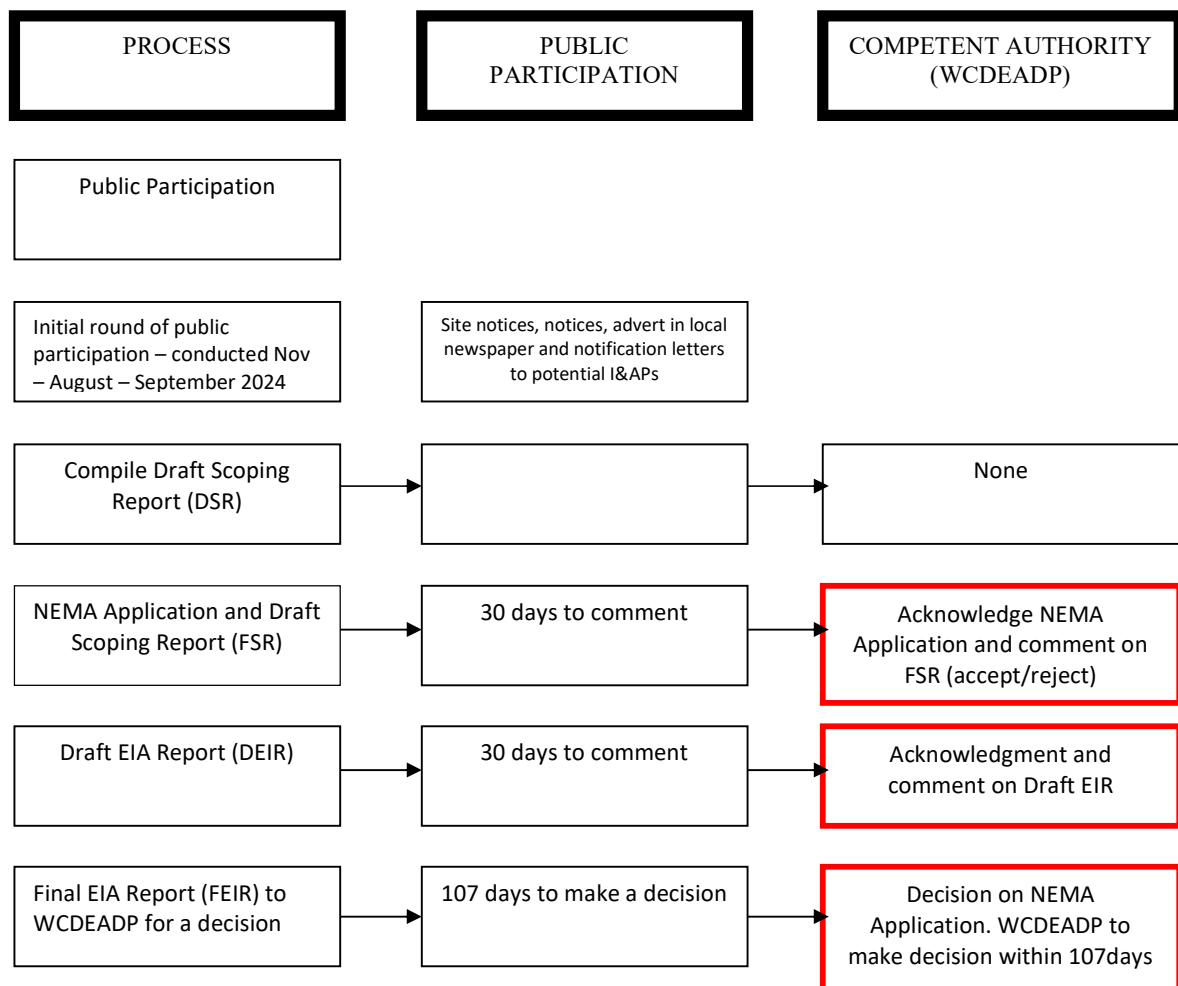


Figure 13. Summary of the EIA process and public participation process. The red indicates the stages where the competent authority will be consulted during the process.

6.2 TASKS TO BE UNDERTAKEN DURING THE EIA PHASE

The following activities form part of the Environmental Impact Assessment (EIA) phase of the process:

- Compilation of the Draft Environmental Impact Report (EIR) (this document) based on the findings of the specialist studies and the Environmental Impact Assessment process;
- Making the Draft EIR and Environmental Management Programme (EMPr) available for public review and comment;
- Notification of Registered Interested and Affected Parties (I&APs), Organs of State and commenting authorities regarding the availability of the Draft EIR and EMPr;
- Receipt and consideration of comments received on the Draft EIR and EMPr;
- Incorporation of comments and responses into the Final Environmental Impact Report (EIR), Environmental Management Programme (EMPr) and Comments and Responses Report (CRR);
- Finalisation of the Environmental Management Programme (EMPr); and
- Submission of the Final EIR, EMPr and associated appendices to WCDEA&DP for consideration and decision-making.

Interested and Affected Parties will be afforded an opportunity to review and comment on the Draft Environmental Impact Report and Environmental Management Programme during the prescribed 30-day public participation period in accordance with the EIA Regulations, 2014 (as amended).

The Draft EIR and EMPr will also be made available to relevant Organs of State and commenting authorities for review and comment in accordance with Section 24O of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

Where necessary, meetings or further engagement with key stakeholders, Organs of State and commenting authorities may be undertaken to address issues raised during the public participation process.

At the end of the public review period, the Draft EIR and EMPr will be revised where necessary in response to comments received from Interested and Affected Parties, commenting authorities and Organs of State. All comments received, together with responses thereto, will be incorporated into the Final Environmental Impact Report, Environmental Management Programme and Comments and Responses Report.

Correspondence with Interested and Affected Parties will be undertaken via appropriate communication channels, including email, telephone communication, written correspondence and, where applicable, newspaper advertisements.

Should amendments to the assessment process become necessary as a result of comments received or requirements raised by commenting authorities or Organs of State, WCDEA&DP will be informed accordingly.

6.3 PROFESSIONAL TEAM

The following professionals are part of the project team.

Table 4: Members of the professional team

DISCIPLINE	SPECIALIST	ORGANISATION
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Environmental Consultants	Bianca Gilfillan	EnviroAfrica cc
Dam Engineers	Lizbe Bester	Sarel Bester Ingenieurs BK
Water Use Licence Application	Lizbé Bester	Sarel Bester Ingenieurs BK
Botanist	Dr David McDonald	Bergwind Botanical Surveys and Tours
Heritage	Jonathan Kaplan	Agency for Cultural Resource Management
Freshwater	Dirk van Driel	WATSAN Africa
Hydrological and EWR Assessment	Howard Hydrology / DWS Reserve Determination Process	Howard Consulting / Department of Water and Sanitation

6.4 PUBLIC PARTICIPATION

A Public Participation Process (PPP) was undertaken in accordance with the requirements of the National Environmental Management Act, 1998 (Act No. 107 of 1998), the Environmental Impact Assessment Regulations, 2014 (as amended), and the Western Cape Department of Environmental Affairs and Development Planning (WCDEA&DP) Guideline on Public Participation (2011).

Interested and Affected Parties (I&APs) were identified throughout the environmental assessment process. Adjacent landowners, relevant Organs of State, conservation organisations, ward councillors, and representatives of the local and district municipalities were included in the project database. A complete list of registered Interested and Affected Parties is included in Appendix 4D.

Public participation for the proposed Harmony Instream Dam and associated agricultural development was undertaken in accordance with the requirements of Regulations 41, 42, 43 and 44 of the NEMA EIA Regulations, 2014 (as amended). The Public Participation Process undertaken during the Scoping Phase included notification of Interested and Affected Parties, distribution of project information, placement of site notices, circulation of reports for public review, and the opportunity to submit written comments.

The issues and concerns raised during the Scoping Phase were captured in the Scoping Phase Comments and Responses Report and have been considered in the preparation of this Environmental Impact Report (EIR) and Environmental Management Programme (EMPr).

In accordance with the EIA Regulations, registered Interested and Affected Parties, commenting authorities and relevant Organs of State are being afforded an opportunity to review and comment on the Draft Environmental Impact Report and Environmental Management Programme during the prescribed 30-day public participation period. Relevant Organs of State have also been consulted in accordance with the requirements of Section 24O of NEMA.

The Public Participation Process remains ongoing and will continue throughout the EIA phase to ensure that all relevant stakeholders are provided with a reasonable opportunity to participate in the environmental assessment process. Comments received during the review period will be captured in the Environmental

Impact Assessment Phase Comments and Responses Report and incorporated into the Final Environmental Impact Report and Environmental Management Programme, where applicable.

Table 5: Summary of the public participation process

REGULATION	REQUIREMENT	COMPLIANCE
R41(2)(a)(i)	Site notices and posters	A site notice (A2) was placed at the entrance to the farm from the R303. Additional A3 posters were placed at the following locations: • Prince Alfred Public Library • Community notice board at the Spar in Prince Alfred Hamlet • Community notice board at Kaap Agri in Op-die-Berg • Community notice board at the Spar in Op-die-Berg Please refer to Appendix 4B for proof of site notices and posters.
R41(2)(a)(ii)	Alternative sites	Not applicable. No alternative site was identified as reasonable and feasible for detailed assessment.
R41(2)(b)(iii)	Notification of ward councillor	Notification letters were distributed to the relevant Ward Councillor within the Witzenberg Local Municipality. Please refer to Appendix 4F for proof of notification.
R41(2)(b)(iv)	Notification of local and district municipalities	Notification letters were distributed to the Witzenberg Local Municipality and the Cape Winelands District Municipality. Please refer to Appendix 4F for proof of notification.
R41(2)(b)(v)	Notification of organs of state	Notification letters were distributed to relevant Organs of State and commenting authorities, including: • Department of Water and Sanitation (DWS) • CapeNature • Heritage Western Cape (HWC) • Western Cape Department of Agriculture • Western Cape Department of Environmental Affairs and Development Planning (WCDEA&DP) Please refer to Appendix 4F for proof of notification.
R41(2)(b)(vi)	Notification of adjacent landowners	Notification letters and/or emails were distributed to neighbouring landowners and registered Interested and Affected Parties. Please refer to Appendix 4F for proof of notification.
R41(2)(c)(i)	Newspaper advertisement	An advertisement notifying Interested and Affected Parties of the proposed development and public participation process was placed in the Witzenberg Herald. Please refer to Appendix 4A for proof of advertisement.
R42 & R44	Register of	A register of Interested and Affected Parties (I&APs) was opened and

	Interested and Affected Parties	maintained throughout the Public Participation Process and remains available upon request. Please refer to Appendix 4D for the Interested and Affected Parties Register.
R43(1)	Comment period	Registered Interested and Affected Parties were afforded a 30-day review and comment period during the Scoping Phase and are being afforded a further 30-day review and comment period during the Environmental Impact Assessment phase. Relevant Organs of State have also been consulted in accordance with Section 24O of NEMA.
R44	Recording of comments and responses	All comments received from Interested and Affected Parties, commenting authorities and Organs of State have been recorded and addressed in the applicable Comments and Responses Reports (CRRs). Please refer to Appendix 4E for the Scoping Phase Comments and Responses Report and copies of comments received. Comments received during the EIA phase will be incorporated into the Final EIA Comments and Responses Report.

6.4.1 PUBLIC PARTICIPATION UNDERTAKEN DURING THE EIA PHASE:

A number of organisations, authorities, landowners and individuals were identified as Interested and Affected Parties (I&APs) during the Public Participation Process undertaken for the proposed Harmony Instream Dam and associated agricultural development. A complete list of identified and registered I&APs is included in Appendix 4D.

The Public Participation Process undertaken to date is summarised in Table 5 above.

During the Environmental Impact Assessment phase, the Draft Environmental Impact Report (EIR) and Environmental Management Programme (EMPr) are being made available to registered I&APs, relevant Organs of State and commenting authorities for a 30-day review and comment period in accordance with the EIA Regulations, 2014 (as amended). Relevant Organs of State have also been consulted in accordance with Section 24O of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

Comments received during the review period will be recorded and responded to in the Environmental Impact Assessment Phase Comments and Responses Report (CRR). Where necessary, the Draft EIR and EMPr will be amended in response to comments received prior to submission of the Final EIR and EMPr to the Western Cape Department of Environmental Affairs and Development Planning (WCDEA&DP) for decision-making.

6.4.2 INTERESTED AND AFFECTED PARTIES

Interested and Affected Parties (I&APs) were identified and notified throughout the Public Participation Process by means of newspaper advertisements, site notices, notification letters and electronic correspondence distributed to stakeholders included on the project database.

The Public Participation Process included the notification of adjacent landowners, relevant Organs of State, local and district municipalities, conservation authorities, ward councillors and other identified stakeholders. A register of Interested and Affected Parties has been maintained throughout the Environmental Impact Assessment process and is included as **Appendix 4D**.

7. ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS

7.1 BIODIVERSITY

The proposed Harmony Instream Dam and associated agricultural development are located within a biodiversity-sensitive landscape in the Koue Bokkeveld region. The project area comprises indigenous vegetation, previously disturbed areas and existing agricultural land, with the proposed dam footprint located predominantly within indigenous fynbos vegetation.

Vegetation mapping obtained from the Vegetation Map of South Africa, Lesotho and Eswatini (Mucina & Rutherford, 2006, as updated), together with the findings of the specialist botanical assessment, confirmed that the proposed Harmony Instream Dam footprint occurs predominantly within Winterhoek Sandstone Fynbos, while portions of the broader project area include Kouebokkeveld Alluvium Fynbos, which is classified as Critically Endangered in terms of the National List of Ecosystems that are Threatened and in Need of Protection.

Spatial biodiversity mapping further indicates that portions of the project area occur within a mapped Critical Biodiversity Area (CBA) and intersect an Ecological Support Area (ESA) Category 1: Aquatic, highlighting the importance of maintaining biodiversity patterns, ecological processes and freshwater ecosystem functioning.

A specialist Botanical Assessment was undertaken to assess the vegetation communities, ecological condition and biodiversity sensitivities associated with the proposed development. The assessment confirmed the presence of indigenous vegetation within portions of the proposed dam footprint and associated agricultural development area, including areas of relatively intact fynbos vegetation, and identified biodiversity sensitivities associated with both components of the proposed development.

Potential biodiversity impacts associated with the proposed development include:

- Permanent loss of indigenous vegetation within the approved development footprint;
- Impacts on Winterhoek Sandstone Fynbos and Critically Endangered Kouebokkeveld Alluvium Fynbos;
- Habitat fragmentation and disruption of ecological processes and landscape connectivity;
- Introduction and spread of alien invasive plant species;
- Construction-related disturbance, erosion and habitat degradation; and
- Cumulative biodiversity impacts within the broader landscape.

Alternative dam layouts and agricultural layouts were assessed throughout the Environmental Impact Assessment process. The preferred development layout was selected as the option that provides the most appropriate balance between engineering feasibility, agricultural requirements, heritage constraints and biodiversity considerations, while avoiding or minimising impacts on higher sensitivity vegetation where reasonably practicable.

Mitigation measures recommended by the Botanical Assessment include limiting disturbance to the approved development footprint, demarcating no-go areas prior to construction, rehabilitating disturbed areas using appropriate indigenous species where required, implementing alien invasive vegetation control measures, and avoiding unnecessary disturbance of remaining indigenous vegetation.

The findings and recommendations of the Botanical Assessment have informed the refinement of the

preferred development layout and have been incorporated into this Environmental Impact Assessment Report and the Environmental Management Programme (EMPr).

7.2 FRESHWATER

The proposed Harmony Instream Dam and associated agricultural development are located within the Houdenberg River catchment, which forms part of the upper Doring River system within the Olifants–Doorn Water Management Area. The project area falls within the Koue Bokkeveld Mountain Catchment Area and includes the Houdenberg River, ephemeral drainage features and associated riparian habitats that contribute to the hydrological functioning of the catchment.

The Freshwater Impact Assessment confirmed that the project area contains ephemeral drainage features that convey seasonal runoff and contribute to local hydrological processes. The Houdenberg River forms an important component of the broader freshwater network and supports downstream ecological functioning, lawful water use and catchment processes. The assessment further confirmed that portions of the freshwater environment have been modified by historical agricultural activities and lawful water resource development.

Potential freshwater impacts associated with the proposed development include:

- Disturbance of freshwater habitats and riparian areas during construction of the proposed dam and associated infrastructure;
- Disturbance of ephemeral drainage features during establishment of the associated agricultural development;
- Alteration of local surface-water runoff patterns and sediment transport processes;
- Increased erosion and sedimentation associated with earthworks and vegetation clearance;
- Potential impacts on downstream water quality and freshwater ecological functioning during construction and operation; and
- Cumulative impacts associated with existing agricultural activities and water resource development within the broader catchment.

Concerns regarding downstream water availability, environmental flow requirements, freshwater ecological functioning and cumulative catchment impacts were raised during the Scoping and Environmental Impact Assessment processes. These matters were comprehensively assessed through the Freshwater Impact Assessment and informed the refinement of the preferred development layout and the identification of appropriate mitigation measures.

Water abstraction and storage associated with the proposed development are regulated through Water Use Licence No. 01/E21D/AB/9699. The Water Use Licence prescribes abstraction limits, operational controls, monitoring requirements and measures to protect downstream environmental flow requirements, freshwater ecosystems and lawful downstream water users.

Recommended mitigation measures include:

- Compliance with all conditions of Water Use Licence No. 01/E21D/AB/9699;
- Maintenance of downstream environmental flow requirements and natural hydrological functioning;
- Implementation of erosion and sediment control measures throughout the construction phase;
- Appropriate stormwater management and irrigation system design;
- Protection of water quality through the implementation of construction and operational management measures;
- Rehabilitation of disturbed freshwater and riparian areas following construction; and

- Ongoing monitoring and reporting in accordance with the Water Use Licence and Environmental Management Programme (EMPr).

The findings and recommendations of the Freshwater Impact Assessment informed the refinement of the preferred development layout and have been incorporated into this Environmental Impact Assessment Report and the Environmental Management Programme (EMPr). Subject to the implementation of the recommended mitigation and management measures, the identified freshwater impacts are expected to be reduced to acceptable levels while maintaining compliance with the applicable water resource management requirements.

7.3 HERITAGE

Potential impacts on heritage resources were identified as an environmental consideration associated with the construction and operation of the proposed Harmony Instream Dam and associated agricultural development.

A Heritage Impact Assessment (HIA) and a Palaeontological Impact Assessment (PIA) were undertaken as part of the Environmental Impact Assessment process in accordance with the requirements of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA).

The Heritage Impact Assessment confirmed that the project area contains archaeological heritage resources, including the rock art sites HMY1 and HMY2, which have been assigned Grade IIIA (high local significance). These heritage resources are situated outside the proposed dam footprint and will not be directly affected by construction or inundation. A 50 m No-Go buffer around both sites has been incorporated into the project design to ensure their long-term protection.

The assessment also identified HMY3, comprising a low-density scatter of Later Stone Age artefacts with Low (Grade IIIC) archaeological significance. The site lies outside the proposed construction footprint and will not be impacted by the proposed development. No archaeological resources were identified within the proposed agricultural development area on the Remaining Extent of Farm Houdenberg No. 415, while the preferred agricultural development area on the Remaining Extent of Farm Winkelhaak No. 224 is not expected to impact archaeological heritage resources due to the historical disturbance associated with agricultural activities.

The Palaeontological Impact Assessment confirmed that the project area is underlain by geological formations with recognised palaeontological sensitivity. Although there is a very small possibility that fossil material may occur below the ground surface within unweathered bedrock, the proposed development area has been substantially disturbed by historical agricultural activities and is overlain by soils. Consequently, the likelihood of significant palaeontological resources occurring within the disturbed surface layers is considered to be low.

Potential heritage impacts associated with the proposed development include:

- Disturbance of previously unidentified archaeological resources during excavation activities;
- Disturbance of subsurface palaeontological resources during earthworks;
- Potential indirect impacts on the HMY1 and HMY2 rock art sites should the recommended protection measures not be maintained; and
- Localised changes to the cultural landscape associated with the proposed development.

The Heritage Impact Assessment concluded that the proposed Harmony Instream Dam and associated agricultural development are acceptable from a heritage perspective, provided that the recommended mitigation measures are implemented. These include:

- Maintaining the 50 m No-Go buffers around HMY1 and HMY2;
- Concluding a Section 42 Heritage Agreement between the landowner and Heritage Western Cape to ensure the long-term protection of the rock art sites;
- Incorporating the Rock Art Guide into the Environmental Management Programme (EMPr) and ensuring that all construction personnel are informed of its contents;
- Implementing the Fossil Chance Find Protocol during construction; and
- Immediately notifying Heritage Western Cape should previously unidentified archaeological or palaeontological material be encountered during construction.

The findings and recommendations of the Heritage Impact Assessment and Palaeontological Impact Assessment have informed the refinement of the preferred development layout and have been incorporated into this Environmental Impact Assessment Report and the Environmental Management Programme (EMPr).

7.4 VISUAL IMPACT

Potential visual and landscape impacts associated with the proposed Harmony Instream Dam and associated agricultural development were considered as part of the Environmental Impact Assessment process.

The surrounding landscape is characterised by a well-established agricultural setting comprising cultivated orchards, irrigation infrastructure, farm roads, agricultural buildings, farm dams and associated farming activities within the Koue Bokkeveld region. The proposed development is therefore considered compatible with the existing rural and agricultural character of the receiving environment.

The proposed Harmony Instream Dam is comparable in scale, function and appearance to existing agricultural water-storage infrastructure that occurs throughout the surrounding landscape and is not expected to introduce a visually intrusive or incompatible land use.

The proposed development is not located on a prominent ridgeline or visually sensitive skyline, and views of the dam and associated infrastructure are expected to be largely confined to adjacent agricultural properties and sections of existing farm access roads. Existing topography and surrounding agricultural land uses further limit the visual extent of the proposed development.

Potential visual impacts associated with the proposed development include:

- Localised alteration of the rural landscape character;
- Temporary visual impacts associated with construction activities;
- Minor changes to the visual character and sense of place within the immediate area; and
- Visual changes associated with the dam embankment, inundation area and associated infrastructure.

The proposed development has been designed to integrate with the existing agricultural landscape and is considered compatible with the surrounding land uses. Given the established agricultural character of the area, the limited visual exposure of the site and the relatively localised nature of the proposed infrastructure, significant adverse visual impacts are not anticipated.

Based on the nature, scale and location of the proposed development, together with the existing landscape character and findings of the Environmental Impact Assessment, a standalone Visual Impact Assessment was not considered necessary.

7.5 SAFETY

Potential safety considerations associated with the proposed Harmony Instream Dam were identified during the Environmental Impact Assessment process and have been addressed through the engineering design of the proposed development.

The proposed Harmony Instream Dam has been designed in accordance with the applicable provisions of the National Water Act, 1998 (Act No. 36 of 1998) and the associated dam safety requirements administered by the Department of Water and Sanitation (DWS). The engineering investigations considered dam wall stability, spillway capacity, flood attenuation, hydraulic performance, structural integrity and long-term operational safety.

Potential safety-related issues associated with the proposed development include:

- Risks associated with dam wall instability, overtopping or structural failure;
- Construction-related occupational health and safety risks;
- Flood management and spillway performance during high-flow events;
- Public and worker safety during the construction and operational phases; and
- Long-term inspection, monitoring, operation and maintenance of the dam infrastructure.

The engineering design incorporates appropriate safety factors, operational controls and management measures to ensure compliance with the applicable dam safety requirements and engineering standards. Construction will be undertaken in accordance with the approved engineering drawings and specifications, while the operation of the dam will comply with the applicable conditions of Water Use Licence No. 01/E21D/AB/9699 and any additional requirements imposed by the Department of Water and Sanitation.

Routine inspections, monitoring and maintenance of the dam, spillway and associated infrastructure will be undertaken throughout the operational life of the development to ensure the continued structural integrity and safe operation of the facility.

Based on the engineering investigations and detailed design undertaken for the proposed development, no fatal flaws relating to dam safety were identified. Subject to compliance with the approved engineering design, applicable legislative requirements, Water Use Licence conditions and ongoing operational maintenance, the proposed Harmony Instream Dam is considered capable of being constructed and operated safely.

7.6 SOCIO-ECONOMIC IMPACT

The proposed Harmony Instream Dam and associated agricultural development are anticipated to result in positive socio-economic impacts at both the local and regional scales through improved agricultural productivity, enhanced irrigation water security and support for the long-term sustainability of the farming enterprise.

Construction of the proposed dam and associated infrastructure is expected to generate temporary employment opportunities during the construction phase, including opportunities for local labour, contractors and service providers.

In addition to short-term construction employment, the proposed development has the potential to support long-term employment associated with the establishment, operation and maintenance of the proposed irrigated deciduous fruit orchards. The proposed dam forms an integral component of the broader agricultural development by providing the lawful storage of authorised surplus winter high flows, thereby improving the reliability of irrigation water supply and long-term water security for the farming operation.

The proposed development supports the continued growth of Harmony Trust, a 100% black-owned B-BBEE agricultural enterprise, and is consistent with broader objectives relating to agricultural transformation, rural economic development and sustainable agricultural production within the Koue Bokkeveld region.

Potential socio-economic benefits associated with the proposed development include:

- Employment opportunities during the construction and operational phases;
- Expansion of irrigated deciduous fruit production;
- Improved long-term irrigation water security and increased resilience to climatic variability;
- Support for local contractors, suppliers and agricultural value chains; and
- Continued growth and sustainability of a 100% black-owned B-BBEE farming enterprise.

The Agricultural Compliance Statement concluded that the proposed agricultural development is suitable for irrigated deciduous fruit production and that improved irrigation water security will enhance agricultural productivity and contribute to the long-term sustainability of the Harmony Trust farming enterprise.

Subject to the implementation of the recommended mitigation and management measures, the proposed development is expected to result in an overall positive socio-economic outcome through increased agricultural production, sustained employment opportunities and continued support for the local agricultural economy while contributing to the long-term sustainability of agriculture within the Koue Bokkeveld region.

7.7 OTHER ISSUES IDENTIFIED

In addition to the specialist themes assessed as part of this Environmental Impact Assessment, a number of broader environmental, engineering and operational considerations were identified during the Scoping and Environmental Impact Assessment processes. These include:

- Cumulative impacts associated with water abstraction, water storage and agricultural development within the broader Houdenberg River catchment;
- Climate variability, climate change adaptation, drought resilience and long-term water security;
- Compliance with the conditions of Water Use Licence No. 01/E21D/AB/9699, including abstraction limits, environmental flow requirements and operational controls;
- Operational water management, environmental monitoring and reporting requirements;
- Compatibility of the proposed development with the surrounding agricultural land uses and the existing rural landscape character;
- Construction-related erosion, sedimentation, stormwater management and rehabilitation requirements;
- Long-term operation, inspection, maintenance and safety of the proposed dam infrastructure;

- Sustainable agricultural production through improved irrigation water security and reliability; and
- Compliance with the applicable environmental, heritage, water resource and agricultural legislation.

These matters have been considered throughout the Environmental Impact Assessment process and have informed the engineering design, specialist investigations, refinement of the preferred development layout and the assessment of alternatives. The findings have also informed the development of appropriate avoidance, mitigation, rehabilitation, monitoring and management measures incorporated into the Environmental Management Programme (EMPr).

The Environmental Impact Assessment concluded that, subject to the implementation of the recommended mitigation and management measures, compliance with the conditions of Water Use Licence No. 01/E21D/AB/9699, and adherence to the Environmental Management Programme (EMPr), the identified environmental impacts can be avoided, minimised or managed to acceptable levels. Collectively, these measures support the long-term environmental sustainability, operational viability and regulatory compliance of the proposed Harmony Instream Dam and associated agricultural development.

8. SPECIALIST STUDIES

As a result of the environmental issues and potential impacts identified during the Environmental Impact Assessment (EIA) process, a number of specialist studies were undertaken to evaluate the potential environmental impacts associated with the proposed Harmony Instream Dam and associated agricultural development.

The following specialist studies were undertaken as part of the EIA process:

- Botanical Assessment;
- Freshwater Impact Assessment;
- Heritage Impact Assessment;
- Palaeontological Impact Assessment;
- Hydrological Assessment;
- Environmental Water Requirement (EWR) Assessment; and
- Agricultural Compliance Statement.

The findings and recommendations of these specialist studies have been incorporated into this Environmental Impact Report (EIR) and have informed the assessment of environmental impacts, the identification of avoidance, mitigation and management measures, the assessment of alternatives, and the development of the Environmental Management Programme (EMPr).

Each appointed specialist was provided with terms of reference appropriate to their respective field of expertise to ensure that the identified environmental issues, site sensitivities and potential impacts were assessed in a comprehensive, integrated and consistent manner. The specialist findings also informed the refinement of the preferred development layout and the evaluation of the overall environmental acceptability of the proposed development.

The specialist studies collectively conclude that, while the proposed development will result in certain unavoidable environmental impacts, these impacts can be avoided, minimised or managed to acceptable levels through the implementation of the recommended mitigation measures, compliance with the conditions of Water Use Licence No. 01/E21D/AB/9699, and adherence to the Environmental Management Programme (EMPr). The specialist findings therefore provide the technical basis for the conclusions and recommendations presented in this Environmental Impact Report.

8.1 CRITERIA FOR SPECIALIST ASSESSMENT OF IMPACTS

The impacts of the proposed activity on the various components of the receiving environment were evaluated by the respective specialists in terms of:

- nature of the impact;
- duration (time scale);
- extent (spatial scale);
- magnitude or intensity;
- probability of occurrence; and
- significance.

Impacts were assessed as either positive or negative and considered for both the construction and operational phases of the proposed development, including cumulative impacts where relevant.

The determination of impact significance represents a professional judgement by the respective specialist and is generally based on a combination of the above assessment criteria, together with consideration of mitigation measures and the sensitivity of the receiving environment.

Each specialist applied an assessment methodology appropriate to their discipline, as described in the relevant specialist reports appended to this Environmental Impact Report.

8.2 BRIEFS FOR SPECIALIST STUDIES

8.2.1 Botanical Assessment

Dr David McDonald of Bergwind Botanical Surveys and Tours conducted the Botanical Assessment for the proposed Harmony Instream Dam and associated agricultural development. The specialist report is attached as Appendix 8A.

The terms of reference for the Botanical Assessment included the following:

- Provide a baseline description of the vegetation occurring within the study area and place the vegetation within its regional and biogeographical context;
- Identify and describe the vegetation communities occurring within the project area and assess their conservation significance, ecological condition and sensitivity;
- Verify the mapped vegetation types and identify any threatened ecosystems, Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs), Species of Conservation Concern (SCC) and other biodiversity features requiring protection;
- Assess the current ecological condition of the affected areas, including the extent of historical disturbance, transformation and habitat connectivity;
- Identify, describe and assess the potential impacts of the proposed development on indigenous vegetation, biodiversity pattern and ecological processes;
- Assess the significance of the identified impacts before and after the implementation of mitigation measures;
- Recommend appropriate avoidance, mitigation, rehabilitation and management measures to minimise impacts on biodiversity resources;
- Provide input into the refinement of the preferred development layout, the Environmental Management Programme (EMPr) and the Site Sensitivity Verification process; and
- Confirm the environmental acceptability of the proposed development from a botanical perspective, subject to the implementation of the recommended mitigation and management measures.

8.2.2 Freshwater Assessment

Dr Dirk van Driel of WATSAN Africa was appointed to conduct the Freshwater Assessment for the proposed Harmony Instream Dam and associated agricultural development. The specialist report is attached as Appendix 8C.

The terms of reference for the Freshwater Assessment included the following:

- Identify, delineate and describe all watercourses, freshwater features and associated riparian habitats potentially affected by the proposed development;
- Assess the ecological condition, Present Ecological State (PES), Ecological Importance and Sensitivity (EIS), and ecological functioning of the affected freshwater systems;

- Assess the potential impacts of the proposed dam, associated infrastructure and agricultural development on freshwater ecosystems, hydrological functioning, water quality and downstream ecological processes;
- Assess the potential impacts on environmental flow requirements and the interaction between the proposed development and the broader Houdenbek River catchment;
- Assess cumulative impacts associated with water abstraction, water storage and agricultural activities within the broader catchment;
- Assess the significance of identified freshwater impacts before and after the implementation of mitigation measures;
- Recommend appropriate avoidance, mitigation, rehabilitation and management measures to minimise impacts on freshwater resources;
- Provide recommendations relating to erosion and sediment control, stormwater management, rehabilitation, water quality protection and operational water management;
- Provide specialist input into the refinement of the preferred development layout, the Environmental Management Programme (EMPr) and the Environmental Impact Assessment process; and
- Confirm the environmental acceptability of the proposed development from a freshwater perspective, subject to the implementation of the recommended mitigation and management measures.

8.2.3 Hydrological and Environmental Water Requirements Assessment

Gerald Howard and Bruce Paxton of the Freshwater Research Centre were appointed to undertake the Hydrological and Environmental Water Requirements (EWR) Assessment for the proposed Harmony Instream Dam and associated agricultural development. The specialist report is attached as Appendix 8E.

The purpose of the study was to assess the hydrological functioning of the Houdenbek River catchment, determine the Environmental Water Requirements (EWRs) of the affected river system, evaluate the availability of authorised surplus winter high flows for abstraction and storage, and inform the operational management of the proposed Harmony Instream Dam.

The terms of reference for the Hydrological and Environmental Water Requirements Assessment included the following:

- Re-establish and update the hydrological model configuration for the Koue Bokkeveld catchment;
- Simulate long-term streamflow records for the relevant sub-catchments associated with the proposed abstraction and storage system;
- Generate daily streamflow data for the proposed abstraction point, dam site and downstream river reaches;
- Determine the Environmental Water Requirements (EWRs) and environmental flow thresholds applicable to the affected river system;
- Assess the availability of authorised surplus winter high flows in relation to existing lawful water uses, downstream environmental flow requirements and the Ecological Reserve;
- Assess the proposed abstraction, storage and operating rules to ensure compliance with environmental flow requirements and sustainable water resource management objectives;
- Evaluate the hydrological performance of the proposed dam under a range of climatic and runoff conditions, including periods of reduced rainfall and drought;
- Assess cumulative hydrological impacts associated with water abstraction, storage infrastructure and existing agricultural water use within the broader Houdenbek River and Doring River catchments;

- Provide recommendations regarding dam operation, abstraction controls, environmental flow releases and long-term water resource management; and
- Compile a specialist report summarising the hydrological modelling, Environmental Water Requirement assessment, assumptions, methodology, findings and recommendations.

8.2.4 Heritage Assessment

Jonathan Kaplan of the Agency for Cultural Resource Management (ACRM) was appointed to undertake the Heritage Impact Assessment (HIA) for the proposed Harmony Instream Dam and associated agricultural development. The specialist report is attached as Appendix 8D.

In accordance with Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a Notice of Intent to Develop (NID) was submitted to Heritage Western Cape (HWC). Heritage Western Cape confirmed that specialist heritage input was required as part of the Environmental Impact Assessment process and that a Heritage Impact Assessment and Palaeontological Impact Assessment should be undertaken.

The terms of reference for the Heritage Assessment included the following:

- Assess the potential impacts of the proposed development on archaeological, palaeontological, historical and cultural heritage resources in accordance with the National Heritage Resources Act, 1999 (Act No. 25 of 1999);
- Undertake a field assessment of the proposed development footprint and surrounding area;
- Identify and assess the significance of archaeological sites, rock art, historical features, cultural landscapes and any other heritage resources that may be affected by the proposed development;
- Assess the significance of identified heritage resources in accordance with the grading system prescribed by the NHRA;
- Assess the potential impacts of the proposed development on identified heritage resources before and after mitigation;
- Recommend appropriate avoidance, mitigation, monitoring and management measures to protect identified heritage resources;
- Prepare a Heritage Chance Find Procedure and provide a Fossil Chance Find Protocol for implementation during construction, where applicable;
- Provide input into the refinement of the preferred development layout and the Environmental Management Programme (EMPr); and
- Confirm the heritage acceptability of the proposed development, subject to the implementation of the recommended mitigation and management measures.

The Heritage Impact Assessment identified the archaeological sites HMY1 and HMY2, comprising rock art sites of Grade IIIA (high local significance), together with HMY3, a low-significance archaeological scatter (Grade IIIC). The preferred development layout was refined to avoid direct impacts on these heritage resources, with 50 m No-Go buffers incorporated around HMY1 and HMY2.

The Heritage Impact Assessment concluded that the proposed development is acceptable from a heritage perspective, provided that the recommended mitigation measures are implemented. These include maintaining the recommended heritage buffer zones, implementing the Heritage Chance Find Procedure and Fossil Chance Find Protocol, incorporating the Rock Art Guide into the Environmental Management Programme (EMPr), and concluding a Section 42 Heritage Agreement with Heritage Western Cape for the long-term protection of the identified rock art sites.

9. ENVIRONMENTAL IMPACT ASSESSMENT, SIGNIFICANCE AND MITIGATION METHODOLOGY

The following impact assessment methodology was applied by EnviroAfrica CC to assess the actual and potential environmental impacts associated with the proposed Harmony Instream Dam and associated agricultural development.

The methodology provides a systematic and standardised approach for identifying, assessing and evaluating the significance of potential environmental impacts associated with the proposed development and the reasonable alternatives considered during the Environmental Impact Assessment (EIA) process. The methodology also facilitates a consistent comparison of impacts before and after the implementation of avoidance, mitigation and management measures.

Positive environmental and socio-economic impacts are identified and discussed qualitatively within this Environmental Impact Report (EIR). The formal significance rating methodology, however, focuses primarily on the assessment of adverse environmental impacts and associated risks that require avoidance, mitigation, management or monitoring.

Environmental activities and associated impacts were identified based on:

- the different phases of the proposed development;
- the nature of the proposed activities; and
- the potential environmental consequences associated with these activities.

For each identified environmental aspect or activity, potential impacts were assessed according to the following criteria:

- Probability (Likelihood);
- Extent (Spatial Scale);
- Duration (Temporal Scale);
- Magnitude or Intensity (Severity); and
- Consequence to the Receiving Environment.

Each impact was assigned a rating for the above criteria. The combined ratings were then used to determine the overall significance of the impact.

Impact significance was assessed both:

- before mitigation (baseline or worst-case scenario); and
- after mitigation (residual impact significance).

The pre-mitigation significance rating reflects the likely impact under a worst-case scenario, assuming that no mitigation measures are implemented. The post-mitigation significance rating reflects the anticipated residual impact significance following the implementation of recommended mitigation and management measures.

The significance ratings were then categorised according to a standard significance scale, indicating:

- Low significance;
- Medium significance; or
- High significance.

The impact assessment methodology applied in this Environmental Impact Report allows for a comparative assessment of impacts associated with the proposed development and identified alternatives and provides a consistent framework for evaluating environmental risks and the effectiveness of mitigation measures. assessment.

Table 6: Impact Assessment Methodology						
SIGNIFICANCE CRITERIA	Very High	High	Medium	Low	Negligible (very-low)	Score
Value	16	8	4	2	1	
Probability (likelihood) (P)	Definite. Impact will definitely occur.	Highly probable. Very likely for impact to occur.	Probable. Impact may likely occur.	Improbable. Impact may occur. Distinct Possibility	Improbable. Low likelihood/unlikely for impact to occur.	
Extent (E)	Impact potentially reaches beyond national boundaries	Impact has definite provincial/potential national consequences	Impact confined to regional area/ town	Impact confined to local region and impact on neighbouring properties	Impact confined to project property / site	
Duration (D)	Permanent The impact is expected to have a permanent impact, with very little to no rehabilitation possible	Long-Term The impact is expected to last for a long time after construction with rehabilitation expected to be 15-50 years. Impact is reversible but only with long-term mitigation	Medium-term The impact is expected to last for some time after construction with rehabilitation expected to be 5 - 15 years. Impact is reversible but only with on-going mitigation	Short-term The impact is expected to last for a relatively short time with rehabilitation expected to be 2-5 years. The impact is reversible through natural process and/or some mitigation.	Very short/ temporary The impact is expected to be temporary and last for a very short time with rehabilitation expected to be less than 2 years. The impact is easily reversible through natural process and/or some mitigation.	
Magnitude (Intensity/ Severity) (M)	It is expected that the activity will have a very severe to permanent impact on the surrounding environment. Functioning irreversibly impaired. Rehabilitation often impossible or unfeasible	It is expected that the activity will have a severe impact on the surrounding environment. Functioning may be severely impaired and may be temporarily cease. Rehabilitation will be needed to restore system integrity	It is expected that the activity will have an impact on the surrounding environment, but it will maintain its function, even if moderately modified (overall integrity not compromised). Rehabilitation easily achieved	It is expected that the activity will have a perceptible impact on the surrounding environment, but it will maintain its function, even if slightly modified (overall integrity not compromised). Rehabilitation easily achieved	It is expected that the impact will have little or no effect on the integrity of the surrounding environment	
Receiving environment (Consequence): (RE)	Very sensitive, pristine area – protected site or species permanently or seasonally present	Unused area containing only indigenous fauna / flora species	Unused area containing indigenous and alien fauna / flora species	Semi-disturbed area already rehabilitated / recovered from prior impact, or with moderate alien vegetation	Disturbed area/ transformed/ heavy alien vegetation	
FINAL RATING (average score)						

ENVIRONMENTAL RATING SIGNIFICANCE KEY:**Negative Impacts**

SIGNIFICANCE	RATING	Final rating score / value range
Very Significant	Very High	-11 to -16
Significant	High	-7 to <-11
Increasing Significance	Medium	-4 to <-7
Insignificant	Low	-2 to <-4
	Very Low	-1 to <-2

ENVIRONMENTAL SIGNIFICANCE RISK RATING

Please refer to **Appendix 9C** for the Environmental Impact Risk Rating Matrix applied during the assessment process. The matrix was used to identify and evaluate the potential impacts of the proposed development on the receiving environment, based on desktop investigations, specialist input and site-specific information.

In addition to the assessment of identified impacts against the various significance criteria, the effectiveness of mitigation measures was also considered where applicable. In such instances, impacts were assessed both before and after mitigation to determine the anticipated residual impact significance following implementation of recommended management measures.

Mitigation measures and recommendations provided by the appointed specialists have been incorporated into the impact assessment and Environmental Management Programme (EMPr).

A more detailed assessment of the identified impacts, including specialist findings and recommended mitigation measures, is provided in Section 10 of this Environmental Impact Report.

10. ASSESSMENT OF ENVIRONMENTAL IMPACTS

The specialist studies detailed in Section 8 were undertaken to assess the potential environmental impacts associated with the proposed Harmony Instream Dam and associated agricultural development, and to determine the significance of these impacts before and after mitigation.

The findings and recommendations of the specialist studies have informed the impact assessment contained in this Environmental Impact Report (EIR). Full copies of the specialist reports are included in Appendix 8.

The following specialist studies were undertaken:

- Botanical Assessment;
- Freshwater Assessment;
- Hydrological and Environmental Water Requirements Assessment;
- Heritage Impact Assessment; and
- Palaeontological Impact Assessment.

The sections below provide a summary of the key findings, identified impacts, significance ratings and recommended mitigation measures associated with each specialist discipline undertaken:

10.1 Botanical Impact Assessment

The Botanical Assessment was undertaken by Dr David McDonald of Bergwind Botanical Surveys and Tours. The full specialist report is attached as Appendix 8A.

10.1.1 Key Findings

The Botanical Assessment identified two indigenous vegetation types within the broader study area, namely Winterhoek Sandstone Fynbos and Kouebokkeveld Alluvium Fynbos, the latter being classified as Critically Endangered in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004): National List of Ecosystems that are Threatened and in Need of Protection.

The assessment confirmed that the study area comprises a combination of indigenous vegetation, previously disturbed areas and land historically modified through agricultural activities. Although portions of the site have been transformed, remnants of indigenous vegetation remain and continue to contribute to local biodiversity and ecological functioning. The assessment therefore focused on identifying environmentally sensitive areas requiring avoidance or appropriate management.

Field surveys confirmed that the proposed development area includes patches of Winterhoek Sandstone Fynbos, particularly on sandstone ridges and less disturbed portions of the site, together with areas of Kouebokkeveld Alluvium Fynbos associated with alluvial soils. The botanical assessment identified these vegetation communities as having conservation significance and recommended that unnecessary disturbance be avoided wherever reasonably practicable.

The assessment further confirmed the presence of alien invasive vegetation, including a mature stand of Poplar (*Populus × canescens*) within the proposed dam wall area. The removal of invasive alien vegetation, together with the rehabilitation of disturbed areas following construction, was identified as an opportunity to improve the ecological condition of the site over the long term.

The specialist survey identified several drainage features and areas supporting indigenous vegetation that contribute to ecological connectivity within the landscape. The preferred development layout was refined to minimise impacts on these features and to reduce the loss and fragmentation of indigenous vegetation as far as reasonably practicable.

The Western Cape Biodiversity Spatial Plan (WCBSP) identifies portions of the study area as Ecological Support Areas (ESAs), while the National Web-Based Environmental Screening Tool identifies areas of Medium to Very High terrestrial biodiversity sensitivity. Detailed field verification undertaken as part of the Botanical Assessment refined these mapped sensitivities by distinguishing between transformed areas and areas where indigenous vegetation and ecological functioning remain. The verified findings informed the final assessment of botanical sensitivity and the refinement of the preferred development layout.

Although portions of the broader study area are mapped as Critically Endangered ecosystems, the specialist concluded that the preferred development layout, together with the implementation of the recommended avoidance, mitigation, rehabilitation and alien invasive plant control measures, would minimise impacts on indigenous vegetation and ecological processes to acceptable levels. The Botanical Assessment concluded that the proposed development is environmentally acceptable from a botanical perspective, provided that the recommended mitigation measures and Environmental Management Programme (EMPr) are fully implemented.

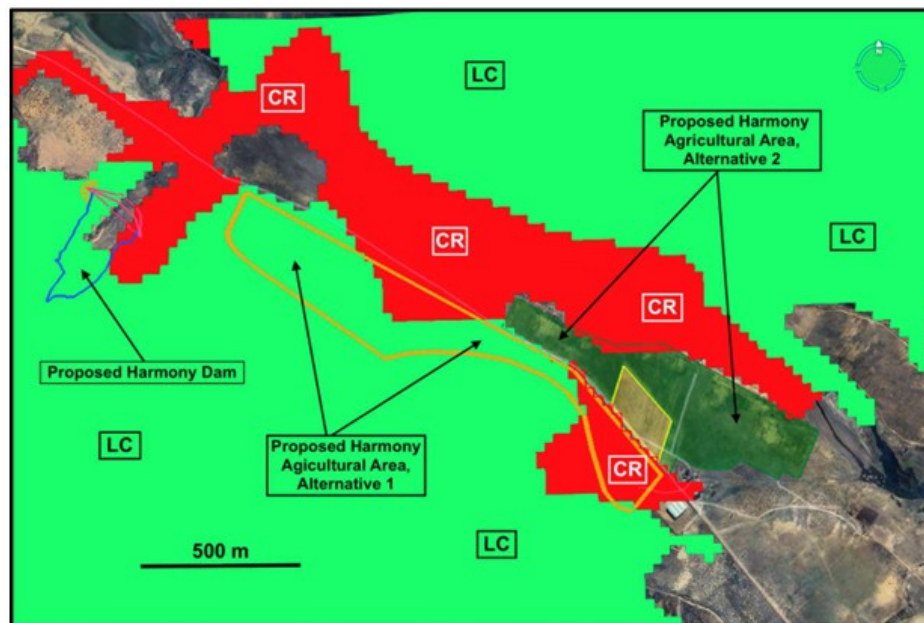


Figure 14: A map of the Red Listed Ecosystems in Houdenbek-Winkel Haak area of the Kouebokkeveld.

10.1.1 Impact Assessment

According to the Botanical Assessment (Appendix 8A), the principal botanical impacts associated with the proposed Harmony Instream Dam and associated agricultural development relate to the permanent loss of indigenous vegetation within the dam footprint, inundation area and associated infrastructure, together with temporary vegetation disturbance during the construction phase.

The Botanical Assessment confirmed that the study area comprises a combination of indigenous vegetation, previously disturbed areas and land modified through historical agricultural activities. Although portions of the development footprint have been transformed, indigenous vegetation communities remain within the broader study area and continue to contribute to local biodiversity, ecological connectivity and ecosystem

functioning. Consequently, the assessment focused on avoiding and minimising impacts on these environmentally sensitive areas wherever reasonably practicable.

The specialist identified that the proposed development will result in the loss of limited areas of Winterhoek Sandstone Fynbos and may affect portions of Kouebokkeveld Alluvium Fynbos, a Critically Endangered vegetation type. Through the refinement of the preferred development layout, environmentally sensitive areas were avoided where practicable, thereby reducing habitat loss, fragmentation and impacts on ecological processes.

The Botanical Assessment also confirmed the presence of alien invasive vegetation, including a mature stand of Poplar (*Populus × canescens*) within the proposed dam wall footprint. The specialist recommended that this stand be removed and appropriately managed to prevent regrowth or resprouting. This recommendation has been incorporated into the Environmental Management Programme (EMPr), together with ongoing alien invasive plant control, rehabilitation of disturbed areas and long-term vegetation monitoring.

Potential indirect impacts identified by the specialist include vegetation disturbance outside the approved development footprint, habitat fragmentation, soil erosion, sedimentation, the spread of alien invasive vegetation and degradation of adjacent natural habitats. These impacts can be effectively managed through the implementation of the recommended avoidance, mitigation, rehabilitation and monitoring measures contained in the EMPr.

Overall, the Botanical Assessment concluded that the proposed development will result in unavoidable, localised impacts on indigenous vegetation. However, through the implementation of the recommended avoidance, mitigation, rehabilitation and long-term management measures, these impacts can be reduced to acceptable levels. The preferred development layout was therefore considered environmentally acceptable from a botanical perspective.

Under the No-Go Alternative, the proposed dam and associated infrastructure would not be constructed, thereby avoiding direct development-related impacts on indigenous vegetation. However, existing agricultural activities and associated land disturbance would continue within the study area, and opportunities to rehabilitate disturbed areas and remove alien invasive vegetation as part of the proposed development would not be realised.

10.1.2 Mitigation Measures

The following mitigation measures and recommendations were provided in the Botanical Assessment (**Appendix 8A**) and have been incorporated into the Environmental Management Programme (EMPr):

- Disturbance to indigenous vegetation must be restricted to the approved development footprint, with environmentally sensitive areas clearly demarcated prior to the commencement of construction and no unnecessary disturbance permitted outside the approved works area.
- Areas disturbed during construction that are not required for operational purposes must be rehabilitated as soon as practicable using locally occurring indigenous fynbos species representative of the surrounding vegetation communities.
- Rehabilitation of the dam wall and other disturbed areas should utilise locally sourced indigenous vegetation and brush-packing techniques, where appropriate, to promote natural seed dispersal, vegetation establishment and erosion control. Exotic or non-local plant species must not be used for rehabilitation.

- Appropriate erosion prevention, sediment control and stormwater management measures must be implemented throughout the construction and operational phases to minimise impacts on surrounding vegetation and freshwater systems.
- The existing stand of Poplar (*Populus × canescens*) within the proposed dam wall footprint must be removed and appropriately managed to prevent regrowth or resprouting, as recommended by the Botanical Assessment.
- Cleared and rehabilitated areas must be monitored regularly for the establishment or re-establishment of alien invasive plant species, with follow-up control measures implemented where necessary.
- Construction activities must be undertaken in a manner that minimises unnecessary vegetation clearing, habitat fragmentation and disturbance outside the approved development footprint.
- All avoidance, mitigation, rehabilitation, monitoring and alien invasive plant control measures recommended in the Botanical Assessment must be incorporated into and implemented through the Environmental Management Programme (EMPr).

10.1.3 Conclusion

The Botanical Assessment concluded that the proposed Harmony Instream Dam and associated agricultural development will result in unavoidable but localised impacts on indigenous vegetation through the construction of the dam wall, inundation area and associated infrastructure.

The assessment confirmed that, although portions of the study area have been historically modified through agricultural activities, indigenous vegetation communities, including Winterhoek Sandstone Fynbos and Kouebokkeveld Alluvium Fynbos, remain within the broader study area and contribute to local biodiversity and ecological functioning. Through the refinement of the preferred development layout, environmentally sensitive areas were avoided where reasonably practicable, thereby reducing the loss and fragmentation of indigenous vegetation and minimising impacts on ecological processes.

The specialist concluded that the implementation of the recommended avoidance, mitigation, rehabilitation and alien invasive plant management measures, together with the rehabilitation of disturbed areas using locally occurring indigenous vegetation, will reduce the residual botanical impacts to acceptable levels. The removal and ongoing management of alien invasive vegetation, including the existing stand of Poplar (*Populus × canescens*), will further contribute to improving the long-term ecological condition of the site.

The Botanical Assessment therefore concluded that the proposed development is environmentally acceptable from a terrestrial botanical perspective, provided that the recommended mitigation measures and the Environmental Management Programme (EMPr) are fully implemented.

The preferred development layout was supported by the specialist as the most appropriate option, as it minimises impacts on sensitive vegetation and ecological processes while achieving the objectives of the proposed development.

10.2 Freshwater Ecological Assessment

The Freshwater Ecological Assessment was conducted by Dirk van Driel of WATSAN Africa. Please refer to **Appendix 8C** for the full specialist report.

10.2.1 Key findings

According to the Freshwater Ecological Assessment, several episodic drainage lines occur within the broader study area, particularly within the eastern portion of the site. These drainage lines convey seasonal surface runoff into excavated channels associated with the historical agricultural activities on the property, which ultimately drain toward the Houdenberg River located west of the proposed development area.

The assessment concluded that the excavated channels within the study area have been substantially modified through historical cultivation and land transformation activities. Indigenous vegetation has largely been removed and the channels altered and straightened to optimise agricultural use of the land. As a result, the channels now function primarily as artificial drainage features conveying episodic runoff from the limited upstream catchment area toward the Houdenberg River.

The Freshwater Ecological Assessment determined that the excavated channels do not display the ecological characteristics typically associated with wetlands or riparian systems. In particular:

- the channels do not support obligate or facultative wetland vegetation species;
- no significant hydromorphic soil indicators, such as mottling or gleying, were identified;
- no sustained saturated soil conditions were recorded; and
- the vegetation occurring within the channels is primarily terrestrial graminoid and shrub vegetation associated with disturbed conditions.

The upstream episodic drainage lines occurring within the surrounding mountainous areas were, however, identified as functioning natural watercourses associated with the broader drainage network. These systems support more natural ecological processes and vegetation assemblages due to reduced disturbance and favourable local microclimatic conditions.

Although the excavated channels within the development footprint were not considered true wetlands or riparian systems from an ecological perspective, the specialist confirmed that these channels still function as hydrological conduits conveying surface runoff to the Houdenberg River system. The channels are therefore considered watercourses in terms of the National Water Act, 1998 (Act No. 36 of 1998), due to their hydrological functioning and connectivity within the broader catchment.

The Freshwater Ecological Assessment, therefore, concluded that:

- the affected freshwater features within the proposed development footprint are largely artificial and historically modified;
- the ecological sensitivity of the affected excavated channels is low;
- the proposed development will not result in significant impacts on intact wetland systems;
- the upstream natural drainage features remain more ecologically sensitive and should be protected where possible; and
- appropriate erosion, stormwater and operational management measures will be required to minimise impacts on downstream hydrological functioning and water quality.

Figure 16 below illustrates the sub-catchments, drainage lines and modified hydrological features associated with the proposed Harmony Instream Dam and agricultural area. The figure demonstrates the episodic nature of the drainage network and the manner in which surface runoff is conveyed through the broader catchment toward the Houdenberg River system.

The figure further illustrates that portions of the drainage network within the study area have been historically modified through agricultural activities, including excavated channels, berms and cultivated areas. These modified channels nevertheless continue to perform an important hydrological function by conveying episodic runoff within the catchment.

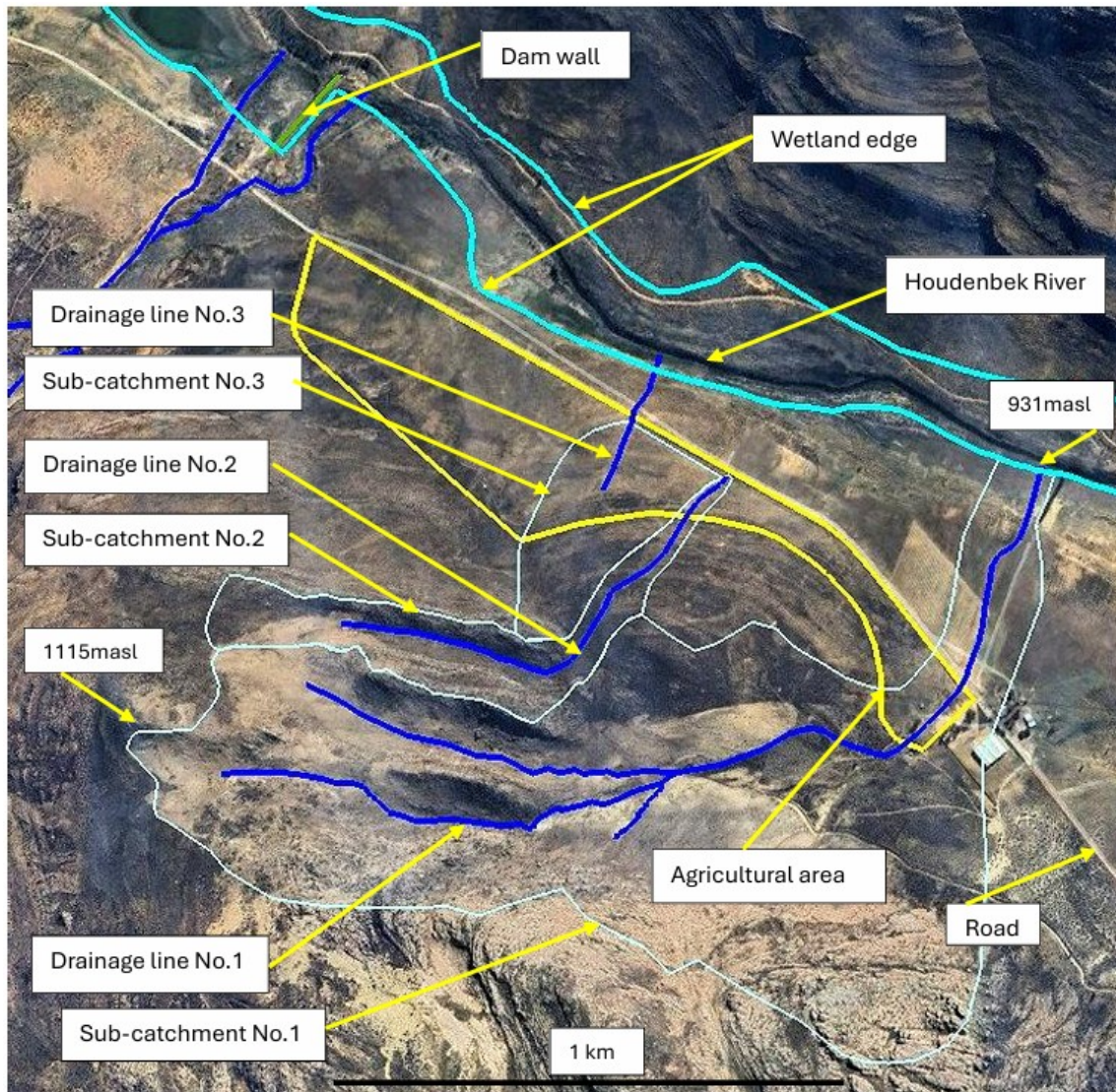


Figure 15: Sub-catchments and drainage lines associated with the proposed Harmony Instream Dam

10.2.2 Impact Assessment

The Freshwater Ecological Assessment identified a number of potential impacts associated with the proposed Harmony Instream Dam and associated agricultural development on freshwater ecosystems, hydrological functioning, water quality and downstream ecological processes. The assessment considered impacts associated with the site preparation, construction, operational and maintenance phases of the proposed development.

Site Preparation Phase

Potential impacts during the site preparation phase include the disturbance of soils and vegetation within the approved development footprint, resulting in an increased risk of erosion and sediment mobilisation. Construction vehicles and machinery may also contribute to the contamination of surface runoff through accidental hydrocarbon spills if not appropriately managed. Vegetation clearing and earthworks have the potential to increase sediment transport to downstream drainage features and ultimately the Houdenbek River if suitable erosion and stormwater controls are not implemented.

Construction Phase

The construction phase presents the greatest potential risk to freshwater resources. Potential impacts include sediment-laden runoff from disturbed areas and stockpiles, localised erosion, temporary alteration of drainage patterns, degradation of water quality through poor construction practices, and disturbance of modified drainage channels. If unmanaged, these impacts could adversely affect downstream freshwater habitats and ecological functioning.

The specialist concluded that these impacts can be effectively minimised through the implementation of appropriate erosion prevention, sediment control, stormwater management and construction management measures, together with rehabilitation of disturbed areas immediately following construction.

Operational Phase

During operation, the proposed dam will alter the natural flow regime through the storage of authorised surplus winter high flows. The Hydrological and Environmental Water Requirements Assessment confirmed that, provided the dam is operated in accordance with the requirements of Water Use Licence No. 01/E21D/AB/9699 and the recommended Environmental Water Requirements (EWRs), downstream ecological functioning and environmental flow requirements can be maintained.

Potential operational impacts include localised changes in downstream flow patterns, seepage through or beneath the dam wall, erosion associated with spillway discharge, sediment movement and cumulative hydrological effects. The specialist noted that limited seepage may provide localised increases in soil moisture downstream, although this is not expected to result in significant adverse ecological impacts.

Maintenance Phase

Potential impacts associated with routine maintenance activities include temporary vegetation disturbance, erosion associated with maintenance or desilting works, disturbance of drainage features during repair activities and the temporary mobilisation of sediments. These impacts are expected to be localised, short-term and readily manageable through the implementation of the Environmental Management Programme (EMPr).

Overall, the Freshwater Ecological Assessment concluded that the proposed development is environmentally acceptable from a freshwater perspective. The predicted impacts on freshwater ecosystems, hydrological functioning and downstream ecological processes are expected to be of low significance, provided that the recommended avoidance, mitigation, rehabilitation and operational management measures are fully implemented.

The assessment further concluded that compliance with the Environmental Water Requirements, implementation of appropriate erosion and sediment control measures, protection of downstream water quality and adherence to the conditions of Water Use Licence No. 01/E21D/AB/9699 will ensure that downstream freshwater ecological functioning is maintained.

The specialist recommended that:

- construction activities should, where practicable, be undertaken during the drier months to minimise erosion and sedimentation;
- appropriate erosion prevention, stormwater and sediment control measures must be implemented throughout the construction and operational phases;
- disturbed areas must be stabilised and rehabilitated as soon as practicable following construction;
- downstream freshwater systems and water quality should be monitored during construction and operation to verify the effectiveness of mitigation measures; and
- the dam must be operated in accordance with the Environmental Water Requirements and the conditions of Water Use Licence No. 01/E21D/AB/9699 to ensure the maintenance of downstream ecological functioning.

10.2.3 Mitigation Measures

The following mitigation and management measures were recommended in the Freshwater Ecological Assessment and have been incorporated into the Environmental Management Programme (EMPr) for the site preparation, construction, operational and maintenance phases of the proposed Harmony Instream Dam and associated agricultural development.

Site Preparation and Construction Phase

- Construction activities should, where reasonably practicable, be undertaken during the drier months to minimise erosion, sediment transport and impacts on downstream freshwater systems.
- Disturbance to watercourses and modified drainage features must be restricted to the approved development footprint, and unnecessary crossings by vehicles and construction machinery must be avoided.
- Contractor laydown areas, stockpiles, batching areas, refuelling areas and construction camps must be located outside watercourses and drainage features and, where practicable, at least **10 m** from these features.
- Appropriate erosion prevention, stormwater management and sediment control measures, including silt fences, sediment traps or similar control structures, must be installed before vegetation clearing and earthworks commence and maintained throughout construction.
- Cleared vegetation and other construction materials must not be stockpiled or disposed of within drainage channels or watercourses.
- Topsoil must be stripped separately from subsoil, stockpiled appropriately for later rehabilitation and protected from erosion.
- Soil stockpiles should not exceed 2 m in height and must be stabilised where necessary to prevent erosion and sediment loss.
- Exposed soils, embankments and disturbed areas must be stabilised as soon as practicable using suitable erosion-control measures and rehabilitated with locally indigenous vegetation.
- Appropriate measures must be implemented to prevent hydrocarbon spills, cement contamination and other pollutants from entering watercourses, including the provision of spill kits and containment measures at refuelling and maintenance areas.
- The existing stand of Poplar (*Populus × canescens*) within the proposed dam wall footprint should be removed in a controlled manner to minimise erosion and sediment mobilisation, in accordance with the Botanical Assessment and EMPr.
- Construction activities must comply with all freshwater management measures contained in the Environmental Management Programme (EMPr).

Operational and Maintenance Phase

- The dam must be operated in accordance with the conditions of Water Use Licence No. 01/E21D/AB/9699 and the Environmental Water Requirements (EWRs) to maintain downstream ecological functioning.
- Spillway structures, outlet works and downstream drainage areas must be inspected regularly for erosion, sediment accumulation and structural stability.
- Any seepage associated with the dam wall must be monitored and managed in accordance with the approved engineering design and operational requirements.
- Routine maintenance activities, including desilting and vegetation management, must be undertaken in a controlled manner to minimise disturbance to freshwater systems and downstream water quality.
- Downstream flow conditions, freshwater habitats and water quality should be monitored periodically to verify the effectiveness of mitigation measures and compliance with Water Use Licence requirements.

- Disturbed areas resulting from maintenance or repair activities must be rehabilitated as soon as practicable following completion of the works.
- Alien invasive vegetation within disturbed areas must be monitored and controlled as part of the ongoing implementation of the Environmental Management Programme (EMPr).

10.2.4 Conclusion

The Freshwater Ecological Assessment concluded that the proposed Harmony Instream Dam and associated agricultural development are environmentally acceptable from a freshwater perspective, provided that the recommended mitigation measures, Environmental Management Programme (EMPr) and the conditions of Water Use Licence No. 01/E21D/AB/9699 are fully implemented.

The assessment confirmed that the freshwater features within the development footprint consist predominantly of historically modified drainage channels with relatively low ecological sensitivity. Although these features have been substantially altered through historical agricultural activities, they continue to perform an important hydrological function by conveying episodic surface runoff to the Houdenberg River and therefore require appropriate protection and management.

The specialist concluded that potential impacts associated with erosion, sedimentation, water quality, hydrological functioning and downstream ecological processes can be effectively avoided, minimised and managed through the implementation of appropriate erosion and sediment control measures, stormwater management, rehabilitation of disturbed areas and compliance with the Environmental Water Requirements.

Accordingly, the preferred development layout was supported from a freshwater ecological perspective, as it minimises impacts on freshwater resources while allowing for the sustainable storage of authorised surplus winter high flows in accordance with the approved Water Use Licence.

10.3 Hydrological and Environmental Water Requirements Study

A Hydrological and Environmental Water Requirements (EWR) Study was undertaken to assess the hydrological characteristics of the Houdenberg River catchment, determine the Environmental Water Requirements (EWRs) applicable to the affected river system and evaluate the availability of authorised surplus winter high flows for storage within the proposed Harmony Instream Dam.

The need for the study was identified during the Environmental Impact Assessment process, including the Public Participation Process, in response to comments received from CapeNature and the Department of Water and Sanitation (DWS) regarding downstream flow requirements, cumulative abstraction pressures and the long-term ecological functioning of the Houdenberg River catchment.

In addition, the Freshwater Ecological Assessment recommended that a hydrological investigation be undertaken to:

- determine the volume of runoff available from the upstream catchment;
- assess the availability of authorised surplus winter high flows for abstraction and storage;
- determine the Environmental Water Requirements (EWRs) applicable to the affected river system;
- assess downstream flow requirements necessary to maintain ecological functioning; and
- evaluate the interaction between the proposed abstraction regime, dam storage capacity and downstream hydrological processes.

The Hydrological and Environmental Water Requirements Study also evaluated the interaction between the proposed abstraction regime, storage capacity and downstream flow conditions within the broader Houdenbek River system.

Please refer to **Appendix 8E** for the complete Hydrological and Environmental Water Requirements Study.

10.3.1 Key findings

The Hydrological and Environmental Water Requirements Study confirmed that runoff within the Houdenbek River catchment is strongly seasonal, with the majority of streamflow occurring during the winter rainfall period and limited natural flows occurring during summer.

The assessment further confirmed that the catchment experiences significant inter-annual variability in runoff, resulting in considerable differences between wetter and drier years. The proposed Harmony Instream Dam is therefore intended to provide carry-over storage of authorised winter flows to improve irrigation reliability during periods of reduced runoff and drought.

The study determined the Environmental Water Requirements applicable to both the proposed dam catchment and the supplementary abstraction point on the Houdenbek River. The assessment concluded that Environmental Water Requirements within the dam catchment can generally be maintained under the proposed operating regime. However, owing to the highly developed nature of portions of the broader Houdenbek River catchment, Environmental Water Requirements at the supplementary abstraction point can only be achieved under suitable flow conditions.

Accordingly, the study recommends that supplementary abstraction from the Houdenbek River should only occur when river flows exceed the prescribed Environmental Water Requirement thresholds.

Hydrological modelling demonstrated that the variable flow regime results in a relatively low 100% assurance yield. However, for irrigation purposes an 80% assurance yield is considered appropriate.

The study concluded that the proposed dam, with an assessed storage capacity of approximately 0.235 Mm³, would provide an estimated 80% assurance yield of approximately 0.175 Mm³ per annum from its own catchment. This yield could increase to approximately 0.205 Mm³ per annum through supplementary abstraction from the Houdenbek River at a pumping capacity of approximately 10 l/s, subject to compliance with Environmental Water Requirements and the conditions of Water Use Licence No. 01/E21D/AB/9699.

10.3.2 EWR Implementation

The Hydrological and Environmental Water Requirements Study determined the Environmental Water Requirements applicable to the Houdenbek River at the identified supplementary abstraction point. Mean monthly Environmental Water Requirement flows were calculated to maintain downstream ecological functioning.

The required Environmental Water Requirement flows are presented in Table 7 below.

Table 7: Required Mean Monthly Environmental Water Requirement (EWR) Flows at the Diversion Site

Month	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
EWR (m ³ /s)	0.016	0.008	0.003	0.000	0.000	0.000	0.000	0.013	0.029	0.021	0.051	0.021	0.161

The study concluded that these Environmental Water Requirements are expected to be achieved through integrated operational management within the broader catchment, including coordinated operation of existing water infrastructure, abstraction management and, where necessary, controlled releases.

The study further recommended that provision be made during the detailed design of the proposed dam for the incorporation of a bottom outlet structure, should Environmental Water Requirement releases be required as part of future operational management.

The specialist noted that controlled releases from the proposed dam alone may not always achieve the intended downstream ecological benefits because existing on-channel dams and abstraction infrastructure elsewhere within the catchment may intercept these flows.

Accordingly, implementation of the Environmental Water Requirements should form part of an integrated catchment-wide water resource management approach undertaken in consultation with the relevant authorities and water users.

Further information regarding the proposed operational approach and Environmental Water Requirement implementation is provided in Section 5 of the Hydrological and Environmental Water Requirements Study (Appendix 8E).

10.3.3 Conclusion

The Hydrological and Environmental Water Requirements Study confirmed that the Houdenberg River catchment is characterised by strongly seasonal runoff and considerable inter-annual variability, with the majority of flows occurring during the winter rainfall period.

The assessment concluded that Environmental Water Requirements within the proposed dam catchment can be maintained under the proposed operating regime. Supplementary abstraction from the Houdenberg River should only occur when river flows exceed the prescribed Environmental Water Requirement thresholds and in accordance with the conditions of Water Use Licence No. 01/E21D/AB/9699.

Hydrological modelling demonstrated that the proposed Harmony Instream Dam is capable of providing an estimated 80% assurance yield of approximately 0.175 Mm³ per annum from its own catchment, with the potential to increase this yield to approximately 0.205 Mm³ per annum through supplementary abstraction from the Houdenberg River under suitable flow conditions.

Overall, the study concluded that the proposed development is hydrologically feasible and environmentally acceptable, provided that the recommended operational controls, abstraction restrictions, Environmental Water Requirement management measures and Water Use Licence conditions are fully implemented.

11. SUMMARY OF IMPACTS AND CUMULATIVE EFFECT

11.1 Summary of Impacts

Please refer to Appendix 9A for the detailed impact and significance rating tables applicable to the various phases of the proposed Harmony Instream Dam and associated agricultural development, including the recommended mitigation and management measures.

The impact assessment presented in **Appendix 9A** incorporates:

- the Environmental Assessment Practitioner's (EAP) impact assessment;
- specialist risk assessments and findings;
- identified mitigation measures; and
- the anticipated residual impacts following mitigation.

Table 8-12 below provides a summary of the key impacts associated with the alternatives, taking into consideration the findings of the specialist studies and the proposed mitigation measures.

11.1.1 Preferred Alternative – Harmony Instream Dam and Associated Agricultural Development

Table 8: Impact Summary (Preferred Alternative)

Aspect	Impact	Significance (No Mitigation)	Significance (With Mitigation)
Phase: Construction			
Heritage	Disturbance or damage to archaeological and rock art resources during construction activities	Low (Negative)	Very Low (Negative)
Palaeontology	Disturbance of potential fossil-bearing material during earthworks	Very Low (Negative)	Very Low (Negative)
Botanical	Loss and disturbance of indigenous vegetation, including Winterhoek Sandstone Fynbos and limited areas of Kouebokkeveld Alluvium Fynbos	Low (Negative)	Very Low (Negative)
Freshwater	Disturbance of modified drainage features, increased erosion, sedimentation and reduced water quality during site preparation	Low (Negative)	Low (Negative)
Freshwater	Disturbance associated with construction of the dam wall, spillway and associated infrastructure	Low (Negative)	Low (Negative)
Hydrology / Environmental Water Requirements	Temporary alteration of local drainage patterns and hydrological processes during construction	Medium-Low (Negative)	Low (Negative)
Water Quality	Potential contamination of soils and surface water from fuels, hydrocarbons, concrete and construction materials	Medium (Negative)	Low (Negative)
Erosion and Stormwater	Increased erosion and sediment transport associated with exposed soils, earthworks and stormwater runoff	Medium (Negative)	Low (Negative)
Alien Invasive Vegetation	Spread or re-establishment of alien invasive plant species within disturbed areas	Medium-Low (Negative)	Low (Negative)
Agricultural	Temporary loss of agricultural land within the construction footprint	Low (Negative)	Low (Negative)
Dam Safety	Construction-related safety risks associated with earthworks, machinery and dam wall construction	Medium (Negative)	Low (Negative)

Socio-economic	Temporary employment creation and local economic benefits during construction	Low (Positive)	Low (Positive)
Dust	Dust generation associated with vegetation clearing, earthworks and vehicle movement	Medium-Low (Negative)	Low (Negative)
Visual	Temporary visual impacts associated with construction activities, machinery and stockpiles	Medium (Negative)	Low (Negative)
Traffic	Increased construction traffic on local access roads	Medium (Negative)	Low (Negative)
Noise	Noise generated by construction activities and heavy machinery	Low (Negative)	Very Low (Negative)
Cumulative Impacts	Contribution to cumulative disturbance of biodiversity, freshwater resources and hydrological processes within the Houdenbek River catchment	Medium (Negative)	Low (Negative)

Aspect	Impact	Significance (No Mitigation)	Significance (With Mitigation)
Phase: Operational and Maintenance			
Freshwater	Potential seepage through the dam wall, erosion associated with spillway discharge and sedimentation within downstream drainage features	Low (Negative)	Low (Negative)
Freshwater	Temporary impacts associated with maintenance activities, including desilting, vegetation management and sediment stockpiling	Medium (Negative)	Low (Negative)
Hydrology / Environmental Water Requirements	Alteration of downstream flow dynamics associated with water storage, abstraction and implementation of Environmental Water Requirement releases	Medium (Negative)	Low (Negative)
Water Quality	Potential deterioration in downstream water quality associated with erosion, runoff and sediment mobilisation	Medium-Low (Negative)	Low (Negative)
Erosion and Stormwater	Localised erosion associated with spillway discharge, stormwater concentration and maintenance activities	Medium-Low (Negative)	Low (Negative)
Alien Invasive Vegetation	Potential establishment or spread of alien invasive vegetation within disturbed maintenance areas	Low (Negative)	Very Low (Negative)
Agricultural	Permanent loss of agricultural land within the dam inundation footprint	Low (Negative)	Low (Negative)
Dam Safety	Operational safety risks associated with dam infrastructure, inspections and maintenance activities	Medium (Negative)	Low (Negative)
Visual	Long-term visual change associated with the presence of the dam and associated infrastructure	Low (Negative)	Low (Negative)
Climate Resilience	Improved resilience to drought through increased water security for agricultural production	Medium (Positive)	Medium (Positive)
Socio-economic	Long-term employment opportunities and support for sustainable agricultural productivity	Low (Positive)	Low (Positive)
Cumulative Impacts	Cumulative impacts associated with water abstraction, storage and altered hydrological processes within the broader Houdenbek River catchment	Medium (Negative)	Low (Negative)

11.1.2 Alternative Dam Layouts (Options 1 and 2)

Table 9: Impact Summary (Alternative Dam Layouts)

Aspect	Impact	Significance (No Mitigation)	Significance (With Mitigation)
Phase: Construction			
Heritage	Potential disturbance to archaeological and rock art resources within the construction footprint	Low (Negative)	Very Low (Negative)
Palaeontology	Potential disturbance of fossil-bearing material during excavation activities	Low (Negative)	Very Low (Negative)
Botanical	Increased loss and disturbance of indigenous vegetation, including Winterhoek Sandstone Fynbos and Kouebokkeveld Alluvium Fynbos, due to the larger development footprint	Medium (Negative)	Low (Negative)
Freshwater	Increased erosion, sedimentation and disturbance of drainage features associated with the larger development footprint	Medium (Negative)	Low (Negative)
Freshwater	Increased disturbance to hydrological functioning associated with larger inundation areas and additional earthworks	Medium (Negative)	Low (Negative)
Hydrology / Environmental Water Requirements	Increased alteration of local drainage patterns and downstream flow dynamics associated with the larger development footprint	Medium (Negative)	Low (Negative)
Water Quality	Increased risk of sediment-laden runoff and construction-related contamination entering downstream drainage features	Medium (Negative)	Low (Negative)
Erosion and Stormwater	Increased erosion potential associated with larger exposed areas and more extensive earthworks	Medium (Negative)	Low (Negative)
Alien Invasive Vegetation	Increased disturbance may facilitate the establishment and spread of alien invasive vegetation	Medium-Low (Negative)	Low (Negative)
Agricultural	Increased loss of agricultural land associated with the larger inundation footprint	Medium-Low (Negative)	Low (Negative)
Dam Safety	Increased engineering complexity and construction risks associated with additional infrastructure and saddle wall components	Medium (Negative)	Low (Negative)
Socio-economic	Temporary employment creation and local economic stimulation during construction	Low (Positive)	Low (Positive)
Dust	Increased dust generation associated with the larger construction footprint and earthworks	Medium (Negative)	Low (Negative)
Visual	Greater temporary visual disturbance associated with expanded construction activities and infrastructure	Medium (Negative)	Low (Negative)
Traffic	Increased construction traffic and heavy vehicle movements on local access roads	Medium (Negative)	Low (Negative)
Noise	Increased construction-related noise associated with the larger development footprint	Medium-Low (Negative)	Low (Negative)
Cumulative Impacts	Greater cumulative disturbance to biodiversity, freshwater resources and hydrological processes within the broader Houdenberg River catchment	Medium (Negative)	Medium-Low (Negative)

Aspect	Impact	Significance (No Mitigation)	Significance (With Mitigation)
Phase: Operational and Maintenance			
Freshwater	Increased erosion and sedimentation associated with the larger inundation area, spillway discharge and downstream drainage features	Medium (Negative)	Low (Negative)
Freshwater	Greater disturbance associated with maintenance activities, including desilting, vegetation management and sediment stockpiling	Medium (Negative)	Low (Negative)
Hydrology / Environmental Water Requirements	Increased alteration of downstream hydrological functioning associated with water storage, abstraction and Environmental Water Requirement implementation	Medium (Negative)	Low (Negative)
Water Quality	Increased potential for sediment mobilisation and downstream water quality deterioration	Medium (Negative)	Low (Negative)
Erosion and Stormwater	Increased long-term erosion potential associated with the larger operational footprint and concentrated stormwater flows	Medium (Negative)	Low (Negative)
Alien Invasive Vegetation	Potential establishment or spread of alien invasive vegetation within disturbed maintenance areas	Low (Negative)	Very Low (Negative)
Agricultural	Greater permanent loss of agricultural land associated with the larger inundation footprint	Medium-Low (Negative)	Low (Negative)
Dam Safety	Increased operational and maintenance complexity associated with the larger infrastructure footprint and additional dam wall components	Medium (Negative)	Low (Negative)
Visual	Greater long-term visual change associated with the larger dam and associated infrastructure	Medium-Low (Negative)	Low (Negative)
Climate Resilience	Improved drought resilience and long-term water security for agricultural production	Medium (Positive)	Medium (Positive)
Socio-economic	Long-term support for sustainable agricultural production and employment opportunities	Low (Positive)	Low (Positive)
Cumulative Impacts	Greater cumulative impacts associated with water abstraction, storage and altered hydrological processes within the broader Houdenbek River catchment	Medium (Negative)	Medium-Low (Negative)

11.1.3 Preferred Agricultural Layout

Table 10: Impact Summary (Preferred Agricultural Layout)

Aspect	Impact	Significance (No Mitigation)	Significance (With Mitigation)
Phase: Construction			
Heritage	Potential disturbance to archaeological resources during land preparation and orchard establishment	Low (Negative)	Very Low (Negative)
Palaeontology	Potential disturbance of subsurface fossil-bearing material during land preparation and earthworks	Low (Negative)	Very Low (Negative)
Botanical	Loss and disturbance of indigenous vegetation and degraded habitat associated with orchard establishment	Low (Negative)	Very Low (Negative)
Freshwater	Soil disturbance, erosion and sedimentation associated with land preparation, orchard establishment and irrigation infrastructure	Medium-Low (Negative)	Low (Negative)
Freshwater	Potential sediment-laden runoff into nearby drainage features and the Houdenberg River system	Medium-Low (Negative)	Low (Negative)
Hydrology / Environmental Water Requirements	Minor alteration of local surface runoff patterns associated with land preparation and irrigation infrastructure	Low (Negative)	Very Low (Negative)
Water Quality	Potential temporary deterioration in water quality associated with sediment-laden runoff and construction activities	Medium-Low (Negative)	Low (Negative)
Erosion and Stormwater	Increased erosion risk associated with exposed soils during land preparation and orchard establishment	Medium (Negative)	Low (Negative)
Alien Invasive Vegetation	Disturbance may facilitate the establishment and spread of alien invasive vegetation	Medium-Low (Negative)	Low (Negative)
Agricultural	Temporary disturbance of existing agricultural areas during orchard establishment	Low (Negative)	Very Low (Negative)
Socio-economic	Employment creation and local economic stimulation associated with orchard establishment and irrigation infrastructure	Medium (Positive)	Medium (Positive)
Dust	Dust generation associated with land preparation, earthworks and vehicle movement	Medium-Low (Negative)	Low (Negative)
Visual	Temporary visual disturbance associated with orchard establishment and associated infrastructure	Low (Negative)	Very Low (Negative)
Traffic	Increased vehicle and agricultural machinery movements during the establishment phase	Low (Negative)	Very Low (Negative)
Noise	Temporary noise associated with construction machinery and agricultural	Low (Negative)	Very Low (Negative)

	equipment		
Cumulative Impacts	Contribution to cumulative agricultural transformation and altered hydrological processes within the broader Houdenbek River catchment	Medium-Low (Negative)	Low (Negative)

Aspect	Impact	Significance (No Mitigation)	Significance (With Mitigation)
Phase: Operational and Maintenance			
Botanical	Ongoing orchard maintenance and cultivation activities within transformed agricultural areas	Low (Negative)	Very Low (Negative)
Freshwater	Irrigation return flows, sedimentation and surface runoff associated with orchard operations	Medium-Low (Negative)	Low (Negative)
Freshwater	Potential deterioration of water quality within nearby drainage features resulting from agricultural activities	Medium (Negative)	Low (Negative)
Hydrology / Environmental Water Requirements	Minor alteration of infiltration, groundwater recharge and surface runoff patterns associated with irrigation and cultivation	Low (Negative)	Very Low (Negative)
Water Quality	Potential impacts associated with fertiliser application, agrochemicals and agricultural runoff	Medium (Negative)	Low (Negative)
Erosion and Stormwater	Localised erosion associated with cultivation activities and concentrated stormwater runoff	Medium-Low (Negative)	Low (Negative)
Alien Invasive Vegetation	Potential establishment or spread of alien invasive vegetation within disturbed operational areas	Low (Negative)	Very Low (Negative)
Agricultural	Long-term productive use of agricultural land and improved agricultural output	Medium (Positive)	Medium (Positive)
Visual	Long-term alteration of the agricultural landscape character associated with orchard development	Low (Negative)	Very Low (Negative)
Climate Resilience	Improved agricultural water security, productivity and resilience to drought	Medium (Positive)	Medium (Positive)
Socio-economic	Long-term employment opportunities and support for the local agricultural economy	Medium (Positive)	Medium (Positive)
Cumulative Impacts	Contribution to cumulative agricultural transformation and altered hydrological processes within the broader Houdenbek River catchment	Medium-Low (Negative)	Low (Negative)

11.1.4 Previous Agricultural Layout (Initial Layout)

Table 11: Impact Summary (Previous Agricultural Layout)

Aspect	Impact	Significance (No Mitigation)	Significance (With Mitigation)
Phase: Construction			
Heritage	Potential disturbance to archaeological resources during land preparation and orchard establishment	Low (Negative)	Very Low (Negative)
Palaeontology	Potential disturbance of subsurface fossil-bearing material during land preparation and earthworks	Low (Negative)	Very Low (Negative)
Botanical	Increased loss and disturbance of indigenous vegetation and sensitive habitats due to the larger development footprint and encroachment into less disturbed areas	Medium (Negative)	Medium-Low (Negative)
Freshwater	Increased erosion and sedimentation associated with land preparation within environmentally sensitive and flood-prone areas	Medium (Negative)	Low (Negative)
Freshwater	Increased potential for sediment-laden runoff into nearby drainage features and the Houdenbek River floodplain	Medium (Negative)	Low (Negative)
Hydrology / Environmental Water Requirements	Greater alteration of surface runoff patterns associated with cultivation closer to drainage features and flood-prone areas	Medium (Negative)	Low (Negative)
Water Quality	Increased potential for sediment-laden runoff and deterioration of downstream water quality	Medium (Negative)	Low (Negative)
Erosion and Stormwater	Increased erosion potential associated with cultivation within steeper slopes and flood-prone areas	Medium (Negative)	Low (Negative)
Alien Invasive Vegetation	Disturbance associated with land preparation may facilitate the establishment and spread of alien invasive vegetation	Medium-Low (Negative)	Low (Negative)
Agricultural	Temporary disturbance of existing agricultural land during orchard establishment	Low (Negative)	Very Low (Negative)
Visual	Increased temporary visual disturbance associated with orchard establishment extending closer to the floodplain and surrounding natural areas	Medium-Low (Negative)	Low (Negative)
Traffic	Increased movement of agricultural vehicles and machinery during the establishment phase	Low (Negative)	Very Low (Negative)
Noise	Temporary noise associated with agricultural machinery and establishment activities	Low (Negative)	Very Low (Negative)
Socio-economic	Employment creation and local economic stimulation associated with orchard establishment	Medium (Positive)	Medium (Positive)
Cumulative Impacts	Increased cumulative agricultural transformation and altered hydrological	Medium (Negative)	Medium-Low (Negative)

	processes within the broader Houdenbek River catchment		
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Aspect	Impact	Significance (No Mitigation)	Significance (With Mitigation)
Phase: Operational and Maintenance			
Botanical	Ongoing disturbance to more sensitive vegetation and habitat associated with agricultural activities	Medium (Negative)	Low (Negative)
Freshwater	Increased irrigation return flows, sedimentation and surface runoff entering nearby drainage features and the Houdenbek River floodplain	Medium (Negative)	Low (Negative)
Freshwater	Increased potential for impacts on riparian functioning and downstream water quality	Medium (Negative)	Low (Negative)
Hydrology / Environmental Water Requirements	Greater alteration of local hydrological functioning associated with cultivation closer to flood-prone areas and drainage features	Medium (Negative)	Low (Negative)
Water Quality	Potential impacts associated with fertiliser application, agrochemicals and agricultural runoff	Medium (Negative)	Low (Negative)
Erosion and Stormwater	Increased long-term erosion potential associated with cultivation within environmentally sensitive terrain	Medium (Negative)	Low (Negative)
Alien Invasive Vegetation	Potential establishment or spread of alien invasive vegetation within disturbed operational areas	Low (Negative)	Very Low (Negative)
Agricultural	Continued productive agricultural use of the land	Medium (Positive)	Medium (Positive)
Visual	Greater long-term alteration of the rural landscape character associated with orchard development	Medium-Low (Negative)	Low (Negative)
Climate Resilience	Improved agricultural water security, productivity and resilience to drought	Medium (Positive)	Medium (Positive)
Socio-economic	Long-term employment opportunities and support for the local agricultural economy	Medium (Positive)	Medium (Positive)
Cumulative Impacts	Greater cumulative agricultural transformation and altered hydrological processes within the broader Houdenbek River catchment	Medium (Negative)	Medium-Low (Negative)

11.1.5 No-Go Alternative

Table 12: Impact Summary (No-Go Alternative)

Aspect	Impact	Significance (No Mitigation)	Significance (With Mitigation)
Phase: Construction			
Heritage	No disturbance to archaeological or heritage resources, as no construction activities would occur	No Impact	No Impact
Palaeontology	No disturbance to fossil-bearing material, as no earthworks would occur	No Impact	No Impact
Botanical	No direct loss or disturbance of indigenous vegetation associated with the proposed dam or agricultural development	No Impact	No Impact
Freshwater	No direct disturbance to drainage features, watercourses or freshwater ecological functioning associated with construction activities	No Impact	No Impact
Hydrology / Environmental Water Requirements	Existing downstream flow conditions and hydrological processes would remain unchanged	No Impact	No Impact
Water Quality	No construction-related impacts on surface water quality	No Impact	No Impact
Erosion and Stormwater	No construction-related erosion, sedimentation or stormwater impacts	No Impact	No Impact
Alien Invasive Vegetation	Existing alien invasive vegetation may continue to persist in the absence of active management and rehabilitation	Low (Negative)	Low (Negative)
Agricultural	No expansion of agricultural infrastructure or cultivation areas	No Impact	No Impact
Socio-economic	Loss of potential construction employment opportunities and associated local economic benefits	Medium (Negative)	Medium (Negative)
Dust	No construction-related dust generation	No Impact	No Impact
Visual	No construction-related visual impacts	No Impact	No Impact
Traffic	No increase in construction-related traffic	No Impact	No Impact
Noise	No construction-related noise impacts	No Impact	No Impact
Cumulative Impacts	No additional cumulative construction-related impacts within the broader Houdenberg River catchment	No Impact	No Impact

Aspect	Impact	Significance (No Mitigation)	Significance (With Mitigation)
Phase: Operational			
Botanical	Existing vegetation communities and habitat condition remain unchanged	No Impact	No Impact
Freshwater	Existing hydrological conditions, freshwater ecological functioning and drainage patterns remain unchanged	No Impact	No Impact
Hydrology /	No improvement in agricultural water	Medium	Medium

Environmental Water Requirements	security or resilience to drought due to the absence of additional water storage	(Negative)	(Negative)
Water Quality	Existing surface water quality conditions remain unchanged	No Impact	No Impact
Erosion and Stormwater	Existing erosion and stormwater conditions remain unchanged	No Impact	No Impact
Alien Invasive Vegetation	Existing alien invasive vegetation may continue to establish and spread in the absence of active management and rehabilitation	Low (Negative)	Low (Negative)
Agricultural	Agricultural expansion and associated productivity improvements would not be realised	Medium (Negative)	Medium (Negative)
Visual	Existing rural landscape character remains unchanged	No Impact	No Impact
Climate Resilience	Reduced long-term agricultural water security and resilience to drought compared to the proposed development	Medium (Negative)	Medium (Negative)
Socio-economic	Long-term employment opportunities, agricultural growth and associated economic benefits would not be realised	Medium (Negative)	Medium (Negative)
Cumulative Impacts	No additional cumulative impacts on biodiversity, freshwater resources or hydrological processes within the broader Houdenberg River catchment associated with the proposed development	No Impact	No Impact

11.2 Cumulative effect

Cumulative impacts, in relation to the proposed activity, refer to the combined effects of past, existing and reasonably foreseeable future activities within the broader receiving environment, where individual impacts may be of low significance in isolation but may become more significant when considered collectively.

The proposed Harmony Instream Dam and associated agricultural development are located within an established agricultural landscape in the Koue Bokkeveld region, where several existing farm dams, irrigation systems and cultivated agricultural areas already occur. The Houdenberg River catchment is therefore characterised as a modified and actively managed agricultural catchment.

Potential cumulative impacts associated with the proposed development relate primarily to:

- cumulative water abstraction and storage within the Houdenberg River catchment;
- cumulative alteration of downstream hydrological functioning and flow regimes;
- cumulative impacts on freshwater ecosystems and surface water quality;
- cumulative transformation and fragmentation of indigenous vegetation and habitat; and
- cumulative visual and agricultural landscape modification within the region.

According to the Botanical Impact Assessment (Appendix 8A), the proposed development is expected to result in low cumulative impacts on terrestrial biodiversity. This conclusion is based on the fact that much of the development footprint has been historically modified through agricultural activities and that the proposed layout has been refined to minimise disturbance to indigenous vegetation and environmentally sensitive areas.

The Freshwater Ecological Assessment and Hydrological and Environmental Water Requirements Study recognised that cumulative impacts on downstream hydrological functioning, water availability and freshwater ecological processes within the Houdenberg River catchment remain important considerations. However, both studies concluded that the proposed development is unlikely to result in unacceptable cumulative impacts, provided that:

- water abstraction remains within the limits authorised under Water Use Licence No. 01/E21D/AB/9699;
- Environmental Water Requirements are maintained;
- operational controls and environmental flow management measures are implemented where required;
- erosion, sediment and stormwater management measures are effectively implemented and maintained; and
- ongoing monitoring and adaptive management are undertaken throughout the operational life of the development.

The proposed agricultural layout has furthermore been refined to avoid environmentally sensitive areas, including flood-prone areas, drainage features and the Mountain Catchment Area boundary, thereby reducing the potential for cumulative impacts on freshwater resources, ecological connectivity and indigenous vegetation.

From a socio-economic perspective, the proposed development is expected to contribute positively to cumulative regional agricultural productivity, improved long-term water security and sustained employment opportunities within the Koue Bokkeveld region.

Overall, the cumulative impacts associated with the proposed Harmony Instream Dam and associated agricultural development are considered to be acceptable and manageable, provided that the recommended mitigation measures, the Environmental Management Programme (EMPr) and the conditions of Water Use Licence No. 01/E21D/AB/9699 are fully implemented.

12. CONCLUSION AND RECOMMENDATIONS

The Environmental Impact Assessment (EIA) undertaken for the proposed Harmony Instream Dam and associated agricultural development has evaluated the potential environmental, social and economic impacts of the proposed development in accordance with the requirements of the National Environmental Management Act, 1998 (Act No. 107 of 1998), and the Environmental Impact Assessment Regulations, 2014 (as amended).

The following specialist studies were undertaken as part of the EIA process:

- Botanical Assessment;
- Freshwater Ecological Assessment; and
- Hydrological and Environmental Water Requirements Study.

The findings of these specialist studies, together with the information presented in this Environmental Impact Assessment Report, indicate that the proposed development can proceed without resulting in significant adverse environmental impacts, provided that the recommended mitigation measures, operational controls and monitoring requirements are fully implemented.

The mitigation measures recommended by the specialists have been incorporated into the Environmental Management Programme (EMPr) (Appendix 10) and should form part of any Environmental Authorisation issued for the proposed development.

The need for the proposed development is to provide secure storage of authorised surplus winter high flows for subsequent use during the summer irrigation season. The Applicant currently holds lawful water use authorisations and proposes to improve the reliability of agricultural water supply by storing authorised surplus winter high flows for use during periods when natural river flows are lower. This approach supports more efficient water resource utilisation while reducing reliance on summer abstractions from the Houtenbek River.

The proposed development is situated within an established agricultural landscape in the Koue Bokkeveld where farm dams, irrigation infrastructure and cultivated agricultural land are common features. The proposed development is therefore compatible with the surrounding land uses and the existing agricultural character of the area.

The preferred site was selected because it maximises the use of historically transformed agricultural land while avoiding, as far as reasonably practicable, environmentally sensitive areas. The dam wall has been positioned between existing ridges, thereby reducing the volume of construction material required and improving the engineering feasibility of the development.

Several development alternatives were assessed during the Environmental Impact Assessment process, including alternative dam layouts, alternative agricultural layouts and the No-Go Alternative. The preferred layout was identified following consideration of the environmental, technical and economic characteristics of each alternative and was found to represent the most appropriate balance between environmental protection and engineering feasibility.

The Heritage Impact Assessment concluded that the preferred development layout avoids significant impacts on identified heritage resources through the implementation of the recommended avoidance measures, buffer zones and the Environmental Management Programme.

The Botanical Assessment concluded that the preferred development layout would result in limited impacts on indigenous vegetation, primarily affecting small, isolated patches of Winterhoek Sandstone Fynbos. The

majority of the development footprint is situated within historically transformed agricultural land. Following implementation of the recommended mitigation measures, the residual botanical impacts are considered to be of Low to Very Low Negative significance, and the proposed development is considered acceptable from a terrestrial biodiversity perspective.

The Freshwater Ecological Assessment concluded that the proposed development poses a low risk to downstream freshwater systems, provided that the recommended erosion and sediment control measures, stormwater management measures, rehabilitation requirements and environmentally sensitive construction practices are implemented.

The Hydrological and Environmental Water Requirements Study confirmed that the proposed development is hydrologically feasible and that the Environmental Water Requirements of the Houdenbek River system can be maintained, provided that water abstraction remains within the authorised limits of Water Use Licence No. 01/E21D/AB/9699, Environmental Water Requirements are maintained, and the recommended operational controls are implemented.

The cumulative impact assessment further concluded that the proposed development is unlikely to result in unacceptable cumulative impacts within the Houdenbek River catchment, provided that the mitigation measures, Environmental Management Programme and Water Use Licence conditions are fully implemented.

Overall, the Environmental Impact Assessment has demonstrated that the environmental impacts associated with the proposed Harmony Instream Dam and associated agricultural development can be effectively avoided, minimised or managed to acceptable levels through the implementation of the recommended mitigation measures.

It is therefore recommended that Environmental Authorisation be granted for the proposed Harmony Instream Dam and associated agricultural development, subject to appropriate conditions of approval, including the implementation of the mitigation measures contained in Section 10 of this report, the Environmental Management Programme (Appendix 10), and compliance with the conditions of Water Use Licence No. 01/E21D/AB/9699.

13. DETAILS AND EXPERTISE OF THE EAP

This Draft Environmental Impact Report was compiled by Bianca Gilfillan, who has an Honours Degree in Environmental Science, a National Diploma and a BTECH degree in Environmental Management. She has been working as an Environmental Assessment Practitioner since 2003 and is currently employed at EnviroAfrica cc.

Qualifications:

- National Diploma in Environmental Management (2000 – 2003)
- BTECH in Environmental Management (2003)
- BSc. (Hons): Environmental Science (2009)

Expertise:

Bianca Gilfillan is an Environmental Consultant and Assessment Practitioner with 23 years of experience across South Africa. She specialises in environmental monitoring, compliance, management, and assessment, with strong expertise in NEMA and EPR Regulations.

Please refer to **Appendix 9A** for the CV of the EAP.

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